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THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JULY 3, 1888.

PAPERS AT THE GAS INSTITUTE MEETING.

THE instalment of the proceedings of The Gas Institute which we publish to-day consists of the papers read by Mr. W. J. Dibdin and Mr. Henry Woodall, with the discussions thereon. As in the cases of Mr. Carpenter and Mr. Valon, the discussion on Mr. Dibdin's paper tended to wander from the author's points, and to deal with others put forward by the speakers themselves. Mr. Dibdin treated of photometers; and most of the speakers persisted in talking of standards of light and similar topics connected with photometry, but by no means entering into the question of the design and construction of the photometer itself. This remembrance brings us back to a proposition that has been frequently made, but never acted upon—that prints of the papers presented at The Gas Institute meetings should be distributed in the room

when the authors rise to read them. It is to be hoped that the Council of the Institute will take this proposal into serious consideration before the next meeting. There are no objections to it whatever, that can be named in the same breath with its many recommendations. The members of the Council at present have the advantage over the ordinary members, in being able to follow the readers through all their arguments and calculations, without being thrown out by any of the common hindrances to appreciation of the author which so frequently spoil the best papers. It is not every writer who is at the same time a good reader; but, apart from this consideration, a man may have a weak voice, the acoustic properties of the hall may be poor, or one of his best points may be lost to a portion of his audience through some momentary interruption. It is to be earnestly hoped that the Council will take up this question at the proper time, and apply the solution we have indicated, which would be a popular as well as a reasonable reform in the management of the Institute meetings. It would be the most effectual way of keeping speakers in a discussion from that misunderstanding of a writer's point which infallibly leads to a wandering and purposeless debate.

To return from this digression respecting the reading of papers in general, to the subject of Mr. Dibdin's paper. As we have already had occasion to remark, when referring to the paper, it is principally an indictment of the Evans photometer, and indirectly of all closed photometers of any pattern. It is a noteworthy fact that the Evans form of this most important instrument is seldom met with out of London. Mr. Dibdin tells us how the pattern came to be designed by the late Mr. F. J. Evans in the first place, and how it was afterwards adopted as a legal gas-testing instrument by the Gas Referees. Its chief recommendation was the fact of its being self-contained; thus rendering a dark room unnecessary. But the supposed advantage is easily overrated; and its drawbacks are, as Mr. Dibdin confesses, serious. The worst of it is that while the apparent advantage of this instrument is very obvious, its disadvantages are occult, and only to be discovered by long experience. It is rather a favourite with those who like an important-looking instrument; but it is responsible for much of the trouble respecting candles that has perplexed photometrists and gas makers of late years. It was decidedly hard upon the makers of photometers that after Mr. Dibdin had pointed to the new "Tower" or "Imperial" pattern of the instrument as being the best of its class, Mr. George Livesey should have been compelled to denounce it as the means of making the South Metropolitan Company waste £2000 worth of cannell last year in the endeavour to obtain a good record. Mr. William King, of Liverpool, clearly showed that the complication of photometer construction is an evil, and claimed the credit of the first simple and efficient form of this apparatus for his father, the late Mr. Alfred King. Apart from this personal question, there is doubtless very great force in Mr. King's advice to operators to keep to the simplest forms of the apparatus; but unfortunately there is about the photometry of gas-flames a certain unavoidable complication, arising from the necessity for standardizing the burners, measuring the quantity, and controlling the pressure of the gas consumed, which renders well-made and reliable appliances imperative. All this accessory apparatus has come to be associated inseparably in ordinary minds with photometry itself, which is essentially a simple matter. The difficulty with many observers, who might otherwise feel disposed to follow Mr. King's advice, is to decide between essentials and non-essentials. We cannot attempt to determine the comparative merits of different forms of photometers, when the most eminent authorities take conflicting views respecting them. It is necessary, however, that attention should be drawn to the emphatic condemnation of the methods of gas testing legalized for the Metropolis by the Gas Referees, with which Mr. Dibdin closed the debate upon his paper. Anything more sweeping than this denunciation of the system under which, as Mr. Dibdin declared, the London gas examiners are "compelled to "commit a nightly fraud with the knowledge of the authorities," has never been printed.

Mr. Woodall's discourse on differential prices for gas has been discounted by his many published utterances upon the same and cognate subjects. It began with a clear statement of the error of Local Authorities who make, out of their gas-works, profit which they apply in the reduction of the local rates—a proceeding which the author described as taxing the few for the benefit of the many, and taxing trade for the relief of property. There is no reply to this indictment; but

unfortunately, the men who commit the error do not profess to argue the point—they merely put their hand into the till and take the money. Upon the question of differential prices for gas, it cannot be said that either the paper or the discussion upon it was particularly instructive. There are two orders of differential prices for gas—one based upon the quantity of gas consumed, and the other upon the purpose or the time of the consumption. Although Mr. Woodall had each of these orders of differences in mind, and mentioned them both, he did not distinguish between them sufficiently to lead the discussion to any clear issue. The arguments for differential prices for gas on the basis of quantity consumed, are simply those which give the wholesale buyer an advantage in price in respect of every other commodity, and are accordingly unanswerable. We have never favoured the extension of too much consideration to large consumers; but so long as the customs distinguishing wholesale from retail trading remain in force, they will continue to be applied in dealings in gas as in other articles of commerce. With regard to the desirability of differential prices on account of differences in purpose, time, or method of consuming gas, the consideration of this problem entails the valuation of special factors which are half commercial and half technical in character. This problem was not touched in the discussion on Mr. Woodall's paper, for which, as already remarked, the author was partly responsible. The paper was undeniably interesting, as anything coming from Mr. Woodall is almost certain to be; but it somehow lacked point, as well as being noticeably deficient in weight of matter. The author has not of late had much to do with selling gas at differential prices; and although the paper was an example of the proneness of a gas engineer to "return to his first love," like other men, it was also an illustration of the ugly truth that first loves are apt to pall upon a man in time. There is nothing more that need be said upon this paper for the present.

THE PAY AND POSITION OF GAS ENGINEERS.

DURING the last few weeks there have been several changes in the occupancy of leading positions in connection with the British gas industry; and there may be more to follow. We have declared our intention of keeping the question of the pay and position of gas managers in England well under notice; and therefore take this opportunity of returning to it, *à propos* of recent events. The removal of Mr. Lewis Thompson Wright to Buenos Ayres—to which rapidly expanding field of labour Mr. Wright will carry the good wishes of all his professional colleagues who have watched his promising career—creates a vacancy at Nottingham; and we are pleased to note that the Nottingham Corporation Gas Committee have followed the good course of announcing the salary which is attached to the appointment, instead of putting it up to a bidding by private tender. If it cannot be said that in offering £600 a year to commence with the Nottingham Committee display noticeable liberality, the figure is at least respectable. The Directors of the Bristol United Gas Company have taken a fresh departure in their system of administration, by advertising for station superintendents and chemists, which cannot be regarded with favour by anyone who is properly solicitous for the interest of the gas engineering profession in general and of this Company in particular. It is all very well to have a full and efficient staff of works superintendents; and a chemist is a good addition to the administrative department. The Company also deserve credit for advertising the amounts of the salaries they mean to pay their station managers. Here, however, approval of their policy must end. They are committing the grave error of trying to do without a head, like the Manchester and Leeds Gas Committees; and, like these, they will regret it some day. A system of administering a large gas undertaking having several stations, consisting of a republic of mutually independent superintendents working under a clerical head, has its superficial and temporary recommendations—especially to the clerical head—but it is certain to break down in the long run. Nobody in the concern has sufficient authority to direct the undertaking as a whole; and so, after a shorter or longer time, depending upon local circumstances, a consulting engineer will have to be called in to set matters straight, regardless of expense. Again, one is at a loss to know why Bristol wants three chemists—if these officers are to be worthy the name, and are not to be merely routine gas testers. Surely it would be more in accordance with common sense to confide the executive work to a duly qualified and properly paid chief engineer; giving him his necessary staff of station superintendents and

one capable chemical assistant. We offer this criticism on the policy of the Bristol Gas Company principally on general and public grounds, but also in the interest of the undertaking. It is quite possible that somebody may think we are answered by saying that the Bristol or any other Board of Directors should be permitted to do their own business in their own way; but the question is too important and too public in its nature to be disposed of in any such manner. A gas undertaking is a branch of the public service; and it is essential that the men who from time to time are entrusted with the guardianship of a permanent department of the service should be reminded of their duty. Boards of Directors and Corporation Gas Committees come and go, and nobody remembers them; but the effects of their wisdom and folly, chiefly displayed in the choice of capable or incapable executive officers, endure for generations after they have been personally forgotten, in the undertakings of which they have had temporary control. There are towns in England whose inhabitants have to pay half as much again for their gas as need have been charged, simply because of the blunders or some bygone magnate of the Board who carried everything in his own way while he lived, and never suspected what a legacy of trouble he was providing for his successors. We do not say that, in the case of Bristol, the Board are knowingly regardless of the future; but we hold that, by whomsoever advised, they are wrong in depriving their undertaking of a responsible engineering head, and maintain that if the present Board do not survive to discover their error, the revelation will come to their successors, probably at some particularly awkward time.

THE CIRCULAR INQUIRY NUISANCE AGAIN.

A FURTHER illustration of the extent and virulence of the "circular of inquiry" plague has reached us during the past week. This time it is a list of questions relating to gas-retort stokers, and emanates from the Secretary of an important Gas Company in the West of England. The matter is to be read in conjunction with the remarks contained in another paragraph relating to the attempts that are being made in some quarters to abolish engineers, and administer gas undertakings of respectable magnitude by the aid of a clerical staff and a few works superintendents. The circular now in question contains nine questions intended to ascertain the pay and work of stokers and firemen, and would be harmless enough if addressed by an engineer and manager to his professional friends. As a means whereby a Board of Directors and their Secretary hope to be able to do without the services of the officer who should be responsible for the carbonization work of their business, however, it is objectionable in the highest degree. Several copies of the circular have been sent to us from different parts of the country; from which we judge that it has been distributed broadcast. We hope that very few replies will be sent, as a hint to the Company to make arrangements for doing their business in a proper manner. Engineers and managers will have themselves to thank if they give any assistance to a policy aimed at their own extinction. It is a curious indication of the confused sense of duty prevailing in the mind of this particular inquirer that, although he signs his letters as Secretary, he addresses them to engineers and managers. Why does he not send them to his fellow-secretaries? Because he knows very well that the subject-matter is none of their business; and it should not be any of his. We shall have great pleasure in receiving any other specimens of circular-letters which the recipients have reason to regard as unwarranted, and shall duly gibbet them as they deserve. At the same time, the most effectual cure for this evil is to regularly deposit all such objectionable letters in the waste-paper basket; and this course we unhesitatingly say should be followed with nine out of every ten of these communications.

THE DEMAND FOR COKE.

If anybody can give a rational explanation of the cause of the increased demand for coke that set in last autumn, and has since been maintained, to the depletion of the stores in most British gas-works, it would be welcomed in these columns. The report of the Birmingham Gas Committee, presented at to-day's Town Council meeting, shows that all the quantity of coke in stock on June 21 at the stations of the department was only 763 tons, whereas at the corresponding period last year there were 19,124 tons unsaleable. Doubtless when the accounts of the principal Gas Companies come to be made up for the half year that has just expired, they will show a similar result. It would be interesting to know the reasons for this remarkable change, because at present it looks like

one of those unaccountable vagaries of trade that confound the most prescient men of business. Who would have prophesied, this time last year, that before another twelvemonth had passed the too-solid mountains of coke that cumbered the ground in nearly every gas-works in the kingdom would have melted away, and that prices would be raised accordingly? Yet it is precisely this power of foreseeing business fluctuations that is the most valuable possession of the trader. In this matter of coke, however, demand seems to rise and fall for no reason that the keenest-sighted dealer or producer can distinguish. All we know at present is that whereas last year there was plenty of coke in stock, this year there is none; but what has really brought about the change is a mystery. People talk glibly enough about times of good trade and bad trade; but very few can recognize the broad signs of either condition while they actually exist, to say nothing of foreseeing their appearance. Most men can only be certain about such matters after the time has passed. We can look back upon the extraordinary advance in the value of coal and iron of twelve years ago or thereabout, and remark that anybody who could have foreseen what would happen at that time could have made a great fortune by forestalling the rise. Many did so; but the process was more accidental than deliberate. Many buyers of coal and iron then took credit to themselves for their cleverness in making contracts for future supplies on good terms for themselves; but people who once happen to make a good shot in this way, are liable to try the same thing once more, and make a disastrous failure of it. Over and over again during the past ten years there has arisen a cry of a general revival of trade, and a warning of a rise in the value of staples as a necessary consequence. Nothing has come of it, however, and speculators for the rise have done no good, even where they have not seriously damaged themselves. Now, comparatively unnoticed by newspapers, and unattended by any remarkable change in the aspect of the national industries, the demand for coke has swelled and swelled—gradually, imperceptibly, and irresistibly—until it has swallowed up the available supply. The unaccountableness of the phenomenon recalls to mind the fancy of the philosopher who connected crises and periods of expansion in the world of finance with the appearance and absence of sun-spots. People must have a reason for movements that they see going on around them in the affairs of trade and industry, even if nothing nearer than the planetary system presents itself. The Goodwin Sands have been ascribed to the influence of Tenterden Church steeple; and have the recent changes in the occupancy of the Imperial throne of Germany had anything to do with reducing the stock of coke in the United Kingdom? If not, to what is this change due? The question is far easier asked than answered.

Water and Sanitary Affairs.

THE action brought by the East London Water-Works Company in the City of London Court, a report of which appeared in the last number of the JOURNAL, points to a practical inconvenience in the working of Mr. Forrest Fulton's Act. Primarily, the person "using" the water supplied by a Company is liable to pay for it; but in the cases which come within the operation of the recent Act, the short and simple remedy of cutting off the supply in the event of non-payment, has been forbidden. In the action referred to, defendant was occupier of premises where the Company's water was consumed; that is to say, he was allowed to live there by his employer, a contractor, whose name was persistently concealed from the Company. In these circumstances, how was the water-rate to be recovered, and from whom? The Company brought an action against the defendant, the actual occupier. Ultimately, under the pressure of Commissioner Kerr's remarks, the full name and address of the mysterious contractor were admitted, and he was made a co-defendant in the action. In this case, therefore, the Company probably will overcome the obstacles placed in their way, and in the end the rates will be recovered. Nevertheless, the hardship of the position is apparent. It cannot be doubted that if the Company had been at liberty to cut off the water, the knowledge that they possessed that power would have led to payment of the rates without the expense and delay involved in taking legal proceedings. Even so, but for the peremptory direction of the learned Commissioner (a direction which it would seem by no means easy to enforce against an obstinate defendant), justice would still have been balked. Mr. Fulton's Act has

thus opened a way for fraud and deception, against which the Water Companies are almost powerless. It is true that payment in advance can be required for the first quarter's water supply; but afterwards there is nothing to prevent a dishonest consumer getting in arrear, and "dodging" the lawful claims of the Company.

The question whether an over-payment of water-rent can be considered a compulsory payment, and therefore recoverable by the consumer, was recently dealt with in the form of a test action in the Burnley County Court. The case was reported in the JOURNAL for May 22 last (p. 992); and some editorial remarks with respect to the controversy appeared in the JOURNAL for the following week. We then ventured to express the opinion that the return of any excess of water-rent, received by a Company or Corporation in the circumstances mentioned, could not legally be claimed in an action by the person who paid it. It is satisfactory to find, from the judgment which appears in another column, that this view has been sustained by Justices Cave and Wills, who heard the appeal from the Burnley County Court in the particular case referred to. The Burnley Corporation had charged one of their customers a sum calculated at the rate of 5 per cent. on the gross rental of the house in his occupation, the amount of the rate on that basis being £8 15s. 4d. The sum, if calculated with reference to the rateable value, would have been £7 3s. 10d. The plaintiff paid the larger amount, and then claimed to recover the difference—viz., £1 11s. 6d.—on the ground that, legally speaking, the payment had been made under duress. The County Court Judge arrived at the conclusion that this contention was well founded, simply because the Corporation possessed the power to cut off the water supply. It was not suggested that they had actually threatened to cut it off. In view of this fact, it is not surprising that the Corporation should have submitted the case to the decision of the Judges of the Queen's Bench Division—a decision which, we apprehend, must be taken as finally settling a point of no small importance to Water Companies, and, if the term is permissible, Water Corporations, in general. The position certainly would be very serious if, after accounts had been closed and dividends distributed, consumers could "spring" on shareholders or ratepayers demands for sums of money which in previous years had been voluntarily paid and received in good faith as being the rates authorized by law. The Judges have now made it perfectly clear that this cannot be done; and by virtue of their ruling have put a check on the flood of vexatious litigation which might probably have broken forth if the decision of the County Court Judge at Burnley had proved to be sound law. At the same time, it is desirable that the effect of the learned Judges' decision should not be over-estimated. They have simply held that the mere possession of power to cut off water supply was not enough to sustain a plea of duress, and enable the consumer to claim a return of what he professed to have paid under some sort of compulsion. In the Burnley case, as already pointed out, there really was no compulsion at all. Not a word was said about cutting off the water if respondent failed to pay the full sum claimed; and, therefore, the payment of the amount was obviously voluntary. Regarded as a test action, brought for the purpose of raising an undoubtedly important point, the case selected was surprisingly weak. It would be easy to conceive an instance in which the circumstances could be made to wear the aspect of at least partial compulsion. The Companies, therefore, should exercise the necessary tact in avoiding disputes to which there might not be a favourable issue. In the case of many provincial undertakings, doubts still exist (owing to the varying phraseology of Special Acts) whether the water-rates are properly assessable on the gross estimated rental or on the rateable value of the premises to which the supply is furnished. At Burnley, the former was the footing on which the rates were claimed and paid for many years. Recently, however, the Corporation appear to have arrived at the conclusion that their mode of charging was erroneous. The same kind of thing may occur elsewhere. But in those instances in which doubts exist, it would obviously be bad policy to provoke or hasten a contest; nor should Directors be in a hurry to give away the rights of those whose interests they hold in trust. "Annual value," as we have before insisted, is not a term which is to be construed with reference only to the Dobbs definition. There is much in the remarks made by eminent Judges in the more recent cases, to encourage every Water Company to await a legal interpretation of their own Special Act before relinquishing a large portion of their annual income.

The Gas Institute.

PROCEEDINGS AT THE TWENTY-FIFTH ANNUAL MEETING.

CHARLES GANDON, Esq., M. Inst. C.E., PRESIDENT.
PAPERS AND DISCUSSIONS.

(Continued from Vol. LI.)

PHOTOMETERS.

By W. J. DIBBIN, F.I.C., F.C.S., Chemist and Superintending Gas Examiner to the Metropolitan Board of Works.

At the present time, which may be called the transition period in photometry, both with regard to the standard of light and the instrument with which that standard is used, there are few more vexed questions demanding the serious attention of gas managers and examiners than that connected with photometers. The various departures which have been made from time to time from the simple open bar of Bunsen, have brought about a condition of things in regard to photometers which demands careful consideration, in order that, in the changes evidently imminent, they may be distinctly understood, and that the new instrument, whichever one may be finally adopted, should give accurate results, and thus renew the confidence of all in the work done—a state of things which cannot by any means be said to exist in all cases at the present time.

In order that the present paper may have a practical value, it is not now proposed to discuss photometers other than those founded upon the principle of the Bunsen bar, both open and closed. The instruments thus referred to comprise the simple bar, either of the Letheby or Keates type, the Evans closed photometer, the "Canadian," and the recently-introduced "Imperial" standard. The "Radial" photometer when used for horizontal rays, being an open bar of the simplest type, will naturally fall under this head.

The simple bar photometer is so well known that little description of it is required. Shortly, it consists of a bar 60 inches in length in the Letheby form, or 75 inches in the Keates; having the gas-flame fixed at one end, and a candle balance with the candles at the terminal point at the other—the disc being placed in a sighting-box, which freely travels on wheels along the bar. As used by both Letheby and Keates, this instrument was employed in a room darkened during the testings. For the supposed better protection of the candles from draughts, a box was placed so as to enclose them, with the result that at times this "protection" has a deleterious effect on the candles by excessive heating of the contained air. For the purpose of avoiding the necessity of darkening the experimental room, and to comply with the requirements of the Standards Department of the Board of Trade, when certifying this instrument for the Canadian Government, the whole of the apparatus—viz., the meter, governor, bar, &c., were enclosed in a small wooden room, and shut in with heavy curtains; and in this form it is known as the "Canadian" photometer. From this it is seen that the Canadian photometer is merely a Letheby bar enclosed in a small portable room, which requires most careful ventilation to ensure accurate results, especially when candles are employed as the standard.

In 1858, in consequence of a dispute with the St. James's Vestry as to the illuminating power of the street lamps, it was decided to test the burners in use *in situ*, as the authorities at that time would not consent to the removal of the burners to a proper testing-room. Under the direction of Mr. F. J. Evans, then Engineer to The Gaslight and Coke Company, a closed photometer was constructed, and mounted on a platform in Piccadilly. The end of this photometer was constructed of such a size that it could be placed bodily over the street lamp. The disc was fixed at a point 50 inches from the flame, and the candles mounted on a travelling holder on the reverse side of the disc, and moved for the purpose of taking the readings by means of an endless cord and winch-handle, situated immediately in front of the disc. Falliug doors were fitted for affording access to the burner, disc, and candles respectively. As the testings had to be conducted in the open air, care was exercised to regulate the draughts to the gas and candles; and exit for the burnt gases was afforded by chimneys over the two ends of the box. This system evidently gave such satisfactory results to the inventor that, when he was appointed one of the Gas Referees under the Act of 1868, he so strongly advocated its use at the legal gas-testing stations, that it was adopted, and first fixed at the Arundel

Street, Leadenhall Street, Cannon Street, and Gray's Inn Lane testing stations in 1869. The gas made at Bow Common was at the same time tested with an open Letheby photometer at Friendly Place, Mile End Road; and it continued to be so tested until January, 1881, when this gas was tested with an Evans's photometer at No. 3, Jewry Street. Previous to this, however, the gas supplied by the City of London Gas Company, The Gaslight and Coke Company, and the Great Central Gas Company was, under the Act of 1860, carried into No. 37, Jewry Street, where the late Dr. Letheby tested the several supplies by an open bar photometer from about 1862 to 1868. So that at this time there was by no means unanimity of opinion as to the respective merits of the two forms of apparatus. Since then, station after station was fitted indifferently with one or other of these instruments. In 1876, two stations prescribed by the Gas Referees were fitted with the open bar; but in 1878, in consequence of the complaints of the Company as to the low results obtained by the Official Examiner, the Gas Referees consented to the removal of these two photometers, and the substitution of the Evans closed form in their place. The following are the average results obtained during 48 days before and 48 days after the alteration:—

	Station A.	Station B.
Before	17.0	16.1
After	17.5	17.1

As originally constructed for the gas-testing stations, the Evans photometer was ventilated by the two chimneys, one at either end. Subsequently objection was taken to the deficient ventilation thus afforded; and a long inverted box-cover, open downwards throughout the length of the instrument, was fitted in their place, with the view of ensuring more perfect exit for the products of combustion than had hitherto been obtained. For the same reason, the internal width of the box enclosing the flames and screen was enlarged. When, however, the new arrangement was applied to one of the existing forms, it immediately became apparent that a change for the worse had been made, as before the alteration somewhat reasonable results were obtainable; but afterwards it was almost impossible to get a test within 10 per cent. of the admitted value of the gas, and results of above 25 per cent. were by no means uncommon. The following series of tests recently made in rapid succession, by no less than six of the most experienced photometrists of the day, will show the utter unreliability of one of these converted old-pattern Evans photometers:—

Height of Gas-Flame, Three Inches.

Bunsen Disc.	New Candles and Diddin's Leeson Disc. Candles.
18.8	19.7
21.9	20.0
20.0	20.0
21.3	—

These were amongst some of the worst results given; but were by no means of uncommon occurrence.

For the purpose of thoroughly trying the question, I have at various times made careful comparison tests of three Evans photometers with a simple bar photometer used in the open without screens of any kind, other than those necessary to avoid errors due to reflection, and the protection of the observer from direct rays. The following are the results so obtained:—

Photometer No. 1	First day	Evans' Photometer. Candles.	Open bar. Candles.
"	Second day	16.0	16.3
"	"	16.5	16.4
"	Third day	15.3	15.3
"	"	17.2	17.3
"	"	16.8	16.0
"	"	18.0	16.0
"	"	17.6	16.6
"	"	16.0	16.5
"	Fourth day	16.3	16.2
"	"	16.8	15.5
"	Fifth day	16.3	15.9
"	"	16.7	16.2
"	"	17.0	16.0
"	"	17.5	16.5
"	"	15.7	14.2
Photometer No. 2	Sixth day	17.3	17.3
"	"	18.5	17.1
"	"	16.6	17.1
"	Seventh day	17.1	16.3
"	"	16.9	16.7
"	"	17.2	16.3
"	"	16.4	15.7
"	Eighth day	17.1	17.2
Photometer No. 3	Ninth day	18.7	15.9
"	"	18.7	16.0
"	"	19.1	16.0
"	"	19.3	16.0
"	"	19.8	15.9
"	"	20.7	16.0

Photometer No. 3.	Tenth day.	Evans Photometer.		Open bar.
		Candles.	Candles.	
"	"	18.3	..	15.8
"	"	18.3	..	15.8
"	"	18.6	..	15.9
"	"	18.4	..	15.9
"	"	19.5	..	15.9
"	"	20.8	..	15.9
Average		17.1	..	16.2

From these results, it is seen that the average by the Evans was 0.9 candle over that indicated by the open bar. As the instrument No. 3 had afforded such high results, I conducted a special series of tests with that one, with the following results :—

“ Evans ” Photometer No. 3, with the Wooden Top off, but with Zinc Gauze Screens remaining on.

	Evans Photometer Candles.	Open Bar Candles.	Height of Gas Flame, 3 inches
First day	17.6	16.2	..
"	17.3	16.1	..
"	17.9	16.2	..
"	18.2	16.2	..
"	17.9	16.2	..
"	18.2	16.2	..
Second day	16.3	15.0	2½ inches
"	16.6	14.9	..
"	16.9	15.0	..
"	17.2	15.1	..
"	17.4	15.0	..
Third day	17.5	15.1	..
"	17.0	16.2	3 inches
"	17.4	16.1	..
"	17.7	15.9	..
"	17.9	16.0	..
"	17.7	16.1	..
"	17.8	16.1	..
Average	17.5	15.8	

The zinc gauze was next removed, so as to convert the photometer into an open one, as far as possible ; and the following results found :—

Evans Photometer No. 3, with Wooden and Zinc Tops off.

Evans Photometer Candles.	Open Bar Candles.
15.6	15.5
15.4	15.8
15.7	15.5
16.3	15.8
15.6	15.5
15.6	15.8
Average	15.7

These results are only typical of a large number of others ; one special series of over 90 having been conducted at the request of the Metropolitan Gas Referees, with the result of most fully endorsing the indications shown above as to the behaviour of photometer No. 3—viz., that the removal of the wooden top is a decided advantage. Previously to its removal, 19 and 20 candle gas was often indicated ; while, after its removal, these results fell to between 17 and 18 candles, and again dropped on the removal of the gauge screen to about 16 candles—the tests being far more concordant in the latter case. The errors due to candles were avoided as far as possible by the use of those of two different makers and different packets.

The moving of the candles in the Evans photometer has long been admitted as a serious error ; and at the request of the late Mr. Keates, Messrs. W. Sugg and Co. constructed a modified Evans photometer, in which the candles were fixed as in the bar, and the screen was made moveable. Since then, this form of instrument has been modified. Two large towers are now placed, one at each end, for the reception of the candles and gas-burners respectively ; and the disc is moved. The tower or Imperial photometer, as this new pattern is called, has been sanctioned by the Gas Referees ; and two of them are in use in the Metropolis. The results obtained with it are far more concordant than with the old pattern Evans ; and the indications of candles agree as closely as can be expected with those afforded by the ten-candle test, which I have elsewhere shown to be a very reliable standard when used with 16-candle gas, or an inferior gas carburetted with pentane. Comparative tests with the bar photometer used in the above detailed experiments have also given very satisfactory results ; so much so, that I have no hesitation in advocating its use, if it is considered desirable that a closed photometer should be necessary.

Up to a short time back, it was always assumed that the errors of observations were invariably due to candles. The series of tests now given demonstrate conclusively that in a large number of instances candles “ have been more sinned against than sinning,” by being used in an instrument which has rendered it impossible for them to yield the results they would otherwise have done. In many of the above tests, the

same candles were used, being carefully transferred from one photometer to another, as also were the standard burners. The meters were carefully compared, and found to give identical measurements of the gas burnt ; while the height of the gas-flame was the same. The erratic behaviour of the candles in a large number of cases when used in the “ Evans ” photometer was doubtless due to the elevated temperature and vitiated atmosphere, as, when the doors of the instrument were kept open, or repeatedly opened during a test, the readings were more uniform.

The outcome of the numerous experiments which I have now conducted is that the Evans photometer, even at its best, is a most unsuitable instrument for practical photometry ; that if a Bar photometer is to be used, it should be perfectly open ; but that if a closed instrument is deemed preferable, it should be of the Imperial or tower (as it has been called) type, in which the opposing flames are placed in a large area, in which a considerable volume of air is moving at a slow speed, free from side or top draughts.

Recently I had an opportunity of demonstrating the principle in connection with one of the ordinary Lethby photometers, in which the flame was placed in a partially closed chamber—viz., closed on three sides, and partly so in front by means of a glazed window. In using such an instrument in connection with my recent experiments on the standards of light, I found it of considerable advantage to cover the top of this chamber, leaving a 6-inch circular opening for the exit of the vitiated air, and to close the part left open over the glazed front. The result was to immediately steady the flame in a manner similar to that in the tower photometer ; and far more concordant results were indicated in consequence. One outcome of this steadying the flame is that the readings are made with much greater facility and accuracy.

In the new pattern photometer I have introduced an improved form of disc-holder, in which the disc and mirrors are reversed, without the removal of the frame from the box, as in the Evans ; and consequently readings are more reliable, as the trouble of turning the disc is so slight that there is no reason why one-half should not be taken with the disc and mirrors in one position, and the remainder with them reversed. This disc-holder can, of course, be fitted to other photometers.

It may possibly be thought that, in view of the near approach of a change in the standard of light, the considerations arising from the behaviour of candles have little weight. This would indeed be so but for one fact, which has hitherto not received the attention which its importance deserves, and which is of the utmost consequence in connection with any one of the proposed substitutes for candles, and especially so with the pentane air-gas flame of Mr. A. Vernon Harcourt. This point is the steadiness of the flame. The arrangements for the ventilation of the Evans photometer render it impossible that any gas-flame should burn steadily in it. In the tower photometer the steadiness of any flame, even the pentane, is most remarkable, so much so that the confidence of the operator in the accuracy of his results is greatly enhanced ; and he feels that at last he has an instrument which is worthy of his best endeavours.

I have to acknowledge my indebtedness to Mr. A. F. Damon, one of the Metropolitan Gas Examiners, for his valuable services in connection with many of the experiments mentioned in this paper.

Discussion.

The PRESIDENT said that Mr. Dibdin, who had always been a great advocate for the improvement of the standard of light for photometry, had put forward the opinion (with which he quite agreed) that candles, although not perfect, were not so bad as they had been made out by many persons to be. His experience was that if candles were carefully and properly used, very uniform results might be obtained. In saying so, he did not wish it to be inferred that an endeavour should not be made to obtain a better standard, because it must be admitted that candles were liable to be irregular and uncertain ; but at the same time, he thought closed photometers were entirely unsuited for candles. He was sure the members would pass a vote of thanks to Mr. Dibdin.

Mr. GEORGE LIVESY (London) thought it was not possible, in the short time at their disposal, to go into a discussion on standards of light ; but they should confine themselves to the question of photometers, which was the subject of the paper. He joined with Mr. Dibdin in condemning the Evans photometer, which he had never liked, and did not know why it was introduced ; but he had an instinctive prejudice against boxing up two of the lights in such a small

coffin kind of apparatus. What the gas companies wanted was a fair and just measurement; and he was quite certain they all desired to give in illuminating power all that Parliament required. As a proof of this he might take the fact that invariably—putting aside accidental circumstances—the gas companies always gave considerably more light than was really necessary. It was to their interest to do so—to deal fairly and liberally with their customers. This being so, it was essential that they should have a photometer which would give reliable results, which he did not think the Evans photometer did. Still, he was not going to adopt the tower photometer, which he should condemn nearly as strongly as the Evans. That instrument cost the South Metropolitan Gas Company last year at least £2000 for extra candle; for they had to make 18-candle gas, and then they could not show 16 candles in the tower photometer. Why it was, he did not know; but whether it was the restriction of the air supply, or whatever it might be, there was the fact, and, do what they could, they could not keep up the quality. It was constantly just on the 16-candle standard—sometimes below; rendering them liable to penalties for deficiency of light. The most experienced of the gas testers had tried it; and at last a very high authority in testing (whose name he would not mention), with the Official Gas Examiner, brought out results very much in excess of those which the latter had been in the habit of producing. Perhaps the gas examiner, finding that a leading photometrist obtained results so very different from his own, thought he might have been wrong in his reading. However, it was sufficient to condemn the instrument if two men, or a number of men, obtained varying results from it. He did not like the boxing in at all; and he was very pleased to see that Mr. Dibdin put in the word “if”—“if” he said, “a closed instrument is deemed ‘preferable, it should be of the Imperial or tower type.’” Further on he told them of another one which was not a closed photometer, but as open as it could be, in order to meet the convenience of not having an entirely darkened room. This was how he described it: “Recently I had an ‘opportunity of demonstrating the principle in connection ‘with one of the ordinary Letheby photometers, in which ‘the flame was placed in a partially closed chamber—viz., ‘closed on three sides, and partly so in front by means of ‘a glazed window. In using such an instrument in connection with my recent experiments on the standards of ‘light, I found it of considerable advantage to cover the top ‘of this chamber, leaving a 6-inch circular opening for the ‘exit of the vitiated air, and to close the part left open over ‘the glazed front. The result was to immediately steady ‘the flame in a manner similar to that in the tower photometer; and far more concordant results were indicated in ‘consequence. One outcome of thus steadying the flame is ‘that the readings are made with much greater facility and ‘accuracy.’” That was his (Mr. Livesey’s) idea of what a photometer should be—one which would give fair results in the hands of varying operators, and under all the ordinary circumstances.

Professor FOSTER (London) remarked that, as far back as September, 1871, there was a short article by himself in the *Chemical News*, which he believed was the first published account in which this question of the Evans photometer was taken in hand. The remarks then made were just as applicable at the present time. Dr. Letheby was at Worthing; and he was in correspondence with him about another matter connected with the supply of the South Metropolitan Company. After referring to that matter, Dr. Letheby thanked him (Professor Foster) for the copy of his notes on photometry, which he said he had read with much interest; that he had done some good by pointing out the error from abnormal combustion of candles in the closed chamber of the Evans photometer; that he had himself repeatedly observed the like increase in the illuminating power of the gas towards the end of the experiment; and that in one case the illuminating power was actually more than double towards the end of the experiment, and the candles seemed to be, as it were, stifled for want of air. But this was not the only objection to the Evans form of instrument. It was too long, seeing how the light diminished with distance; its sides reflected light when dusty; the air of the chamber became too hot for proper combustion; and the ventilation was imperfect. Further, the movement of the candles affected the steadiness of their combustion. Dr. Letheby added that he did not, for obvious reasons, like to enter into a criticism of the instrument especially as his own photometer was in some sense a rival instrument. He referred to this letter, because it showed

clearly what Dr. Letheby’s experience was. His (Professor Foster’s) own experience was that an open bar, if it could be arranged, was the most convenient form—taking care, of course, that there was no particular reflection from the sides of the room, and no unsteadiness produced by draughts. There was certainly something in what Dr. Letheby said about the length of instrument for ordinary 16-candle gas. One could not lay down any very definite rule; and for testing high-power burners one required the disc at a certain distance, as one must not have more than a certain amount of luminous energy per unit area of disc; otherwise it was very difficult to read the slight differences which occurred in the observations.

Mr. WILLIAM KING (Liverpool) thought the discussion very forcibly illustrated the wisdom of the old saying—“Why ‘cannot you let it alone?’” It seemed to be forgotten that the instrument was really invented by the late Mr. Alfred King; and the photometer was an open bar in an open room, fitted with as little apparatus about it as possible. The discussion no doubt showed that these first principles would be wisely carried out at the present time; and that all the “coddling,” so to speak, which the instruments had received during the last 20 or 25 years in the way of reflectors, boxes, &c., was really detrimental to the original simplicity and beauty of the instrument. The photometer should be placed unboxed in a well-ventilated, darkened room; and every gas company should be furnished with that. A photometer-room was as essential a part of gas apparatus as a purifier, or anything else connected with a properly-furnished gas-works. Also, in the case of a corporation or other public body who might wish to test the gas, especially where penal clauses were concerned, a well-found photometer-room was an absolute necessity. Under these circumstances, it was evident that the boxing-in of photometers might be dispensed with. As Mr. Livesey had said, the discussion was not on standard lights; but still a word on candles might not be out of place. As far as his own experience had gone, he thought the candle had been “more sinned against than sinning.” Although he had frequently tried to get the very extraordinary results which had been recorded by some observers, he had failed to obtain them with an open bar, and in a well-ventilated room. He was far from saying that the candle was an altogether satisfactory standard; but he did not think it was quite as black as it had been painted. He would not trespass further on the time of the meeting, except to urge on all the members the advisability of trying experiments with the most simple apparatus. In the form of photometer as first invented nearly 50 years ago, arrangements were made for reversing the screen at every alternate observation if wished; so that the original inventor did not lose sight of this very important point.

Mr. NORTON H. HUMPHREYS (Salisbury) said that one point which had been clearly brought out in the paper was very important—viz., not only should there be a perfectly steady air supply, but the photometer-room should be maintained at an equal temperature of about 60°. He had used a bar photometer some time ago, and had adopted boxes like the towers which had been mentioned at each end; and, not having a small room, he had put it up in a large one, with a curtain arrangement. By this means, he could draw back the curtain, and keep the bar at the atmospheric temperature; and he found that he obtained much better results than was formerly the case when the photometer stood in a small room, where the temperature would rise. He had both the candle and the gas-burner boxed in all round, with rather larger circular openings at the top, and open at the bottom; and both boxes were kept perfectly cool. It was not only of importance with regard to the candles, but also in the case of the gas, that the air supply should be steady and equal in temperature throughout the experiments. If all these points were observed, which was not difficult, they would not hear so much about the wide differences with candles.

Mr. FRANK MEAD (Sutton) remarked that Mr. Dibdin had made one very pertinent observation. Many members of the Institute were furnished with these closed Evans photometers; and if he understood the observation referred to correctly, the closed photometer with the top on gave 17·1, against 16·2 candles with a standard photometer. When the box covering the top was removed, the test was 17·5 candles, against 15·8 candles with the standard; but when he took away the zinc screen from the box, concordant results were obtained with the Evans photometer and the tower photometer. Now, if by the removal of the box top and the zinc gauze, an Evans photometer would give concordant results with the standard, what could be more simple than

just to lift away the portions he has mentioned of the instruments, instead of having entirely fresh instruments—a serious matter of cost.

Dr. DUPRÉ (London) desired to point out that the original inventor of the photometer under consideration was Bunsen. Bunsen, however, used a photometer on which the two lights to be compared were always on the same side of the disc; and this, it appeared to him, had certain advantages. First of all, they saw with their two eyes, instead of seeing, when looking in the mirror, the two discs with different eyes, which did not always give the same results. Bunsen worked in a dark room; and when he made the experiments which led to the invention, he prepared himself by living for some days in a perfectly dark room. He (Dr. Dupré) could quite imagine, if the photometer was only enclosed in a dark box, and they looked on the discs with different eyes, unless a considerable time was allowed to elapse before the observation was made, it might lead to error; the two eyes being somewhat differently affected by the light on coming from a comparatively light room to the dark box. He should think that the fairest way of testing gas would be some approach to the conditions under which the consumer used it. When a man wished to read by gas, he did not retire into a dark box. It seemed to him that the fairest way to the consumer and to the gas company would be to test the gas in an open room; but the room should be darkened, so that the eye of the observer was at its best for the work, and, if possible, it should be arranged that the disc should be seen with the two eyes simultaneously.

Mr. C. HEISCH (London) said that the paper under discussion was very interesting to him, as he had been working on photometry for nearly 50 years. In the first place, he perfectly agreed with Dr. Dupré that the use of the eye for one side of the disc only was essentially bad. They ought certainly to look at both sides with both eyes; but in an open photometer, this was very easily managed. It was only necessary to retire a sufficient distance from the disc, and both sides practically could be seen at once; for the slightest possible movement of the head was sufficient to show the two sides to both eyes without any trouble. With regard to the question of boxing up the lights, this had been one of the great difficulties ever since the introduction of the Evans photometer. After the passing of the Act of 1860, all the gases supplied to the City were tested by the open-bar photometer at the Jewry Street station. The three gases from the City of London Gas Company, The Gaslight and Coke Company, and the Great Central Company were all led into one room, and tested on the same bar with the same apparatus. This continued until the passing of the Act of 1868; and then the gases from The Gaslight and Coke Company and the City of London Company were transferred to the Evans photometer; but the Great Central Company's gas remained for testing on the open bar. The new system, as far as the gas from the Bow Common works was concerned, began on Lord Mayor's Day, 1880. He was free to confess that, until the Evans photometers were introduced in the City testing-stations, he was not absolutely ignorant of their existence; but pretty nearly so. He had been in the habit of going all about the country testing gas; but never met with one out of the Metropolitan district. They were almost all open bars; and he believed an open bar was the best thing they could possibly use. Free ventilation, both of the candle (or whatever the standard might be) and of the gas was obtained. Two objections to the Evans photometer, besides its want of ventilation, were: (1) They looked at the disc through a pane of glass, which did not increase the facility of accurate reading; and (2) it was a temptation to a man to take a reading when his eyes were not in the best condition. He would sit in a light room, and just go under the hood, and take his observation; but if he waited (say) one or two minutes after getting under the hood, the observation would probably be different. With regard to the Evans photometer, Mr. Dibdin seemed to him to have an idea that it invariably increased the apparent light of the gas, and diminished that of the standard; but he happened to have in use two photometers which had precisely the reverse effect—most distinctly depreciating the quality of the gas to a considerable extent. In order to be at all fair to the companies, he took off the bottom trough in which the cords ran, and sometimes the top cover; and he now obtained from the two photometers very much the same results as he did with an open bar—which was almost invariably from 1 to 1½ candles higher than he could before he took off the bottom. He thought this peculiar effect might be due to that circumstance; but, not being quite certain about it, he only threw

it out as a suggestion. The disc holder in the centre of the photometer happened to fit very close indeed; so that both the heat and the carbonic acid generated principally at the gas end did not find their way beyond it. Therefore, the candles were, comparatively speaking, little affected—there being only a slight rise of temperature, whereas all the carbonic acid was collected on the gas side; and he believed it was this which had the depreciating effect. He mentioned this to show that the Evans photometer did not always work in favour of the gas company. With respect to the much abused candles, he agreed with Mr. King that a large amount of abuse had been wasted on them which they did not deserve. They deserved a good deal, but not to the extent they had received; and he believed much of it was due to the fact that the rule which Mr. King mentioned—of leaving things alone—was not adhered to. They had had limits fixed lately in regard to the burning of candles, which had put it almost beyond the power of the candle manufacturer to make a really good candle. It was all very well to fix a maximum limit as to the amount of sperm which could be burnt, because a candle of that size would not burn more than a certain quantity. It might get rid of it by smoke evaporation, and so on, if it had too big a wick; but the sperm would not be nearly burned. When they fixed a minimum limit, and said the candle should not burn less than 38 grains in ten minutes, it was a different matter. He believed it was of very little importance whether a candle burned 38, 36, or 35 grains, because the sperm was all burnt; and he had himself had—when he had the opportunity of working with gas-holder gas which was not interfered with—instances in which the reading on the photometer varied from 21 candles down to 16; and when they were calculated out to the quantity of sperm burnt, they were within 0.1 of a candle. The other way he could not say the same thing; for if they went up beyond 40 or 41 grains in ten minutes, the sperm was seldom fairly burned, and they would be liable to error. But going downwards, he did not believe there would be any errors, provided they looked well to the shape of the wick. If the wick took a corkscrew shape, or if it stood bolt upright, the candle ought, of course, to be thrown away; but if it burnt steadily with a dry cup, and there was just the proper inclination of the wick to bring the lip of it into the edge of the flame, provided too much sperm was not burnt, he did not think the candle was a bad article after all. They all knew, from the report which he made in conjunction with the late Mr. Hartley, that he was a great believer in the Methven screen, because he considered there were several points about it which made it superior to almost everything else; the principal being that, as the same gas was used for both sides, they were quite sure the lights were the same colour. Anyone who had had much to do with photometry knew that this was a very important point in accurate reading. He did not wish to enter into a discussion of the various standards proposed; but he did strongly object to the introduction of a very large standard of comparison. If they used a 10-candle standard, a difference of 1-10th on the two surfaces of the disc represented only 1-100th of the light on the disc. If, however, they had a 1-candle standard, a difference of 1-10th of a candle represented 1-10th of the whole light on the disc; and he must be a very bad observer who could not see the difference. But to see the difference of 1-100th in the light of 10 candles was by no means so easy; and he had always found that the attempt to use a large standard would upset the observations of three or four accomplished photometrists, which would be absolutely identical when they were using a 1-candle or even a 2-candle standard.

Mr. G. R. HISLOP (Paisley) thought the faults attributed to the Evans photometer were chiefly due to the want of science in its construction. Some years ago he had occasion to purchase an Evans photometer for a room that could not be darkened; and he could not by any means obtain more than 70 to 75 per cent. of the light he should have done from the gas. On the top of the photometer there were two funnels—one at either end; and thinking they were to a great extent the source of the mischief, he removed them. But still he could not obtain a steady flame. He then closed up the opening on top to about a half, by a piece of iron; and even then it did not act properly, until he had pierced a good many holes in the bottom of the box, when he realized results comparable with those from an open photometer. He therefore thought the defects were due to want of taking care to provide against undue air currents. By the means he had explained, he had obtained a steady flame; and the results were raised to what they ought to be.

Mr. J. MILES (Bolton) said that, like Mr. Heisch, he was a great admirer of the Methven screen. He was in the habit of testing by both methods. But invariably with a Methven screen he got superior results (by about 1 to $1\frac{1}{2}$ candles) as compared with the ordinary bar photometer; and he could not find out the reason why this should be so. The greatest possible care was exercised to have the readings alike in every particular; but this result usually occurred. He should like to know if Mr. Heisch could give any explanation as to this, or if the same results had been observed by others.

Mr. A. EDWARDS (Taunton) remarked that he had found the difference was 1 or $1\frac{1}{2}$ candles the other way with the Methven screen. There must certainly be some reason for this variation. On the question of candles he should like to relate a somewhat singular experience that he had recently had.

The PRESIDENT reminded Mr. Edwards that the paper was on photometers.

Mr. EDWARDS said he only wished to mention that, trying two sets of candles—one set being six months old and the other five years old—they gave, on the same photometer, a difference of $1\frac{1}{2}$ candles.

Mr. DIBDIN, in reply, said he was pleased to find that Mr. Livesey entirely agreed with him in condemning the Evans photometer. He was also glad that he pointed out clearly to the meeting that his recommendation of the tower photometer was not unqualified, but that he said advisedly if, after having heard the opinion of some experienced gas engineers who had a decided preference for a closed photometer, they must have a closed photometer, he thought the tower or "Imperial" was by far the best form. In his own work, however, he certainly preferred a simple and open bar, put into a moderately large room free from draughts. He had had considerable experience with such an instrument, which he now found spoken of in the highest terms of praise. Some few years back, it fell to his lot to work with such an instrument in different parts of the Metropolis, and because he packed it up in a box carefully, and had to put it on the top of a cab, it was dubbed a "wheelbarrow" or "peripatetic" photometer; and it was supposed that it could not give accurate results, however it was used. He could not help recalling this little bit of history, when he heard that the simple open bar, used in an open room, was after all looked upon as the best instrument. He found that this form entirely did away with at least 75 per cent. of the objections against candles, because it had been rather a joke among the staff of experienced gas examiners that, when they had had candles as they called them at one of the testing stations, when the Evans or semi-closed form gave results of a very contradictory character, that the cry immediately was: "Send them down, we will use them on the open bar." Then they would put them on the open against other candles. The result would be 16·2, 16·3, 16·4, 16·2; and, changing the candles again, they would be 16·3, 16·5, 16·5, 16·2, 16·4, and so on. They would not get a variation of half a candle when using the same candles which had given 18 or 19 candles in the Evans photometer. They sometimes found 25 per cent. of variation in the legal instrument; but when they used the illegal "wheelbarrow," "travelling," or "peripatetic," or portable photometer, as he preferred to call it, the results were very much more satisfactory. Professor Foster had read a very interesting letter which gave the most unqualified condemnation of the Evans photometer from so eminent an authority as Dr. Letheby; and after that there was not much to be said in favour of the present legal closed test. There had been a most interesting discussion, which it was not necessary to go through in detail; for it was all summed up in an unmitigated condemnation of the Evans form. In one instance, he found that the experience of the staff with which he was associated utterly condemned the Evans photometer, because it so happened with them that when it went wrong, as it commonly did, it made the gas too high, and thus misled the gas engineer as to the value of the gas sent out; because if they returned 18-candle gas for a 3-inch flame, they knew there must be something wrong, and trouble was created in the mind of the engineer who was doing his utmost to perform his duty. On the other hand, he found an eminent authority like Mr. Heisch, who had two Evans photometers which gave results precisely in a contrary direction, obliged to strip them in order to show the gas to be of the quality they believed it was. After that there could be no longer a word said for the use of the Evans photometer; and it was to be hoped that the proper authorities would take cognizance

of these facts, and at once withdraw their sanction from the instrument. Still, some of the highest gas authorities—men who were looked upon in that assembly with great respect, and most deservedly so—did advocate, for their own special reasons, the use of a closed photometer, as against an open one. Therefore, if they meant to have a closed instrument in deference to the opinion of others, let them have the one they had now before them, in the shape of the "tower," which was really a modification after all of the Keates open-bar photometer, simply enclosing the lights with big towers, because he found, after the most careful examination, that it gave perfectly concordant results with those obtained with the open bar. Though, of course, there might be little errors and liabilities to mistake in working a new instrument, still be thought, on further experience, it would be found that the instrument would not militate against the interests of the gas companies, but rather in their favour, by letting them know what was the true value of the gas which they were sending out; and thus enable them to conduct their business in the most business-like way. Under the present system, it was as if a man were to weigh a pound of tea with a lump of clay, which might be 1 lb., 12 oz., or 20 oz. Such was the state of things in which the gas companies were placed, because they did not know what they were measuring with. He asked the co-operation of all the authorities to assist in taking this stigma from the officials who had to do with gas. It was a most painful position; night after night they were compelled by law to commit an entire fraud. He knew the responsibility of such a statement; but it was a fact that, with the full knowledge of the authorities, they were compelled to commit a nightly fraud. They were provided with an instrument which was incorrect, which was known to the authorities to be incorrect; and still they must either report the actual result of the test as made under the Act of Parliament, and the instructions issued by the Gas Referees, and appear as if they did not know their business, because they should have to report such extraordinary results, or they must exercise their discretion as men understanding their business, and report something which they did not find, when working with the official instruments according to the Act. It was not right to ask them to continue in such a position. That was his real object in bringing the question before so intelligent and powerful an association as The Gas Institute.

[Mr. Sugg, who was unable to be present during the reading of this paper, so as to take part in the discussion, has written a letter, which appears in another column to-day, in reference to Mr. Dibdin's conclusions.—ED. J. G. L.]

DIFFERENTIAL CHARGES FOR GAS.

By H. WOODALL, of London.

Had the fortunes of gas companies been placed at the mercy of an evil genius, with power to do his worst by a single Act, I could well imagine his malign influence finding expression in a clause limiting their right to sell gas save at uniform prices throughout their several districts. I feel pretty confident too that, were an effort made to impose such a limitation upon companies, it would arouse the most united and strenuous opposition. Yet, as a matter of fact, one-half at least of all the gas supplied in Great Britain is sold at prices which are uniform over the various areas of supply. How are we to explain the anomaly? Well, no doubt the case was not so anomalous a few years ago, when gas was without a rival; and the language which I have used must be taken as that of one who views the situation from the stand-point of to-day. Still, what we see to-day in the conduct of our business, can scarcely be said to show any sign of change, and is but the natural product of all our yesterdays. The main difference in the position seems to be in this—that yesterday any policy, or no policy, was good enough; whereas to-day it is apparent that, if we must take and hold, it must be in well-fought fields, and that looseness in policy may lead to permanent disaster.

It is not much I am going to recommend in the way of innovation; indeed, I may say scarcely more than has already been done by many. But, simple as my proposals are, I know there will be many among you who will find it hard to accept them, as being at variance with your former practice. Nor can I wonder if such is the case; for, from time immemorial, gas has exercised a wonderful fascination over the minds of men in the direction of conservatism; and, in many instances, it has shown itself to be capable of transforming even the most pronounced of radical free-traders

—whether individuals or communities—into upholders of protection. Many years ago I remember John Bright—that sternest of free-traders—boasting that the town hall at Rochdale had been built out of the profits of the gas-works. That is to say, that the few had been taxed for the advantage of the many, and that trade had been taxed for the relief of property. Manchester—once the centre of liberalism—has always pursued a protectionist policy in regard to gas, and is to-day as hardened as ever in its wrong-doing. Manchester gives place to Birmingham; and straightway the latter falls a prey to the same contradictory folly. Leeds next becomes the centre of radical action; and very nearly succumbed to the same infatuation. But, like “a brand plucked from the burning,” it was rescued; and I trust I may be pardoned for expressing the hope that it may retain its pride of place only so long as its practice in respect to gas is in accord with its professions, in regard to trade and commerce generally. That is to say, so long as gas shall be allowed to go unfettered. For, manifestly, a corporation who charge for gas a price which is in excess of what it can be made and sold for, is differentiating in favour of other illuminants, as by every penny that the gas consumer pays out of his bill towards the reduction of rates, by so much is he contributing towards the extinction of his property in the gas-works; he is sustaining, by a bounty, an industry which could not thrive so well under proper competition, but which, under this class of protection especially, is capable of doing an infinite amount of mischief. What then shall be said of those corporations who, possessing gas-works, are directly subsidizing out of rates installations of the electric light? In one direction, taxing the gas consumer for a costly experiment, and in the other, taking from him the profit which resulted from the supply of important premises. This is surely robbing “Peter to pay Paul” with a vengeance. First they charge an excessive price to cover extravagant public expenditure; then they set up a competitor to some extent out of those misappropriations of profit; and then give to that competitor some of the most profitable business which the gas consumers bought at a high premium, and upon which premium they may have to pay interest in perpetuity! And English gas consumers, who, as everyone knows, have courage enough to seek the bubble reputation in the cannon’s mouth (especially when it is not loaded), cannot produce one man in a hundred to protest against the imposition of such unjust burdens.

In this connection, I will venture to relate a parable. Some years ago my little daughter, then aged four, having strayed away, I went in search of her; and eventually found her in a neighbouring field, milking a cow into a tin can, which another and younger urchin was holding. It was an interesting spectacle for more reasons than one; for something about that cow reminded me of the Manchester gas consumer. She had a vacant look about her; and seemed to be perfectly oblivious of her obligations towards herself or others, and her conduct in allowing her dugs to be wrung by unauthorized persons did not belie her looks. Those seeming innocents quickly developed into “highwaymen”—I mean highways committee men. I need not tell you what they carried away with them; but I can assure you that it had a strong flavour of gas about it. But while I have nothing to say in extenuation of the gas consumer, I must in fairness say this for the cow. There had been an accident at a neighbouring oil-works, in consequence of which the adjacent pastures had been saturated with paraffin. The cow felt that she must eat or die; and so for the nonce “her sense was apoplexied.”

Now, supposing the field to be cleared of the parasitical growths which too often encumber it, have we liberty to deal with our product as wisdom may direct? Not always; for gas is too often forced to compete under straightened conditions, which are inimical to the interests of buyer and seller alike. Almost all companies may charge prices varying with the quantity sold; but some at least are precluded from selling at several prices for several purposes. Thus, you may sell a million feet at a price 50 per cent. under the general price; but half that quantity used differently, might yield a larger amount of profit, and yet you may not sell that, subject to the smallest abatement. Some years ago, having advocated the sale of gas at a low price for purposes other than lighting, I found myself unexpectedly and most completely put out of court, by a clause in an old Act, which stipulated that the price charged to one person for a given quantity should be the price charged to every other person using the same quantity. A reasonable clause enough in the day in which it was framed, when there was no thought of gas being used for motive

purposes, and still less in lieu of smiths’ fires. It is clearly desirable then that, whenever an application to Parliament is necessary, care should be taken to annul all such antiquated restrictions.

Now we will suppose gas free to compete upon its merits in a fair field; and I advance the proposition that, as in all other businesses, profit should be shared between the seller and buyer. I venture also upon another proposition—that, to ignore this principle, must in the long run prove detrimental to the interests of the seller. Hitherto gas-works management has set at defiance every principle of trade. Frequently, it has supported a certain class of consumers at the expense of another class; and very often we have made concessions to the very smallest of our customers in excess of those we have made to our larger. Take, for instance, the case of a company supplying gas at a uniform price, and not charging rent for meters. In such a district a railway company pays £2000 per annum; and the interest on meters need not exceed £20. In the same town 2000 customers might be found whose united consumption would not amount to the sum I have mentioned, but who have entailed an expenditure on meters alone of not less than £1500, interest upon which sum, together with wear and tear, would cost not less than £200. And yet in many quarters we see the railway companies being lost; and efforts being made to make good the situation by advances to cottagers.

Now a central railway station is about the best customer that we can have; and as the special advantages of electric lighting are sacrificed in connection with such premises, we ought the more easily to hold our own. Why are we supplanted? I know that gas can be supplied in certain towns at 1d. per candle per 1000 cubic feet; and I know, too, that, where something approaching this price is being charged, gas occupies the field almost to the entire exclusion of other illuminants. It is patent then that the purveyors of other methods of lighting must ever be greatly indebted to those companies which persist in charging the same price to those out of whom they make profit as to those who involve a loss; and not for worlds would they, at any rate, have the old policy disturbed. That there are many of our customers whom we should be better without financially, I have no doubt whatever. I have in my mind a town in which there are 70,000 consumers, 20,000 of whom do not average more than 10s. per annum, and 100 of whom consume 10 per cent. of the gross supply. The leakage is at the rate of 3000 cubic feet per customer per annum; and, supposing one-half of this to be from the main, and the other from the service, we have to deduct from the 10s. the manufacturing cost of 1500 cubic feet of gas as a first charge against the customer, while, as a matter of course, all other charges—such as cost of service, maintenance and renewal, inspection, collection, &c.—are in excess. All these charges together, worked out as a percentage on the higher class of business to which I have referred, would be inappreciable. Yet in this same town there was one customer, whose account was about £3000 per annum, who applied for an abatement, and could not obtain the smallest concession. He thereupon resolved to make his own gas; and the withdrawal of his custom will entail a loss of at least £1500, which the remaining customers will have to pay. Now, had he received an abatement of 20 per cent. to which on every ground he was entitled, he would have continued to take his supply as before; and the other consumers would still have had £900 of profit out of him, to share amongst themselves. Think what that customer stood for! The gross income from gas in the case of the undertaking to which I refer, divided by the number of consumers, gives less than £3 per customer. It would, therefore, take at least 1000 average consumers to equal this one; while it is certain that 1000 of such customers as are added from year to year would not yield the same profit.

I am afraid that one great cause operating against the adoption of differential charges is the sliding scale, which, designed for the purpose of giving to shareholders a direct participation in all profits as they accrue, may reasonably be regarded as antagonistic to proposals to remove any portion of a company’s business from beyond its influence. But it is already becoming apparent that the sliding scale may become, instead of a reasonable servant, a bad master; while not a few, even amongst its warmest admirers, are of opinion that it should be to some extent restrained. I venture to suggest that the best way to curb it is to remove that class of business which is most in peril out of its reach. Surely it is better to have present dividends (which in all conscience are high enough) assured through long

years, than to exact higher ones, with the inevitable result of alienating the best of your customers, and of leaving to your heirs and successors an attenuated and unstable business. I am glad to note that Mr. Livesey himself is not unfavourable to some interference with the prerogative of his child to pinch, and that he proposes a decremental rate of increase in his power to do harm. For my own part, I think it would be better for all parties were he bound over for a 1000 years. Then we may hope to win back the good friends whom we have lost, and to hold all that we have, by dividing profits in excess of present dividends amongst those who are most entitled to consideration.

I have said before, and I say it again, that, under a system of uniform prices, the largest consumers receive even less consideration than the smallest, for whom we are constantly "trimming" burners, or perhaps providing gas-stoves at unremunerative rents. This anomalous condition can be very simply corrected by a system of discounts. Not on any account would I propose to interfere with any mode of legitimately extending the use of gas amongst the masses; but I do contend that we ought to be just before we are generous, and that to ignore this law will only be to court misfortune.

Discussion.

The PRESIDENT said it appeared to him that this paper went somewhat beyond its title, as he understood it, because Mr. Woodall had touched upon three principal points—first, the undesirability of local authorities making a profit out of gas; secondly (and this was the main object of the paper), he pointed out the desirability in some cases of differential prices; and, lastly, he had made some remarks on the sliding scale. No one was more able to express an opinion on these subjects than Mr. Woodall. At the same time there was another side to each of these questions; and he was sure Mr. Woodall would be pleased if those who entertained different opinions would express them.

Mr. J. P. LEATHER (Burnley) thought that Mr. Woodall was hardly correct in what he said about leakage. Certain towns were professing to sell more gas than they really made; and the unaccounted-for gas was not always leakage, but depended to a great extent—sometimes almost entirely—on the different temperatures at which the gas was measured at the works and at the consumers' meters. It was hardly fair to debit each consumer with this proportion of unaccounted-for gas.

Mr. GEORGE LIVESEY (London) said he was much obliged to Mr. Woodall for bringing forward this paper; but he had expected a much stronger one. Whether Mr. Woodall, by his visit to Australia, had been converted from a lion into a lamb he did not know; but any rate he had shown a great deal of moderation in his views. As far as the paper went, he was prepared to endorse almost everything the author had said. He agreed it was only just that the large consumer should have some allowance made to him; and he had contended for many years that, if the small gas consumer, who paid £2 or £3 per year, was charged the same price per 1000 cubic feet as the man who paid hundreds or thousands of pounds, the large consumer was in fact being charged more for his gas than the small one, simply because it cost less in all the expenses of administration to supply him. There was only one service to look after, one meter to inspect, one account to collect, less trouble for the clerks, and so on; and on this ground alone, the large consumer had a decided claim to an allowance. It was rather difficult to make this adjustment, however; and in some cases it went a great deal too far, and the advantage to the large consumer was much greater than it ought to be. In the case of the South Metropolitan Gas Company, they adopted the rule of allowing a discount of 5 per cent. to the railway companies and public bodies, which satisfied them. In London, and probably in the country, the difficulty of making differential charges was in consequence of the wording of the Acts of Parliament, which compelled them to supply the public lights at the lowest price charged to any private consumer. Now, the public lighting was a series of small consumers, for there was a separate service to each lamp; and therefore a good deal of the argument in favour of giving the large consumer a discount did not apply in dealing with public bodies. If they were to make a very large abatement to railway companies and large consumers, they would have to supply the public lights at the same rate. Their experience was that the 5 per cent. allowance was satisfactory; for there had been no complaints made, and the large consumers seemed to understand that their right to a difference was recognized.

As to the sliding scale, there was really no difficulty whatever. It was within the power of any company under the sliding scale to make differential charges if they pleased, though it was true they could not calculate the dividend on the lower price. If the general price was 3s., although the large consumer was supplied at a cheaper rate, the dividend must be calculated on the 3s. price; and this did no harm. Under the sliding scale, the advantage to the company was no doubt great; but it was also great to the consumer. He was prepared to prove that, taking London at any rate, the price for gas would not be so low by some pence per 1000 cubic feet as it was now, had it not been for the sliding scale. It was an inducement to reduction of price; and, although an advocate for a decremental rate of increase on the sliding scale, he was not an advocate for its abolition. If this were the case, the main inducement to make further reduction of price would be destroyed. Those who had got up to 12 or 13 per cent. should be content to take a diminishing ratio; and instead of taking $\frac{1}{4}$ per cent. for each penny reduction, let them take $\frac{1}{4}$ per cent. for each reduction of twopence. This would be satisfactory all round; and they need not then abolish the sliding scale, which had proved very beneficial, keeping down capital and preventing agitation. They had now been thirteen years without any public outcry against gas companies; and this had never happened before.

Mr. T. NEWBIGGING (Manchester) said he agreed generally with the proposition that the large consumer should have an advantage; but he wished to put this limitation upon the remark—viz., that he should be a consumer all the year round. In this respect he must say a word in favour of the small consumers, who, in many manufacturing towns in Lancashire, were the backbone of the gas undertaking. Although the large consumer burned a great quantity of gas, he only did so during three or four months in the year; and he required to have it within a few hours each day. The consequence was that throughout the summer months a very great proportion of the capital expenditure was unproductive. If it were not for the steady consumption of the small consumers under such circumstances, it would be very difficult indeed to carry on the undertaking, and pay dividends on the heavy capital which had to be expended on increased plant and mains so as to supply the large consumers during a limited portion of the year.

Mr. C. R. MEAD (Sutton) pointed out that the difficulty of supplying large consumers under the Act at a limited price had been overcome in the case of two Acts obtained by companies he was connected with, within the last few years, in this way: The Committee had allowed them a special clause enabling them to supply any consumers at lower rates by having a special agreement in writing. There was a great deal of skirmishing over the clauses; but they got them through.

Mr. LIVESEY asked if they could supply such customers at a less price than the public lamps?

Mr. MEAD: Yes.

Mr. G. SHEPARD PAGE (New York) said the practice in the States with regard to this question might possibly be of interest to the members. One reason for the much greater selling price of gas in the States was the fact that nearly all public lighting had been done by private gas companies; and in making contracts with the city councils, a stipulation was made as to the price at which the gas should be sold. As there were in most places competing companies, there was competition for what was the largest single customer—the street lighting; and this had reduced the cost of public lighting to a figure which represented something like 4s. per 1000 cubic feet, while the price to the private consumer would be 5s. or even 6s.—as, for instance, in Washington, where they carbonized about 40,000 tons of coal per annum, and the price to the general consumer, including the Government, was 5s., while for the city lamps it was 90 cents, or about 3s. 7d. There was but little restriction as to the price to be charged. Gas companies could make contracts with their consumers; and, with the larger consumers, it was a question of buying and selling. As in nearly all matters of business, the wholesale buyer had an advantage over the retail buyer, naturally the larger consumer would get the advantage. In Boston the price to the general consumer was, until the beginning of this year, \$1.40, or about 5s. 7d. Then an opposition Water-Gas Company was established on the usual basis of about \$1 for the capital expended on works, and about \$5 for "watered stock." About the time when the water gas plant was to commence operations, as the water gas advocates and exploiters were not able to induce the

Boston Gaslight Company to see what great benefit they were going to be to the city, they were met with a counter proposition by the Boston Gaslight Company which did not please the water gas men at all. The water gas men were intending to take in certain of the suburban gas companies about Boston, who were selling gas at an average of about 7s.; the Boston price being 5s. 7d. Having secured all these companies, they supposed that the Boston consumer, who was only paying, for his store, shop, or manufactory, \$1.40 per 1000 cubic feet, and living in the suburbs where he was paying 7s., would not object to have the price raised in the city from \$1.40 to \$1.50. That was the plan of the Water Gas Company; and, as he had said, it was met by a counter proposition, on the part of Mr. Greenhough and his associates on the Board of the Gaslight Company, in the form of an announcement that, on Jan. 1, 1888, the price of gas to the general consumer would be \$1.30. They had visited all the largest consumers in the city, the large percentage of whom were under contracts for five years at 4s.; and very little stock had since been sold in the Water Gas Company. Nearly \$2,000,000, or about £400,000, had been expended by the very benevolent gentlemen who came largely from Philadelphia to Boston; but not a foot of gas had been sent out from that station. He thought therefore they would draw the conclusion that the differential price of gas paid the Boston Gas Company.

Mr. WOODALL, replying on the discussion, said he was glad to find there were so many agreed with the proposals he had made. Mr. Leather had touched on the question of leakage, and disputed his way of dealing with the subject; but he could not alter the fact that, taking towns generally, and dividing the leakage over the number of consumers, it came to about 3000 feet per consumer per annum. He did not care what the leakage was as the percentage of the quantity of gas made; it would generally work out something like a given rate per mile. But, of course, it would vary per customer, according as to whether the customers were large consumers or not, and the character of the district. In thickly populated towns, however, it was generally about 3000 feet per customer. He was very pleased to find that Mr. Livesey approved generally of his proposals. He had felt for a long time past that London was under great disabilities at the present time, in consequence of the very active competition all round, both on the part of electric light and oil; but Mr. Livesey's strong objection was that they could not make a concession to large consumers which would be profitable without making it also to the public lighting authorities. On looking into the matter, however, there was not so much in it as might at first sight appear. Although he was strongly opposed to letting public authorities have gas except at the extreme price, still they had the power in their hands, and it could not be taken from them; and they would exact the very best terms they could on behalf of their constituents. Taking the public lighting account generally, it rarely exceeded 7 per cent. of the gross sales; and supposing an abatement were made of 20 per cent. from this 7 per cent., it only amounted to 1 per cent. on the gross income, which was not very much. Therefore, for the sake of retaining the largest and best consumers, he should not hesitate to give this consideration to the public authorities. Mr. Livesey, of course, supported the sliding scale; and he (Mr. Woodall) did not raise any objection to its continuance. He only urged that there should be a limit to the dividends which should be paid under it; and suggested that, instead of adding to the dividend, they should do that which would make their dividends quite secure, by giving a consideration to the large consumers in future. If the accruing profits of gas companies were to be given to the consumers from year to year, they might continue in perpetuity the 13 per cent. of to-day, and would probably be able to pay even greater dividends if disposed after a time. Mr. Newbigging had raised a very important point, which he had always felt was a difficult one in connection with differential prices. There was no doubt about it that the publican, the theatre, and the railway company were amongst the best of their consumers, because they consumed gas regularly throughout the year, and for the greatest number of hours. The mill-owner, on the other hand, demanded the largest amount of gas over a limited number of hours; and as the works and mains had to be sufficiently large to meet the greatest demand, capital expenditure was extravagant in relation to his supply. However, if the discussion had realized nothing else, it had brought out the very important point that Mr. Mead raised—that it was possible to obtain power from Parliament to make special agreements in writing with

customers. This was the great thing to be desired by gas companies—that they should be in a position to do that in their own interest and in the interest of consumers, which almost every other trading body was able to do.

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(FOR STOCK AND SHARE LIST, see p. 38.)

BUSINESS on the Stock Exchange during the past week has been decidedly fair, though none of the markets have been extremely active. A favourable influence was exerted by the pacific aspect of affairs on the Continent—exhibiting a market contrast to the state of almost general apprehension which prevailed not so long ago. The Money Market has been very easy; the requirements for the settlement, and the close of the half year, producing no stringency. The tendency has thus been in favour of better prices all round; the Foreign Market having perhaps the best of it. The Gas Department has been extremely quiet; but all stocks have been firm, with the single exception of Commercial old. A parcel of this stock being offered on Monday, and realizing only 265 as the best bid, brought the quotation down. There were no further transactions in it during the week; and we do not expect to see any more allowed to go at such a figure. It will not bear comparison with the prices of Gaslight "A" and South Metropolitan "A," to which the stock is in no way inferior. To bring Commercial to pay a fraction over 5 per cent., ought to be good business. Gaslight "A" has not been extensively dealt in; but it has grown steadily stronger every day. The last price marked, 252, was the best of the week—against 248½, the best of the previous week. A few transactions have been marked in the debenture and 10 per cent. preferences, at good figures. The 4½ per cent. debenture stock is quoted 5 better than the similar stock of the Commercial; and again it is hard to imagine why. South Metropolitan have been inactive; two or three deals in the "B," at middle figures, being the sum total. Imperial Continental has been steady; maintaining its advance of the previous week, but not improving upon it. Other undertakings offer nothing for remark, except Bahia, which has advanced 1, and Continental Union, which is ½ better. The Water Companies have been very inactive; and show few changes, except on deduction of dividends. Southwark, ordinary, however, recovered the 1 it had dropped the week before. East London was weaker, and receded 1½. The daily operations were: On Monday the opening showed a favourable tendency in all departments. Business in Gas was only moderate; but every stock dealt in was very firm, except Commercial old, which receded 3½. Water was quite featureless. There was a shade more activity in Gas on Tuesday, and at very fair figures. Buyers of Gaslight "A" made the price 1 higher. Water again offered nothing to remark. Gas was quieter on Wednesday, but prices were disposed to rise. Gaslight "A" improved 2. Water was very quiet and unchanged. Business in Gas continued very restricted on Thursday, but with undiminished firmness. Bahia rose 1; and Continental Union original was ½ better. In Water there were a couple of transactions in New River; but nothing else was touched. Business in Gas on Friday was at about the level of the previous day. Prices were still disposed to rise, but quotations were unaltered. One transaction in Southwark ordinary (which rose 1) was all the business in Water; but East London fell 1½. On Saturday there were only two transactions marked in Gas, and none in Water; and all quotations closed without any change.

ELECTRIC LIGHTING MEMORANDA.

THE ELECTRIC LIGHTING ACT AMENDMENT BILL PASSED—THE ELECTRIC LIGHTING INSTALLATION AT LEAMINGTON—ELECTRIC LIGHT TROUBLES IN THE UNITED STATES.

THE Electric Lighting Act Amendment Bill has become law; having received the Royal Assent on the 28th ult. It now remains to be seen whether it will bring all or any of the benefits ascribed to it in advance by its promoters. We believe, as we have held all along, that the Act will be useless as a means of reviving the electric lighting industry, which suffers under financial and economic, rather than legal disabilities. Curiously enough, a criticism of the measure in *Industries* (probably written by an electrician, and meant as a reproach to Mr. Chamberlain's Act) confirms this view. The critic is complaining bitterly of the restriction of the purchase-money of an electric lighting concern to the actual value of the plant, &c.; and he remarks: "Where improvement is so rapid as in electric light machinery, the market value of the plant a few years after its erection is liable to be considerably below its first cost; and therefore the recompense represented by the purchase-money would not have been equivalent to the outlay, even after a few years. A glance at the price lists published by the leading dynamo makers five years ago and those published now will make this evident. The price of low-tension dynamos, suitable for central station work, shortly after the passing of the Act, averaged over £1 per lamp; now it is barely half that amount. It is evident that had a company started some five years ago, they would have had to purchase machines at the high figure of £1 per lamp, and would have had to sell them, under the compulsory purchase clause, at the lapse of 21 years, to the local authorities at less than 10s. a lamp. This would have represented a dead loss of one-half of their original outlay." The writer cannot see that this

is one of the greatest recommendations of Mr. Chamberlain's Act, regarded from the point of view of the local authorities. Why should £1 of public money go for 10s. worth of plant, merely because a company were foolish enough to buy dynamos when they were dear, instead of waiting until they became cheap? According to the plea of our contemporary, the high prices of electric lighting plant five years ago would be perpetuated at the public cost. The Electric Lighting Act stopped this injustice; and now the electricians have obtained all the relief, in the matter of length of tether, they wanted—or at least all they could expect to get. Even *Industries* tells them they ought to be satisfied with the new Act. But shall we see a revival of electric lighting projects for the coming season, in consequence of this alteration of the law? It is possible, but very unlikely, except as a merely speculative venture to form a basis for stock-jobbing manipulations.

It appears from a statement that has been published that the electric lighting plant at Leamington is not being utilized as speedily as its projectors expected. The plant actually in position comprises four Chamberlain-Hookham shunt-wound dynamos, all of 800 lights capacity; but two of them are sufficient to supply the 1100 lamps actually in nightly use. A small current for day service is supplied by an accumulator, as the engines are only driven at night. The distribution was first on the Hopkinson-Edison three-wire system; but, "owing to the great complication entailed by this system," it has been abandoned for the ordinary two-wire system. This does not say much for Dr. Hopkinson's great invention. A commissioner of *Industries*, who made a special inspection of the Leamington installation with a view to ascertain the facts, confesses that the street lighting is not altogether a success. He speaks well, however, of the private lighting. The private supply is generally measured by a meter of Mr. Hookham's invention, which is like a small dynamo, and is revolved by a percentage of the current required for lighting. The supply is charged for at the rate of 8d. per unit when the consumption is under 40 units per quarter; between 41 and 150 units, the charge is 6d. per unit; and beyond this quantity, it is 4d. This is equivalent to 16-candle gas at from 6s. 8d. to 3s. 4d. per 1000 cubic feet. The price of gas at Leamington is 2s. 7d. per 1000 cubic feet. Altogether, the special correspondent of *Industries* thinks that the Leamington electric lighting experiment is "a modest, yet fairly successful attempt to supply a public want." It is to be hoped the proprietors are satisfied with their venture.

A correspondent of the *Electrical Engineer* states that New England and the Eastern States have experienced the epidemic "now quite general" of trouble with electric light wires. The Edison station at Fall River was recently burnt down—of course, on a most awkward night for the subscribers. In Halifax, Nova Scotia, a servant of the Electric Light Company was killed by touching a wire on a pole in the street; another workman in the employ of the Company having shared the same fate a week previously. The fact appears to be that the distributing plant of the speculative companies who have been "running" the electric light in American towns during the past two or three years has become very much the worse for wear, and both companies and the public are now feeling the disadvantages of make-shift fittings. If the electrical speculators are wise, and the business of electric lighting is worth saving, they will take steps for putting matters right before a wave of popular discontent sweeps them away. As it is, they can hardly live for each other. Competition is very keen; and they declare that the intense rivalry for business under which they live is extracting every cent of profit from the work. So that, according to common report, the life of an electric lighting speculator in the United States is not altogether a happy one.

PRESENTATION BY MR. G. GARNETT OF A MACE TO THE CORPORATION OF RYDE.—Last Wednesday the mace which, as stated in the *JOURNAL* a few weeks ago, Mr. G. Garnett, M. Inst. C.E., the Engineer and Secretary of the Ryde Gas Company, had expressed his intention of providing, at his own expense, to complete the insignia of office of the Mayor, was duly handed over to his Worship (Mr. R. Colenutt) and the members of the Corporation in the Town Hall last Wednesday. Mr. Garnett made the presentation; and in doing so remarked that if they had one-tenth of the pleasure in accepting the offering at his hands which he felt at being its donor, he should be abundantly gratified and repaid. Having described the design of the mace, he expressed his satisfaction at the manner in which the work had been carried out by the manufacturer (Mr. Thurlow), and concluded by wishing the Mayor and Corporation, and all present, health and happiness for many years to come. In the evening Mr. Garnett was entertained at a complimentary banquet by the Mayor and Corporation. Alluding to this event, and to Mr. Garnett's connection with Ryde, the *Isle of Wight County Press* last Saturday said: "For thirty years this respected citizen has lived and worked in our midst; and in many ways the town and its people are the better for his presence amongst us. He has been closely identified with the municipal history of the town. Having been one of the promoters of its incorporation, he has now most generously completed the equipment of its governing body with due insignia of authority. It is a satisfaction to know that, as a result of this last mark of his devotion to the interests of the town of his adoption, his name will be handed down with honour to future generations. That he may long be a living example of the success which attends self-deny and persevering labour and of noble purpose is, we are sure, the earnest hope of his numerous friends."

COMPLETION OF THE EDINBURGH AND LEITH GAS-WORKS TRANSFER.

By the agreement with the Edinburgh and Leith Gas Company which was executed on Friday last, the transfer of the undertakings of the Edinburgh and the Edinburgh and Leith Gas Companies to the Corporations of these two places is virtually secured. The controversy has been the occasion of much discussion locally, on account of an opposition which was very vehement in utterance, but was in reality powerless either with the community or with the Legislature. To sum up the history of the negotiations, it may be said that the Joint Committee of the Corporations which took charge of the subject had presented to them at the outset one of the most difficult problems which any Committee similarly situated ever had to solve. They had either to take over the undertaking of the Edinburgh Company on the spur of the moment and with scanty information, or to see the possibility of the community acquiring the gas supply of the district receding into a very dim and distant future. They accomplished the first portion of their task speedily and with credit. They then set themselves to the acquisition of the Edinburgh and Leith Company's undertaking. This should have been easy of accomplishment, seeing that there was plenty of time in which to carry on the negotiations with the Company; but, unfortunately—acting either from advice which was not the best, or from preconceived notions—the Committee created difficulties for themselves, which retarded a settlement until about the last possible moment. Now that the bargain has been completed, it is satisfactory to know that the agreements with both Companies are sufficiently favourable to preclude the possibility of regret on the part of the shareholders at parting with their property, and that at the same time the communities may reasonably expect to reap a handsome profit out of the gas supply. The Edinburgh Company receives £20,000 a year in annuities, and other considerations which will raise the annual charge on their behalf to about £21,000. The Leith Company receives £14,000 in annuities, and other sums which raise the total annual charge on their behalf to £18,809. These two sums together amount to £39,809. This year the Edinburgh Company has earned a profit of £37,000, and the Leith Company one of nearly £27,000—together, £64,000. The results this year may be regarded as so exceptional that they can scarcely be founded on; but the amalgamated undertaking may be relied upon to produce at least £45,000 of annual profit, which will leave upwards of £5000 to be applied (after providing for sinking and reserve funds) either in the reduction of the price of gas or in the redemption of annuities. Taking into account the natural increase in the gas consumption, it is consequently evident that the Corporations have, on their part, effected a very safe bargain with the Gas Companies.

Turning to inquire how the matter stands with the Companies, one is met at the outset with the peculiarity of the position of the Edinburgh Company. The record of this Company is probably unsurpassed by that of any other in the United Kingdom. So well managed has it been, that upon a capital of £200,000 not only has a dividend at the rate of 10 per cent. been regularly paid, but the works have been largely extended out of revenue; and about three years ago accumulated profits to the amount of £45,000 were distributed by way of bonus among the shareholders. A further sum, stated a year ago at £63,000, awaits distribution; and, in addition, the shareholders will soon have divided among them the sum of £27,000, which the Corporations pay as grassum, and a further sum estimated at £30,000, the cost of stores to be paid for by the Corporations—together, £120,000. By the change from dividend to annuities, nearly two years' payments will be made to shareholders during the next twelvemonth; the sum receivable being £37,965 as compared with (at most) £25,000, if no change had been made. Adding the sum to be distributed from revenue during the year to the above-mentioned £120,000, it is brought out that in the course of one year the shareholders will, upon £200,000, receive a return of £157,965. If to this, again, is added the £45,000 distributed three years ago, the magnificent result is arrived at that about the whole capital of the Company will have been returned to the shareholders, and that they are to draw perpetual annuities at the rate of 10 per cent. upon this capital so returned. In the case of the Leith Company the capital is £150,000. The Company have never paid a bonus, but have expended a large proportion of their profits in the extension and renewal of works. The shareholders will be entitled to divide among them, after the 1st of August next, £11,000 of grassum received from the Corporations; the value of stores, £20,000; and their reserve fund of £21,723—together, a sum of £57,723. Adding in their case the amounts of dividend and annuity payable within the next twelvemonth, their total receipts for the year will be £82,410, or more than half their capital.

It will be observed that the shareholders of the Leith Company, though the annual charge upon the community on their account is relatively higher than that on account of the Edinburgh Company, do not occupy so favourable a position in the matter of the distribution of assets as do the shareholders of the Edinburgh Company. This is accounted for by the fact of their business being smaller (only about half that of the Edinburgh), and their large expenditure on works and plant. The increased charge in their case is on account of their capability to go on for a number of years without renewal or extension; and on the same account they have received terms, when compared with the Edinburgh Company, relatively higher than the size of their business warranted—the equity of this lying in the fact that the Company might have reasonably expected

to realize a larger return from their works for some years than they have been accustomed to earn. The two undertakings will be carried on together; and on that footing, the cost per 1000 cubic feet works out at nearly 8d., which compares well with the Birmingham transfer, where the cost was 9d. per 1000 cubic feet. On both sides, therefore, there is matter for sincere congratulation at the result of the negotiations.

A PRESIDENTIAL ADDRESS AND A HISTORIC RELIC.

THE Société Technique de l'Industrie du Gaz en France were fortunate in their President for the past year—M. Albert Ellissen—if only on account of the highly interesting address which he had provided for them, a translation of which was given in the JOURNAL last week. We have not the slightest doubt that the President for the current year—M. Cornuault—will present the world with an interesting address in his turn; but it will not be easy to surpass M. Ellissen's production. A striking proof of that unity of professions in different countries which is brought about by the modern development of technical journalism, is to be found in the fact that the Inaugural Addresses of the last presidents of the British and French Gas Engineers' Associations both contain references to the presidential utterances of foreign compeers. Mr. Gandon quoted M. Alavoine; and M. Ellissen referred to Mr. Foulis. Nay, even more strikingly, M. Ellissen had recourse to Mr. Thomas Duxbury to enforce his own observations upon the extent of ground that yet awaits cultivation by suppliers of gas. It is impossible to overrate the importance of this reciprocity in technical study. Compilers of valuable statistics, and authors of good papers on gas supply, have therein a guarantee that they address a larger audience than that to which they appear to speak; and the reflection should brace them to worthier efforts. An original-minded and able gas engineer attains a world-wide reputation, while perchance he thinks himself known only in a corner of the country to which he belongs; and there is not a grain of valuable seed in paper or address or technical article that is not caught up and spread abroad in the principal languages of the world. If it appears to fall into unthankful soil at first, there is no telling where a fruitful idea may eventually germinate.

M. Ellissen addressed a body of men whose occupation and interest is like that of British gas managers, but whose circumstances are radically different. Gas supply in France, and in the countries influenced by French ideas in this respect, is a very different thing to the same business as carried on in England. It is established on a narrower basis, and presents the peculiar characteristics of licensed undertakings. It has a rigidity, derived from the general concession system, which is not found in the same degree in any other business of the kind in the world. It is often asserted of gas engineering that it is not too progressive, even in countries where unrestricted competition or direct inducement of another kind exists to favour development of processes. What, then, is to be said of it when the financial conditions of its existence positively discourage change of any kind? Having regard to their circumstances, and the fact that the system of concessions has the effect of tabooing many subjects on which their compeers of other nations are free to exercise their wits, the anxiety displayed by the members of the Société Technique for professional intercourse and instruction is most creditable to them.

It is possible to lose sight of much of the limitation that oppresses gas engineering in France in perusing the observations of M. Ellissen upon the present and past of gas supply in England and on the Continent of Europe. His comparative table of the gas consumption of London and some of the principal towns of the Continent is very instructive, and calculated to benefit continental gas engineers. It appears from this statement that the gas consumption of London per head of population is very greatly in excess of that of any other town in the list; Paris and Brussels coming next, with Berlin some way behind. We do not know how this list was prepared, and in particular it is rather difficult to accurately collate gas consumption with population statistics in the case of London; but to whatever modification such considerations might lead in regard to the units of M. Ellissen's calculations, they are probably trustworthy in the main. Compared solely with regard to consumption of gas per head of the population, it would therefore appear at first sight that continental capitals have a good deal of leeway to make up before they can stand alongside of London in this respect; but we cannot make the comparison on this basis alone. The price of gas enters too seriously into the question to be ignored, even for a moment; and having regard to this consideration, the point of saturation of a continental community for gas may be really more nearly approached than would appear from a simple statement of bulk of gas sold. The practical importance of this consideration is very easily appreciated. If there are two places equally circumstanced in every respect, the fact of the gas consumption in one being double what it is in the other might be regarded as an incentive to the administration of the gas undertaking in the latter place to take steps for diminishing the difference. This they might do by enlightening the people as to the advantages of gas, and offering a variety of inducements to its extended use. If, on the other hand, the price of gas in one town is only one-half what it is the other, the point of saturation, beyond which no progress in extending the consumption is to be expected, would be reached much sooner in the dearer district. Speaking generally, the foregoing remarks express the whole philosophy of gas supply, as it is understood and expounded in our columns.

The most universally interesting portion of M. Ellissen's address is the historical part of it. The author is led to regard vehicles carrying lights in towns as part of the street-lighting arrangements; for he says that if the street lighting by other means were perfect, there would be no need for carriage-lamps. *Ergo*, a carriage-lamp is a street-lighting arrangement. There something in this argument; but it will not bear much strain. Suffices, however, to take M. Ellissen back to the consideration of times when the only public street-lamps used in Paris were of a perambulatory character; and it is rather striking to learn that the first contractor for lighting the streets of the capital of France and the centre of European culture ruined himself by the enterprise. Many others have since discovered that there is little or no profit in public lighting. It is very instructive to observe how readily people were to ascribe finality to the—as we now see them—imperfect methods of street lighting adopted in Paris during the last century. Are we, as M. Ellissen hints, too prone to commit the same fault? It is possible; but we cannot quite agree to the proposition that the unexplored resources of physical science are as boundless now as they were a hundred years ago, even though men may not be any better or more humble in their estimates of their own knowledge.

We have some hesitation in accepting M. Ellissen's view of the work of Philippe Lebon, who is described in the address as having had great difficulty with his "marvellous invention" in "dethroning" the Argand lamp. The English view of the matter is that if it had rested with Lebon to dethrone it, the oil lamp would have been paramount still. It is a bit of national pride, which we should be loth to call Chauvinism, that credits Lebon with being the inventor of gas lighting, since it is certain that he was never a maker of gas in the sense that Murdoch was; but the matter is not worth arguing about. The French have quite made up their minds that Philippe Lebon was the inventor of illuminating gas, and we have decided to ascribe the honour to Murdoch. It is a small point, though not without its significance; but we ask how is it, if the inventor of gas was a Frenchman, that so many English words are used in the nomenclature of gas making? Why is there no French equivalent for coke? However, there is no advantage in disputing the point. The French have put up a statue to Lebon, while we have not, up to the present time, done as much for Murdoch; and so we must give them credit for stronger feeling on the subject.

While referring to the early days of gas lighting, it will be a convenient opportunity for mentioning the curious relic of this time in the shape of the prospectus of Mr. Robert Roberts, proprietor of the Oswestry Gas-Works in the year 1821, a reprint of which will be found in another column. Here we have a most interesting reminder of the conditions of gas lighting before the general introduction of meters; and the facts offer a strange similitude to the circumstances of electric lighting at the present day. It must be confessed, however, that the enterprising Mr. Roberts, of Oswestry, was very particular as to the terms upon which he supplied his gas. Some of his subscribers were only allowed to burn gas until nine o'clock, and there was an increasing charge for keeping the burners alight for every hour later until midnight. What a premium was here upon early and regular hours for retiring! He graciously informs his customers that he will not be particular to a quarter of an hour, and will allow the lights throughout the town to be kept on until eleven o'clock on Wednesday and Saturday evenings; but he tells everybody that unless his regulations are conscientiously followed, he will refuse to supply. What a picture do these regulations afford of the way in which the gas maker was at the mercy of the renter, save only for the right of the former to make domiciliary visits at all hours. One's respect for the meter is sensibly increased after thus being brought face to face with the difficulties inherent to any pure rental system. It will be noticed that the astute Mr. Roberts claimed his rents in advance, and was not unfavourable to weekly payments. He strongly advised the use of a glass "consumer," the reasons for which are very innocently given. He particularly objected to tampering with the burners with a view to getting a better light; but how inferior the other means of lighting available at that day must have been, is shown by the fact that as much as a guinea a year would be paid for the use from sunset till nine o'clock of a miserable little rat-tail gas-jet $3\frac{1}{2}$ inches long, probably of two or three candle power at the utmost, and occasionally redolent of sulphur to a degree that would baffle the glass "consumer" to conceal. The gas was pretty good in those days, so far as mere illuminating power was concerned; for it was made at a comparatively low heat, in iron retorts, without mechanical exhaust, and purified by wet lime. The expenses of distribution, however, and the cost of everything required in the works, were very high. Even a brass cock was a philosophical instrument. We recommend this "relic" to future compilers of presidential addresses, as it suggests many more reflections than we can find space for here.

As M. Ellissen remarks, fashion in the matter of artificial lighting has changed since the days when a single $3\frac{1}{2}$ -inch jet was considered a sufficient light for a room. A saloon that was regarded in 1780 as lit up *a giorno* with 1800 wax candles was not considered too brilliant with 8000 probably better candles a century later. An incident such as this is rightly regarded by M. Ellissen as a sign of the times. He at least is not disposed to claim finality too soon. The greater the quantity, and the higher the quality of the light that can be provided for the world's use, the better in his opinion. There is room for all. Gas competed in Oswestry

67 years ago with candles, and underbid the chandler even when selling at rentals equivalent to a price of 15s. per 1000 cubic feet. It was a better and a cheaper light; and if it holds its own anywhere, it must be for the same recommendations. Gas has improved since 1821; and so have candles. Electricity may improve during the next 60 years; and so will gas. "The thing that hath been is the thing that shall be;" and there is nothing in this reflection to make the friends of gas lighting afraid.

THE PAST YEAR'S WORK UNDER THE ALKALI ACT.

THE Twenty-fourth Annual Report of the Chief Inspector under the Alkali, &c., Works Regulation Act, 1881 (Mr. A. E. Fletcher), was issued last week. It embraces the labours of the Chief Inspector and his colleagues during the past year; and as these gentlemen have the supervision of those gas-works in which the manufacture of sulphate of ammonia is carried on, the publication has special interest for our readers. The number of works in England and Ireland now registered under the Act is 927; being an increase of 17 over the number in the previous year. Adding to these the 139 works registered in Scotland (which are separately reported upon), the total in the United Kingdom at the close of last year was 1066. In most of these works several processes are carried on, each of which comes under inspection; and therefore may be regarded in the light of distinct works. Of these processes there were 1245 at the close of 1887; being an increase of 37 over 1886. Adding the 198 in Scotland, we have 1443 as the total for the United Kingdom in 1887, as against 1395 in the previous year.

Taking, first of all, the figures relating to England and Ireland, we find that there were last year 26 processes under inspection connected with the treatment of "gas liquor," as it is styled in the report, and 311 connected with the manufacture of sulphate and muriate of ammonia. The places where the various processes are carried on received 4383 visits last year, and 4402 tests were made. If on the occasion of an inspector's visit the work is found to be in an unsatisfactory condition, the object kept in view is not the obtaining of evidence to support a prosecution, but the speedy improvement of the work. To this end the visits are repeated; and an examination is made of the escaping gases, so as to indicate the source of the difficulty, and assist in finding means for its removal. Usually such action on the part of the inspector—though, Mr. Fletcher states, it is not always welcome at the time—is ultimately acknowledged with satisfaction by the manufacturer; and the expense that may have been incurred in the work is felt in the end to have been money well spent. Mr. Fletcher gives, in tabular form, particulars as to the quantity of deleterious gases emitted in each district under supervision last year, together with the corresponding figures for the two immediately preceding years. The acid gases (stated as SO₂, and expressed in parts per cubic foot) escaping from the sulphuric acid chambers were as follows:—1885, 1.52 grains; 1886, 1.40 grains; 1887, 1.50 grains. The acidity of chimney gases, expressed in a similar way, was: 1885, 0.67 grain; 1886, 0.77 grain; 1887, 0.74 grain. Mr. Fletcher states that the average result of all the tests made throughout the country is very uniform year by year. The amount of hydrochloric acid escaping has for the last three years been 0.1 grain in each cubic foot of chimney smoke. This is exactly half the amount given as the limit in the Alkali Act. The quantity of the same acid gas measured in relation to the production has gradually been diminished, till now it stands at a little less than 2 per cent. of it; the limit given in the Act being 5 per cent. The amount of sulphurous and other acid gases escaping from the sulphuric acid chambers is now, on an average, equal to 1½ grains of sulphuric anhydride; the limit given in the Act being 4 grains. There were four prosecutions under the Act last year; three being for carrying on unregistered works. In these cases penalties of £3, £10, and £18 (the two former with costs) were inflicted; and one firm was fined £20 and costs for neglecting to use the best practicable means for preventing the escape of noxious gases. In Scotland, as stated, the number of works under inspection last year was 139; being one more than in the previous year. The number of separate processes was 198, of which 65 related to the manufacture of sulphate and muriate of ammonia. There were 508 visits paid by the inspectors during the year; and 261 analyses made of escaping gases. From the statement of the total quantity of the principal materials used or produced in the works inspected during the year, it appears that 36,658 tons of sulphate of ammonia were made—5711 tons from ammoniacal liquor, 4842 tons from iron-furnace gases, and 21,098 tons from shale-works.

Taking first the section of the report dealing with alkali works, Mr. Fletcher refers to the struggle that has for several years been carried on between the Leblanc process for the manufacture of soda and the ammonia-soda process of more recent introduction. The result of this contest is awaited with keen interest both by chemists and by those who are commercially concerned therein; the Leblanc process having stood its ground so long, and been more successful than all those processes which have hitherto been brought into competition with it. As bearing on the future position of the alkali trade, Mr. Fletcher notices the interesting process lately elaborated by Messrs. Chance Bros., alkali manufacturers, at Oldbury, for saving the whole of the sulphur which has till now been thrown away in the alkali waste, so well known for its noxious qualities. On this ground the improvement promises, he thinks, to be one of great public advantage, by utilizing a substance which was expensive to dispose of, which caused a nuisance where it was deposited, and was liable to give rise to a sulphurous and malodorous

drainage continually. The quantity of this material now annually produced is 1,500,000 tons; and as the alkali trade is confined to a few districts, the waste is there deposited in enormous quantities. At Widnes alone these deposits cover 450 acres, and contain about 8,000,000 tons of the material. An addition of 1000 tons is made to them every day. The amount of sulphur contained in it is 15 per cent.; and of this Messrs. Chance recover very nearly the whole. The residue deprived of its sulphur is mainly composed of carbonate of lime, and is free from smell. It will probably find an application in the manufacture of cement and otherwise. Another new process now actively prosecuted at Widnes promises, with other changes in the soda manufacture, the accomplishment of the same end—the recovery of the whole of the sulphur in the alkali waste. The arrangement is proposed by Messrs. Parnell and Simpson, and is a combination of the ammonia-soda process with that of Leblanc. It is already at work on a large scale; but sufficient time has not yet elapsed for the commercial results to be known. The promoters, however, say that the process has entirely fulfilled their expectations, and that it is an established success.

Turning to the portion of the report dealing generally with the manufacture of sulphate of ammonia, we find that the total quantity produced in the United Kingdom last year was 113,896 tons (having a market value of £1,253,000), against 106,610 tons in 1886. Of the former total, gas-works produced 85,022 tons; iron-works, 5098 tons; shale-works, 21,098 tons; and coke and carbonizing works, 2678 tons. The figures for the preceding year were: 82,480 tons, 3950 tons, 18,080 tons, and 2100 tons respectively. The important increase to be observed in each case is due, Mr. Fletcher tells us, to the gradual development of trade, and more skilful manufacture, rather than to any new methods of manufacture. There is reason, however, to expect that a large addition may take place from the coke and carbonizing works, and, in particular, from the forms of coke-ovens and gas-producers introduced by Messrs. Brunner, Mond, and Co. In his previous report, the Chief Inspector gave an account of results achieved during six months' continuous working. The quantity of ammonia collected from the coal treated was three or four times greater than that usually produced in gas-works, though even then only half of the possible ammonia had been obtained. The amount of sulphate of ammonia gained was 66 lbs. per ton of slack, the value of which was nearly sufficient to pay for all the coal used in districts where this is cheap. Since that time the apparatus has been in constant use, dealing with 15 to 16 tons of fuel daily. The proprietors are, we learn, so satisfied with the results obtained, that they have put down a largely increased plant—one sufficient to consume from 200 to 240 tons of fuel, and to produce from 6 to 7 tons of sulphate of ammonia every 24 hours. Mr. Fletcher thinks there is good reason to expect that this will be the prelude to considerable changes in our method of burning coal, resulting in a largely increased yield of ammonia.

The Chief Inspector passes on to deal with the subject of smoke-prevention—a matter touched upon in his two preceding reports; and mentions approvingly the efforts now being made by Messrs. Brunner, Mond, and Co., to substitute gaseous for solid fuel. In this connection allusion is made to Mr. Hargreaves's thermo-motor (which was noticed in the JOURNAL in the early part of the present year), with which either liquid fuel or coal may be used. With this engine, an energy of 40-horse power can be maintained with the expenditure of 2 gallons of coal tar or 45 lbs. of coal per hour. Seeing, then, that by the application of further skill in the ordinary use of coal as a fuel, by the adoption of one of the many successful smoke-preventing appliances now available, the emission of black smoke may be avoided, and many collateral advantages obtained, Mr. Fletcher thinks it may be said that the time has come when the law prohibiting the emission of black smoke should be made applicable in all cases, and should be strictly enforced.

Mr. Fletcher closes his report with a few general observations on the Act under which his operations are conducted. He points out that the scope of the original Act, passed in 1863, was extended in 1881 so as to embrace a number of works not contemplated at the earlier date; among them being those in which gas liquor is made use of in any manufacturing process. He thinks it would now be well to include all those processes in which sulphuretted hydrogen is liable to be given off, as well as some others which he specifically mentions. He considers that manufacturers should be compelled to use the "best practicable means" for preventing the emission of noxious gases from their works. Such a provision would, he says, "prove an elastic bond ever tightening as chemical science advanced and placed greater facilities in the hands of the manufacturer." If this view of the subject was adopted, a comprehensive measure for controlling the escape of noxious gases might, he thinks, be so framed as to depend mainly on two clauses—the first defining a noxious gas as one which gives cause for complaint, or referring to a schedule in which such gases are named; the second, declaring that the best practicable means must be adopted to prevent the emission of such a gas. While offering these suggestions for purging the Act of certain of its blemishes, Mr. Fletcher refers to the excellent results that have been obtained by virtue of the measure as it stands. An inspection that was at first dreaded by the manufacturers as an infringement of their rights—an unwelcome intrusion into the secrecy of their operations—has, he says, been acknowledged by them as an aid in the management of their works, assisting them to maintain a standard of manipulation previously thought to be unattainable, and establishing a system of measurement and analysis of waste

gases which has in some cases brought about their profitable employment. In all the works which have come within the scope of the Act, a great and continued advance has been made in the discovery and use of methods for more completely preventing the escape of noxious gases.

Following the Chief Inspector's report are the reports of the District Inspectors, some of which are noticed at length to-day (p. 31), and the remainder will be referred to next week.

THE LONDON COAL AND WINE DUTIES BILL.—Mr. W. H. Smith, in reply to a letter from Conservative members of Parliament for Metropolitan constituencies, says that in the present condition of business it is impossible for him to hold out hope that an early day can be found for the consideration of the Coal and Wine Duties Bill.

THE ELECTRIC LIGHTING EXPERIMENT AT LEAMINGTON.—The Lighting of the Leamington Parade with incandescent electric lamps is still far from being satisfactory; and it is reported that experiments are about to be made with arc lights. Before any extensive changes are made, however, the Corporation will probably be approached in the hope that the town will bear a portion of the expense.

MILL LIGHTING BY GAS.—The Hurst Mill Company, near Ashton, employing about 6000 hands, have hitherto obtained the supply of gas for their two mills from separate works for each mill, both, however, being under the management of Mr. W. Taylor. The Company have decided on discontinuing this arrangement, and having only one large works, furnished with all the most modern appliances for the economical manufacture of gas. Acting on the advice of Mr. Taylor, the work of reconstruction has been entrusted to Messrs. R. Dempster and Sons, Limited, of Elland; the contract (which comprises everything but gasholders) to be completed by the end of September next.

PRESENTATION TO MADAME ALTING-MEES.—Our readers may remember that on the occasion of the gas exhibition held under the auspices of the Jersey Gas Company in April last, lectures on cookery were given by Madame Alting-Mees, and were largely patronized. A desire was then expressed by a number of ladies to take advantage of Madame Alting-Mees' presence in the island to improve their knowledge of cookery. As, however, her engagements did not allow of this being done at that time, a course of lessons was arranged for a future occasion. These have lately been delivered, and have been attended with great success. In order to show their appreciation of Madame Alting-Mees' kindness and courtesy, as well as in recognition of the benefits they have derived from her tuition, the ladies who formed the class have presented her with a pair of handsome Sax-China candelabra.

THE PRICE OF GAS AT LIEGE.—In reference to the paragraph in last week's JOURNAL in which it was stated that for the future the price for day gas is to be 10c., and for night gas 15c. per cubic metre, the Managing Director of the Liège Gas Company (M. Fayn) informs us that this does not quite correctly represent the conditions under which gas will be supplied in the town as from the 16th inst. There is to be no difference whatever in the price of day and night gas. The Gas Company sell the gas in bulk, at the rate of 11c. per cubic metre, or about 2s. 5½d. per 1000 cubic feet, to the municipal authorities, who retail it at 15c. for lighting, and 10c. for cooking, heating, and motive power; thus making from lighting gas a profit of 4c. per cubic metre, out of which they allow the Company 1c. on account of the gas used for other than illuminating purposes. Whether the gas employed for cooking, warming, &c., is consumed by day or by night, the price will be invariably the same—10c. per cubic metre. M. Fayn adds that there is no town in the Continent in which the price of gas, for whatever purpose required, will be so low as in Liège, when the new tariff comes into operation. The town authorities pay the Company at the rate of 15c. per cubic metre—the price charged to private consumers—for the gas burned in the public lamps.

PRESENTATIONS TO MR. F. W. STEVENSON.—Last Thursday evening the workmen employed by the Chester United Gas Company emphasized the friendly relations which have always subsisted between them and the Engineer and Manager (Mr. F. W. Stevenson), by presenting him with a testimonial, on his leaving the Company's service to assume the duties of Engineer of the Sheffield United Gas Company. The testimonial consisted of a portrait of Mr. Stevenson, a cigarette-maker, a meerscham cigarette-holder, and a silver match-box (suitably inscribed); the whole being the gift of the workmen. The presentation was made by Mr. H. Thomas, the oldest *employé* in the Company's service, who spoke in terms of praise of Mr. Stevenson's efforts to improving the works, as well as to lighten the labour of the men and ameliorate their condition generally. He expressed their united hope that Mr. Stevenson would be successful in his new undertaking, and their best wishes for himself and Mrs. Stevenson. In acknowledging the gifts, Mr. Stevenson thanked the donors for their kindness, and said he should always associate the picture with pleasant thoughts of the *employés* of the Chester Gas Company, whom he wished, in return, long life, health, and happiness. He then introduced to the men his successor, Mr. Robert Hunter. Mr. Stevenson has also been presented with a standard barometer by the Secretary and office staff; and a flattering resolution passed by the Directors of the Company, has also been conveyed to him. It may be truly said that Mr. Stevenson will take with him from Chester the heartiest good wishes of all with whom he has been associated there.

Notes.

THE TESTING OF PORTLAND CEMENT.

Mr. Henry Faija, M. Inst. C.E., has read, before the American Society of Civil Engineers, a paper on cement testing, in which he defined the object of testing cement to be the determination of its constructive value; while the necessities of a test are that it should be expeditious, complete, and reliable. The prime object of the paper was to support the recommendation previously made by a Committee of the Society in favour of the establishment of a uniform system of cement testing. According to Mr. Faija, the value of a cement may be determined by its fineness, and also by its tensile strength at two dates. The greater or less increase in strength between the two dates defines the growth, and determines approximately the ultimate strength to be expected from it. In practice, a test at three days and another at seven days from gauging enables a sufficiently accurate determination to be arrived at. The greater the increase in strength shown between these two dates, the longer it may be expected that the cement will continue to acquire strength, and the greater the ultimate strength obtained. The actual strength demanded of a sample, and whether it is to be quick or slow setting, must be determined by the special requirements of the work in which it is intended to be used. Quick-setting cements, as a rule, attain their greatest strength in about six months. After then there seems to be a falling off in tenacity; but to what cause this is due has yet to be discussed, as, in Mr. Faija's opinion, there is no apparent reason, theoretical or practical, why a strength once attained should be partially lost. The proposed adhesive test is, Mr. Faija declares, unquestionably uncertain and untrustworthy. The adhesion of a cement to any material depends as much on the nature of the other material as on the cement; and even where seemingly similar surfaces are secured, it is impossible to be sure that there may not exist slight differences which will affect the results obtained. The same objection applies to the sand test, which has the additional disadvantage that a considerably greater amount of skill is required to gauge a sand briquette than to gauge one of neat cement. With regard to the fineness of cement, Mr. Faija thinks that a residue of 10 per cent. on a sieve of 2500 holes to the square inch is as much as can be expected of any manufacturer, unless an additional price is paid for extra grinding. The most important point, however, in the first determination of the quality of a cement is the absence of cracking or blowing. This fault is due to excess of lime, and is fatal to the soundness of a cement which exhibits it. To test for this fault, Mr. Faija uses a steaming apparatus of his own devising, in which thin pats of neat gauged cement are exposed to vapour at a temperature of 110° Fahr. The pats are left in this atmosphere overnight; and if they are perfectly sound in the morning, the cement is regarded as a safe one to use.

A MAGNESIUM POWDER LAMP.

A continuous magnesium lamp, designed to burn magnesium metallic ribbon, was described in a "Note" appearing in the JOURNAL for the 22nd ult. (p. 910). Another method of obtaining a continuous light from burning magnesium has been invented, by Dr. H. G. Piffard, whereby the metal is burnt in the form of powder. The primary object of the lamp is to furnish a light for photographic purposes. A continuous current of compressed air or oxygen is made to blow a jet of very finely powdered magnesium in an even and thin layer into an alcohol flame; thus producing an enormous magnesium flame of high actinic power. Oxygen is preferred for this purpose, as the mixture of this gas with the metallic particles aids their rapid combustion. In Dr. Piffard's lamp the supply of powdered metal and the blast are so conveniently disposed that the flame is produced regularly so long as the supply of powder lasts. For photographic purposes, of course, the light is not usually required to be of long duration; and a cylinder of compressed oxygen, such as is furnished for the production of the lime-light, is sufficient. No particulars of cost are given; but it is evident that this must be a very expensive way of getting a light. At the same time, the fact that the power of the lamp may be varied through very wide limits, by increasing or diminishing the supply of metallic powder and oxygen, may render it useful for special purposes.

A FLAMELESS EXPLOSIVE.

Many uses in coal mining and in demolitions in places permeated with an inflammable atmosphere, might be found for an explosive which will do its work without igniting gas. Such a preparation has apparently been found in the explosive known as Flameless Securite, made by the Flameless Explosives Company, of 35, New Broad Street, London. Tests of this compound have been made by independent experimentalists during the past few months, which are claimed to have established the fact that Flameless Securite, when fired in a mixture of inflammable gases, will not cause them to explode. Securite is described as a nitrated hydrocarbon in combination with certain oxidizing agents; and the flamelessness of the combustion of this mixture is due to the addition of a proportion of a certain organic salt. In one set of experiments, the Securite was fired by electricity in a wrought-iron cylinder containing a highly explosive mixture of coal gas and air. Sixteen experiments were made with this and other explosives, in order to obtain comparative results; and in no instance did the Securite communicate ignition to the gaseous mixture in which it was exploded. Even in the case of a dynamite cartridge, which was

rendered flameless by the addition of some of the organic salt, no explosion of gas occurred when the dynamite was fired in it. In some cases the cartridge of Securite was surrounded by coal dust; and in all cases the top of the cartridge was open to the gaseous mixture. In the other series of experiments, Mr. Rhodes, of the Aldwarke Collieries, used the apparatus employed by him for testing safety lamps. It consisted of an iron cylinder with an arrangement whereby a highly explosive mixture of coal gas and air was made to travel through it at a velocity of about 6 feet per second. Coal dust could also be carried through the cylinder with the gaseous mixture. A large number of experiments were conducted with Flameless Securite and other explosives under varying conditions, with the effect of confirming the results obtained in the first series of experiments. If these experimental results are borne out in practical working, the employment of Securite may be a means of saving much labour and risk in breaking up *in situ* heavy castings forming portions of old gasholder tanks, &c., which require to be handled in a dangerous atmosphere.

REFLECTORS FOR DISTRIBUTING LIGHT.—Writing on this subject to the Editor of *Industries*, Mr. Alex. P. Trotter says: "With lamps, or groups of lamps, placed at a distance apart equal to their height above the ground, the maximum illumination is $1 + \frac{1}{2}$ the sum of \cos^2 of the angles whose tangents are 1, 2, 3, 4, &c. = 1.976. The minimum illumination is equal to $2 \cos^2$ of the angles whose tangents are 0.5, 1.5, 2.5, 3.5, &c. = 1.91. The greatest variation is, therefore, about $3\frac{1}{2}$ per cent. In a room 80ft. by 40ft. by 28ft. high, with five clusters of lights, the variation would be inappreciable to the most skilled photometrist; especially when the distribution would be assisted by the reflection from the walls. For street lighting, however, such reflectors should be of material service. The London gas-lamps are generally 12 feet high, and 66 feet apart; the distance being five-and-a-half times the height. The variation under these circumstances is very considerable; the illumination at a point on the ground midway between the lamps is about one-thirteenth of the illumination which would be found below the lamp, if it cast no shadow." Mr. Trotter, who has for many years made a study of this subject, promises to send shortly some notes on the distribution of illumination, and the geometrical design of reflectors for street lighting, &c.

WOODEN WATER-PIPES.—All of the earlier water companies in America, like the New River Company in London, used mains of wood, constructed out of what are known as pump-logs, or timber bored from end to end, and pointed at one end so as to fit into the counter-sink at the end of the next log; the space between the two being caulked with oakum. It is known that these pump-logs have certainly lasted nearly a century in some places, although, of course, they are not to be compared with cast-iron pipes used for such purposes. In some portions of the western part of the United States, they are using large water-mains built of staves, made up similarly to a wooden trunk sometimes used to furnish a supply of water to turbines; and it is found (*Engineering* says) that they answer their purpose very well for light pressures. The present water supply of Tokio, Japan, is by the wooden water-pipe system which has been in existence upwards of 200 years, furnishing at present a daily supply of from 25 to 30 million gallons. There are several types of water-pipes in use, the principal class being built up with planks, square, and secured together by frames surrounding them at close intervals. The pipes less than 6 inches in diameter consist of bored logs; and somewhat larger ones are made by placing on the top of the log, a cap, in which a very large groove has been cut. Square boxes are employed in various places to regulate the uniformity of the flow of the water, which is rather rapid, for the purpose of preventing aquatic growth. The water is not delivered to the houses, but into reservoirs nearly 15,000 in number on the sides of the streets.

THE DANGERS OF ELECTRIC LIGHTING.—A correspondent in Calcutta has kindly forwarded a cutting from a local paper giving the following particulars as to a curious fatality which occurred in that city in connection with an electric light installation. The facts came out in the course of an inquiry held by the City Coroner (Dr. E. W. Chambers), concerning the death of two coolies who died from inhaling nitric acid gas from a number of electric batteries, which they, with 18 others, were carrying at a wedding procession. It was shown that Messrs. Mookerjee Bros. were engaged to arrange a display of electric lighting while the procession was moving from Nintollah Street to a house near Chitpore Road. For this purpose the apparatus for the light itself was placed on a platform carried by 10 coolies, while on another platform there were 80 battery cells, carried by 20 coolies, 10 in front and 10 behind. The latter, inhaling the fumes of the poisonous gas from the cells, commenced to cough violently, and eventually, on arriving at Chitpore Road, they put the platform down on the road, and refused to proceed any further. Some Baboos obtained the assistance of the police who were accompanying the procession, and induced the men to carry the platform to the house not far off. Two of the men died from the effects of the poisonous gas which they had inhaled, while five or six more were in the hospital a number of days. The jury returned a verdict that the deceased met their death by inhaling nitric acid gas, through sufficient care not being taken by the contractors for supplying the electric light. After the verdict, the jury desired that a representation should be made to the police authorities that proper regulations should be made for electric light processions, and precautions taken to prevent such occurrences,

Technical Record.

A RELIC OF THE EARLY DAYS OF GAS SUPPLY.

An esteemed correspondent has kindly forwarded to us, for use in the JOURNAL, the following interesting document, illustrating the conditions under which gas was supplied in the year 1821:—

OSWESTRY GAS LIGHTS.
ROBERT ROBERTS

BEGS to present to the notice of the inhabitants of Oswestry the following Scale of Charges, per annum, for Burners of Various Sizes, calculated for Lighting, to the Hours mentioned:—

Description of Burners.	From Sunset till 9 o'clock.	Ditto till* 10 o'clock.	Ditto till* 11 o'clock.	Ditto till* 12 o'clock.	Height of Flame.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	Inches.
One single jet	1 1 0	1 5 0	1 10 0	1 15 0	3½
Two single jets	1 16 0	2 0 0	2 8 0	2 16 0	3
Three single jets	2 14 0	3 0 0	3 15 0	4 10 0	3
Cockspur of three jets . .	2 2 0	2 8 0	2 17 0	3 6 0	2½
Argand, No. 1	2 14 0	3 0 0	3 15 0	4 10 0	2½
Do. No. 2	3 6 0	3 16 0	4 14 0	5 12 0	2
Do. No. 3	3 18 0	4 10 0	5 10 0	6 10 0	2
Batwing	2 14 0	3 0 0	3 15 0	4 10 0	2½

* The last column contains the height which the Flame issuing from the respective Burners will not be suffered to exceed.
** These Burners consume 2, 3, and 4 Cube Feet of Gas per Hour, which, at 15s. per 1000f is equivalent to Candles at 3½d. per lb.!!

RULES.

The above Rents to be paid in advance, quarterly or weekly; and no person can be allowed to change his burners but at Midsummer and Christmas, when a written notice must be delivered to the Proprietor, stating the alteration.

Persons who wish to take the light, may apply to Robert Roberts, by whom their names will be entered numerically in a book, and branch pipes laid in rotation. The Proprietor only contracts to fix the pipes just within the house, and to supply the light when the interior is fitted up and made air-tight, which must be done by each individual.

No extra charge will be made, if the light be extinguished in a quarter of an hour after the time contracted for; and on Wednesday and Saturday evenings the Proprietor will allow burning till eleven o'clock.

In no case can any person be supplied with gas without a glass over the burner, as three or four times the quantity of gas is consumed, accompanied with an extremely offensive odour, when this rule is departed from. The Proprietor recommends the use of the straight chimney glasses, in which the gas burns with a much steadier light than in any others. If too large a flame is attempted to be produced, the illuminating power is but little, if at all increased, whilst the light is much injured both in purity and brilliancy, as a quantity of gas passes off unconsumed, to the loss of the concern, and without benefit to the consumer.

The Proprietor begs to state, that he shall expect to have a free and uninterrupted right of access, by himself or servants, to the places where the lights may be used, for the purpose of inspecting the same occasionally, and superintending the observance of these rules. The interior fittings to be done by the Proprietor only, and paid for on completion of the work.

All persons desirous of being supplied with the light will be required to take it for twelve months certain.

The Proprietor is inclined to grant every indulgence to those who take the gas; but he must, at the same time, claim a corresponding disposition on the part of consumers, both as it respects the regulation of the lights, and the time to which they respectively contract to burn them. If he does not meet with this disposition, he must, in justice to the town, refuse to supply those who depart from the regulations here laid down. And he has further to observe, that a violation of these rules will subject the parties to forfeiture of their rent advanced, and deprivation of the light.

October 4, 1821.

On the back of the preceding document was written the agreement entered into between the "proprietor of the gas lights" and the consumer, who, in the present case, was a medical man. The "proprietor" agreed to fix up and complete in the consumer's shop a "certain pipe, with the necessary appendages thereto belonging, so as to convey the gas therein for his use," and also to allow him to use the gas till ten o'clock each night, for one year, as well as to "burn the gas at any time during the night should his profession or business require a light during the said term"—the consumer, of course, "avoiding wilful waste." For the foregoing the consumer agreed to pay "the full sum of eight pounds and ten shillings" at the expiration of the term specified.

The annual "northern district" meeting of the Association of Municipal and Sanitary Engineers and Surveyors was held last Saturday week at Carlisle, under the presidency of Mr. J. Gordon, of Leicester. The members were met at the Council Chamber by the Mayor and other members of the Corporation; and under the guidance of Mr. H. U. McKie, the City Surveyor, and Mr. J. Hepworth, the Gas and Water Engineer, they visited several places of professional interest in the city. In the course of the proceedings, Mr. Hepworth read a paper on the Carlisle Public Baths, erected in 1833-4, at a cost of £7000.

WESTERN (U.S.A.) GAS ASSOCIATION.

The Annual Meeting of this Association was held at Chicago on May 9, 10, and 11; and a full report of the proceedings—which were under the presidency of Mr. EMERSON M'MILLIN, of Columbus—has since appeared in the *American Gaslight Journal*.

The PRESIDENT commenced his address by referring to the progress of events in the gas industry. Gas managers' views, he said, had been broadened; and the policy of gas companies generally had been liberalized. After passing in review the subjects of the papers to be submitted to the meeting, he gave the results of a question circular addressed to over 200 representative gas companies in the United States and Canada, with a view of obtaining information as to the present status of the lighting business. Unfortunately, only about one-half responded; and these did not fully answer the inquiries. It appears, however, that on the whole the demand for gas is increasing. Some 22 per cent. of the companies are supplying arc lights, and several are launching out into the incandescent electric light system. In most cases there were arc, and in a less number incandescent electric lights to compete with. Speaking generally, the use of gas-stoves was increasing, but this could not be said of gas-engines. Much difference of opinion existed as to the advisability of gas companies entering the electric light business; and a number of reductions in the price of gas had been made the last few months. He gathered that the gas business was in a prosperous and increasing condition; many companies securing an additional demand by encouraging the use of gas-stoves. Also that a great change had taken place in the views respecting the electric light; 25 per cent. of the gas companies were now actually working it, and more than 50 per cent. believed in the desirability of doing so. The demand for electric light, both arc and incandescent, was rapidly increasing. In referring to the demand for cheap gas, he compared the continual reductions that were being made in the price of gas with the treatment accorded to consumers by water companies; and this notwithstanding the fact that the gas undertakings mostly belonged to private individuals working for profit, whilst generally water-works were the property of the public, and were presumably worked for their benefit. Increased consumption had had a great deal to do with bringing about the reductions in price; and it appeared to him that the time was now at hand when an enormous increase could be secured, by furnishing gas at a price that would admit of its general use as fuel. It could hardly be expected that illuminating gas could be supplied at such a low figure; but if the incandescent gas-burners now being introduced were made a practical success, then a non-luminous gas could be sold at a very cheap rate. In converting coal into gas, there need not be a loss of more than one-third of the total heating power; and in burning the gas the loss need not exceed one-sixth. So that, by means of gasification, one-half of the heating power of the coal could be practically utilized. When coal was used direct, not more than 10 per cent. of it was turned to account. Therefore there was a large margin on which to base profits, apart from the cleanliness, convenience, and other advantages of gaseous fuel. In families, the substitution of gas for coal would enable one servant to be dispensed with, and thus effect a large saving; and the consumer could well afford to pay 50 to 100 per cent. more for his fuel gas than his coal cost him. Allusion was next made to the work of the State Gas Commissioners in Massachusetts, which seemed to have given general satisfaction both to the gas companies and to the public. The publication of the accounts had done no harm; and in effect the Commissioners protected existing companies from competition, for few communities would care for the inconveniences of a second gas undertaking, when convinced that the established one was working as cheaply as possible, and only paying a fair dividend on an honest capital. The Commissioners' report showed that the total capital stock of gas undertakings in Massachusetts was £2,400,000; and it was interesting to notice that they were assessed for taxation on a basis of more than £2,600,000. The total taxation was rather over 5d. per 1000 cubic feet sold; and some people asserted that gas could be sold for a less sum than the charge for taxes in Massachusetts. After noticing the advantage afforded by these statistics to managers of gas-works, the President concluded by referring to several matters of purely local interest.

A report from the Committee appointed at the last meeting for the purpose of considering the advisability of forming a Gas Institute was presented by Mr. F. Egner. The Committee sent out nearly 1000 circulars, enclosing stamped addressed envelopes. Only 130 replies had been received; and they therefore concluded that the idea of establishing a Gas Institute was not practicable.

Mr. F. EGNER, of St. Louis, Mo., read a paper on "The Purification of Illuminating Gas in Closed Vessels." After some preliminary observations, he proceeded to give an account of the Claus process, and also of that patented by Mr. W. Young, of Clippens. He next read a letter from Mr. F. Arding, the Secretary of the Ammonia Gas Purifying and Alkali Company, which set forth that the cost of a Claus plant for dealing with 2 million cubic feet per diem would be £8000; that the total working expenses, including royalty, might be estimated at 6d. per ton of coal; and that the receipts for liquor, sulphur, and sulpho-cyanides would be 1s. 7½d. per ton of coal. There would be a net profit of 1s. 1½d. per ton; no risk of nuisance or danger in opening purifiers; and the liquor would be obtained in the form of carbonate, and could therefore be safely converted into sulphate in open saturators. Mr. Egner remarked that the first cost of the apparatus would be double that of ordinary lime or oxide

purifiers; but that existing scrubbers, &c., could be utilized, which would diminish the first expense.

In the discussion, Mr. Faben said he had succeeded in purifying in closed vessels to some extent by admitting a small percentage of air at the purifier inlet. In the summer he passed more than 10 million cubic feet of gas without changing the boxes; but he did not do so well in winter, having to make a change (say) every 2 million cubic feet. He had no hesitation in recommending others to try the experiment. The difference in the illuminating power of the gas was not noticeable. If anything, there was some improvement; but if the air supply was increased to any degree, there was a depreciation of illuminating power. He more frequently had to change his purifiers on account of back pressure than because of impurities passing. Mr. King thought it was difficult to regulate the air in exact proportion to the make of gas. Mr. Lansden had tried revivifying the oxide by forcing a current of air through the box, but was unfortunate enough to work the fan too fast, creating such heat that the oxide was fused and converted into black oxide. Mr. Shreve had tried air revivification with success.

Mr. WALTON CLARK, of Kansas City, Mo., contributed a paper on "Fuel Gas." He began by asking the question, "What is the mixture of gases best adapted to meet the wants of the probable patrons of the companies we represent?" Large consumers could manufacture for themselves; so that the managers of gas-works had to consider the wants of housekeepers and small manufacturers. The objects to be sought for were a maximum of heating effect, distributed at a minimum pressure through mains of a minimum size. Hence the specific gravity of the gas should be as low, and its calorific value as high, as was consistent with economical production. It should yield the highest possible flame temperature, as it might be wanted for incandescent light and power. Therefore it should be composed of combustible gases only; and should be free from sulphur and other impurities. He thought that these conditions would be met by a purified mixture of coal and water gases, in about the proportions in which they were produced from bituminous coal; and that this mixture could be sold at a price which would commend itself to the consumer. Such a gas could not be produced so cheaply, either as regards bulk or heating power, as one containing a large proportion of nitrogen; but from its general applicability, its lower specific gravity, and higher flame temperature, he believed it was more economical to produce and distribute, and much better adapted to meet various wants, than any mixture containing a large proportion of producer gas. A pure fuel gas was limited to hydrogen, carbonic oxide, and hydrocarbons; the other substances were merely diluents. A ton (2000 lbs.) of average bituminous coal had a heating power of about 27 million units. In conversion into gas, a large part of this heat was lost; the actual loss varying according to the kind of gas made.

Assuming a ton of coal to be converted into coal gas in the usual way, the tar used to heat the retorts, and the surplus coke used for the manufacture of water gas, the author showed that the resulting mixture would be 39,000 cubic feet of fuel gas (specific gravity 507), having a heating power of 377 units per cubic foot, and a flame temperature of 4480° Fahr. if burnt with 20 per cent. excess of air. The total heat units would be 14,710,000 per ton of coal. If one-third of the coke was converted into producer gas, and the remainder into water gas, the mixture from one ton of coal would be 66,350 cubic feet (specific gravity 751), having a heating power of 232 units per cubic foot, or a total of 15,411,000 units per ton of coal. The flame temperature, estimated as before, would be 4048° Fahr. The loss of heat would be 45.4 per cent. in the first case; and 43 per cent. in the second. Comparing the two mixtures, it would be seen that, in order to secure another 2½ per cent. of the total heat, the volume was increased 70 per cent., and the flame temperature reduced from 4480° to 4048°. For these reasons, he objected to the admixture of producer gas. It would necessitate the storing and producing plant being 60 per cent. larger in capacity, even without considering the difference in the specific gravity of the mixtures, which would make the comparison still less favourable to the producer gases.

Continuing, the author said that M. Claudel had shown that, in the most efficient way of heating apartments, only 13 per cent. of the heat generated from coal was utilized; and therefore 10 per cent. would be a very liberal estimate for ordinary purposes. But a gas-fire was much more economical in respect to the utilization of heat. The efficiency of gas might safely be taken at 50 per cent. Applying this to the above data, it would appear that a ton of coal, burnt directly, only yielded an efficiency of 2,700,000 units; but if converted into coal and water gas, 7,355,000 units could be obtained from it. Therefore the gas from a ton of coal was equal to 2.7 tons of raw coal as used for domestic heating. In regard to power, the author estimated that a ton of coal converted into gas and used in a gas-engine was equal to 1.83 tons of coal burned under a steam-boiler. The introduction of the Welsbach incandescent burner showed how this gas could be used as an illuminant; and perhaps might settle the question of how to supply fuel and illuminating gas through one set of mains. The writer next went into some calculations, in order to estimate the requirements for fuel gas in a city of (say) 150,000 inhabitants; arriving at the conclusion that the annual quantity of coal carbonized would be 106,000 tons. The demand for heating purposes would, of course, only arise at one season of the year; but for power and domestic use, it would be fairly constant all the year round. The maximum quantity sent out would be about 20 million cubic feet per day; and looking at the sudden variations in demand according to change of weather, the storage capacity should not be less

than half this quantity. In conclusion, the opinion was expressed that the solution of the fuel gas problem was to be found in the perfection of an apparatus for distilling coal, and also gasifying the residual coke in the same vessel.

In commencing the discussion, Mr. Loomis insisted upon the extreme importance of selling fuel gas cheaply. He was interested with Professor Lowe in his series of experiments at Lynn, Mass., where fuel gas was being sold at 2s. 1d. per 1000 cubic feet. At that price it was cheaper than coal for cooking and motive power; but dearer than coal for heating. They found that the gas must be sold at 1s. per 1000 cubic feet in order to secure general custom for it. Even at that price it would still be dearer than coal for some purposes. Where coal was 20s. to 25s. per ton, fuel gas at 1s. per 1000 feet was cheaper than coal for accomplishing the entire work of a house—he was speaking of plain water gas, without admixture either of coal or producer gas. Extensive experiments had been carried on in a large Ohio factory, with the result that gas at 1s. 3d. per 1000 feet was found to be cheaper than coal or coke; and therefore, for general purposes a good fuel gas equal to water gas must be offered at 1s. per 1000 feet. He agreed that the water gas might be mixed with coal gas, by which its calorific value would be increased, and it would also be odorized; but he contended that the mixture should be prepared entirely at one operation, in one generator. The producer gas generated in heating up should be used for firing boilers or metallurgical work. He believed that gas companies should not make illuminating gas only, but also fuel gas; though he did not consider that fuel gas, incandescent burners, and the electric light were going to do all the business—there would still be a demand for illuminating gas. He contended that every gas company should not only make illuminating and fuel gas, but they should also use the waste gases for generating the electric light. In any town there were waste gases enough at the gas-works to supply all the electric light that would be needed. He could make from soft coal 40,000 to 45,000 cubic feet of water gas, and also sufficient producer gas to generate 250-horse power for one hour, which would furnish 25 arc lights for ten hours. As yet he had not measured the producer gas; but his process had been tested side by side with a Siemens, and with a Wellman producer for heating steel. Besides producing the water gas, his apparatus heated as much steel by means of the producer gas from it as the other producers did from the full ton of coal. There was no waste whatever. The whole of the coal was gasified, except the ash. He estimated the heating value of his gas at 350 units per cubic foot, and thought that a gas of 300 unit quality could be profitably made and sold at 1s. per 1000 feet. It would not do to use first-class coal, but the cheapest kind obtainable. He was now able to run his water-gas apparatus without any clinking. Mr. Egner said he had been working an apparatus of his own invention at St. Louis for two years, which would make fuel gas, water gas, or producer gas as required, and use either cannel or any kind of slack. Mr. Zimmermann observed that he was now making a mixed gas in a single vessel, as suggested in the paper. The best result he could secure, however, was 35,000 cubic feet of water gas per ton of coal; and he doubted if anyone else had done more in regular working. He had obtained as much as 70,000 feet of mixed fuel gas per ton. As to the producer gases being available in addition, he wished to say that all the heat was required to make the gas and raise the steam. Not only was it necessary to burn all the producer gas, but also to absorb the heat from the waste gases, if extraneous sources of heat were to be dispensed with. The 35,000 cubic feet were obtained when using hot fuel; and the use of cold fuel reduced the yield to the extent of 2000 feet or so. As to using slack, there was very little advantage, unless it could be worked with perfect ease; as, when making gas at the rate of 50,000 feet or so per ton, the cost of coal was insignificant. The President pointed out some differences in Mr. Clark's data, and these he had used on previous occasions. Mr. Clark took the calorific value of marsh gas at 21,343 units; but he (the President) put it at about 26,383 units. The reason of this was that Mr. Clark took the results of experiments on the actual gas; but he took the value of the carbon and hydrogen contained in the gas. He stated that 150,000 cubic feet of producer gas or 50,000 cubic feet of water gas weighed one ton; and after allowing for ash, &c., the smallest quantity of coal that would produce these quantities was 2888 lbs., and in practice more than 4000 lbs. would be required for their production. Mr. Clark, in reply, said that although he agreed that the coal and the water gas might be produced in one vessel, still he thought the coal gas should be handled separately. If it was passed through a bed of incandescent fuel, it would practically be converted into water gas. The mixture of gases he proposed, having a calorific value of 377 units per cubic foot, could not be sold at 1s. per 1000 cubic feet with coal at 16s. 8d. per ton, as it would cost more than 10d. per 1000 feet to make. He considered the use of slack in large quantities for the manufacture of fuel gas would lead to an increase in its price. The use of hot fuel would certainly lead to better results; and he reckoned the fuel account might be reduced by this means to as low as 42 lbs. of coal per 1000 cubic feet of water gas made. With regard to the President's remarks, it would be found, after deducting 13 per cent. for ash, that the analysis quoted in his present communication, and which was accepted by the President in his paper last October, showed a yield of 95 cubic feet of producer gas per pound of coal.

NEXT Saturday the Association of Public Sanitary Inspectors will pay a visit to Croydon to inspect, among other things, the Corporation Water-Works, the Beddington Sewage Farm, &c.

Register of Patents.

GAS MOTORS.—Bull and Co., H.C., Limited, of the Poultry, London No. 10,202; July 21, 1887. [8d.]

In the motor constructed according to this invention, the gas is exploded in one end of the cylinder, and at the other end steam is used; and it is also proposed to use compressed air in combination with the steam. The air is previously superheated, and both the air and steam are used expansively.

The explosive end of the cylinder is fitted with an inner or supplementary piston, which derives its movement from a cam or equivalent device on the main shaft. The purpose of this piston is to remove the products of combustion, and to draw in a fresh charge of gas and air during a portion of the return stroke of the main piston. This charge is preferably compressed previous to explosion during the remainder of the return stroke. By this arrangement, the cylinder is only partly filled with an explosive mixture; and the explosive gases are worked to a greater degree of expansion—thereby reducing their pressure and temperature at the exhaust; so that a greater amount of work is obtained from the explosive gases, which is an important feature in the economy of fuel in such motors. It will also be observed that, by this arrangement, an explosion may be obtained at every revolution of the engine. The inner piston is not quite so large as the cylinder, and begins its return stroke—which is effected by the cam before mentioned—a little before the main piston reaches it; and it arrives at the base of the cylinder at the same time as the main piston reaches the end of the return stroke. The gas and air which have previously been drawn in therefore find their way to the front of the inner piston through the space intervening between this piston and the cylinder.

GAS MOTOR ENGINES.—Dougill, J., of Manchester. No. 10,360; July 25, 1887. [8d.]

The first part of these improvements consists of an alteration in the movement of the piston and slides of the gas-engines described in patent No. 12,318 of 1884; the piston being made to travel as near as possible to the cylinder cover, for the purpose of thoroughly clearing from the cylinder all the products after combustion. The smaller slide which controls the supply of gas and air to the cylinder, is timed to admit air, but no gas until the piston has travelled one-tenth of its out-stroke; and the larger slide is timed to cut off the supply, and ignite the mixture, when the piston has travelled five-twelfths of its out-stroke. In this way a space equal to one-fifth of the pistons' travel remains between the piston and the cylinder end when the piston is at the end of its in-stroke—in other words, there remains a quantity of products after combustion equal to one-fifth of the piston displacement, within the cylinder after each exhausting stroke of the piston. The smaller slide is timed to admit gas immediately the piston commences its out-stroke; the larger slide, to cut off and ignite the mixture when the piston has travelled about one-third of its out-stroke. The second and third parts of the invention are entirely new manufactures, forming no part whatever of the patent referred to above—the second part consisting in the formation and arrangement of the parts which constitute a governor applicable to all forms of gas-engines; while the third part consists in the formation and arrangement of the parts constituting the slide-valve.

GAS MOTOR ENGINES.—Griffin, S., of Bath. No. 10,460; July 27, 1887. [11d.]

This invention relates to "twin" or double-cylinder engines in which each cylinder alternately gives an impulse to the crank-shaft when working at full power for the purpose of obtaining increased power with more frequent impulses, and consequently greater steadiness in running.

Hitherto, says the patentee, such engines have usually been made with each cylinder working with the double or "Otto" cycle—viz., one impulse (alternately in each cylinder) at every two revolutions of the crank-shaft when working at full power. The great disadvantage of this arrangement is that both pistons, when the cylinders are side by side, must necessarily make their outstroke at the same time; otherwise equal periods between the alternate impulses of each cylinder cannot be obtained. Such engines are thus thrown considerably out of balance (in consequence of the motion of both pistons and connecting rods being simultaneously in one direction), which for high speeds is objectionable.

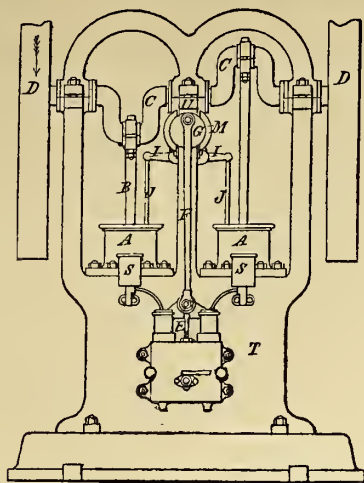
In order to remedy these defects, the engine constructed according to this invention is made with two single-acting cylinders arranged side by side (either horizontally or vertically), and actuating the same crank-shaft; the cycle in each cylinder being that described in patent No. 4080, of 1883—i.e., an impulse takes place at the back end of each cylinder alternately every third revolution; consequently an impulse is communicated to the crank-shaft at every one-and-a-half revolutions, with equal periods between each impulse when at full power. This arrangement admits of the cranks being set opposite each other at such an angle that, while the piston in one cylinder is making an out-stroke, the piston in the other cylinder is making an instroke; perfect equilibrium being thus obtained.

In order to obtain still greater power, combined with great steadiness in running, two double-acting cylinders are placed side by side arranged to actuate the same crank-shaft—thus forming a double horizontal engine. The cranks are set at such an angle with each other, that the periods between each impulse will be equal when working at full power.

Another form of engine is obtained by fixing two such double-acting cylinders on a framing with their piston rods at right angles to each other (similar to an ordinary diagonal steam-engine); both cylinders actuating the same crank, with equal periods between the impulses when the engine is running at full power.

Fig. 1 shows a front elevation of the engine arranged with two single-acting cylinders.

The cylinders A are arranged parallel with each other in the water-casing T; the piston in each cylinder being connected by means of rods B, with the cranks C set opposite each other, and connected together by a central shaft, to the ends of which fly-wheels D are attached. The

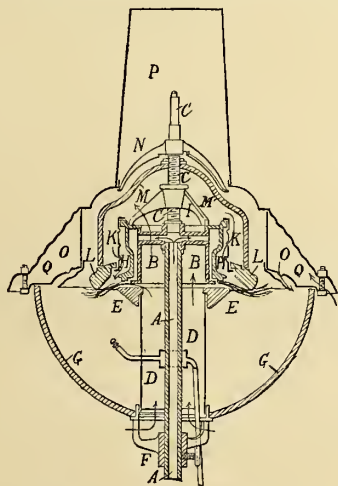


operation of admitting the combustible charge alternately into each cylinder, as well as igniting it at the proper time, is performed by the slide-valve E, which is formed with a double [set of ports or passages (one set for each cylinder) similar to those described in the 1883 patent. The slide-valve receives its motion through the rod F from the crank G, which is attached to a spindle passing through the framing underneath the worm-box U, and having fitted at its opposite end the governor driving-wheel M. Motion, in the proportion of one revolution to three of the crank-shaft, is imparted to this spindle by means of a worm on the crank-shaft working in the worm-box U, which gears with a worm-wheel attached to the spindle (not shown in the drawings). The exhaust-valves K (only one of which is indicated) receive motion from the cam H, through the levers I and rods J. The admission of gas is regulated by the gas cam N, which opens the gas-valve at the proper time, by means of the rod O; this rod being moved either into or out of contact with the gas-valve by the action of the governor L, through the medium of the lever P and rods Q and R. The interior of the cylinders, as well as the slide-valve, is oiled by means of the lubricators S.

The operation of the engine is as follows:—The entire cycle being completed in each cylinder in three revolutions of the crank-shaft, as described in the patent already referred to, an impulse will take place in the right-hand cylinder, causing the crank-shaft to make one entire revolution and a half, at which point the crank C will be on the bottom centre and the combustible charge in the left-hand cylinder fully compressed. The slide-valve E having now completed its stroke in the opposite direction, the charge in the last-named cylinder is ignited, imparting an impulse to the crank C causing the crank-shaft to revolve a further one and a half revolutions. At this point the right crank is again in the position shown in the drawing; and at the same time the entire cycle in the right cylinder having been completed, an impulse is again about to take place, which will be followed on the completion of a further one and a half revolutions of the crank-shaft by an impulse in the left cylinder. When the engine exceeds its normal speed, the governor B will rise; and thus, by means of the rods Q and R and the lever P, move the rod O out of contact with the gas-valve, and shut off the supply of gas. The operations of charging, igniting, and exhausting are not described; being similar to those in the 1883 patent.

LIGHTING AND HEATING BY GAS.—Guibout, O. E., of Dieppe, France. No. 10,558; July 29, 1887. [8d.]

A vertical section of this apparatus is shown in the engraving. It consists of a central gas-tube A, on the upper part of which is screwed a cast-iron cylindrical box B, provided with four channels through which the gas issues. A rod C is screwed on the top of the box; and a tube D, of enamelled copper, is arranged below the box B and concentrically to the



tube A. A ring or collar E of fire-clay rests on the top of the tube D. A collar F, provided with arms and kept in position by a pressure screw, is adapted to the lower part of the gas-tube for the purpose of supporting the glass globe G; while a cast-iron box H, resting on the top of the box B, surrounds the latter. The boxes are adjusted on each other in such a manner that the gas issuing through the end openings of the channels fills the space between the two boxes, and issues at the lower part in the form of an annular sheet. The box H is besides secured in its place by a stirrup I, held in a fixed position on the top of the box by means of a nut screwed on the rod C. A perforated cylinder K, of enamelled copper, surrounds the box H and supports

at its lower part a crown of fire-clay L, which in its turn supports a fire-clay dome M, kept in position by a nut also screwed on to the rod C. Lastly, a triangular support N receives a cover O and the chimney P. This cover is of enamelled copper, and composed of a conical part O and of a circumferential compartment Q, provided with annular openings, and with a row of small holes.

Gas enters through the tube A, and descends through the space between the boxes B and H, and, coming out in an annular sheet, burns between two currents of air—namely, one coming from the tube D, surrounding the central gas-tube A, and issuing between the refractory collar E and the box B; the other formed of air which has risen into the refractory dome M, and then descended between the inner surface of this dome and the perforated cylinder K. The current passes through the cylinder, and comes out above the flame between the box H and the refractory crown L; and the two currents become heated by their contact with the heated parts of the flame. The gases of combustion escape round the dome M; while the air on entering passes through the holes provided for the purpose, and issues so as to keep the glass globe cool.

IGNITING APPARATUS FOR GAS-ENGINES.—Abel, C. D.; communicated from the Gas Motoren Fabrik Deutz, Deutz, Germany. No. 11,444; Aug. 22, 1887. [8d.]

This invention relates to apparatus for igniting the charges of gas engines by means of a portion of the charge brought in contact with the interior of a tube, arranged centrally within an annular Bunsen burner, the flame of which effectually heats it so as to make the ignition of the charge within it perfectly reliable. At the same time, the flame is rendered of a reducing character and consequently protects the tube from injury through oxidation.

In operating the apparatus, a portion of the compressed combustible charge in the cylinder passes back through the igniting channel into the horizontal channel of the burner, and also partly up into the heated igniting-tube. The flame travels down the tube, and thence in both directions in the horizontal passage, and finding no escape at the outer end of it, is projected by the expansion due to the combustion through the igniting passage into the cylinder, where it effects the ignition of the charge. The tubular extension of the burner passage, besides assisting in the projection of the flame, also serves, on the removal of its cap, for the withdrawal of any solid deposits that may be carried backwards into the burner from the cylinder by the entering compressed gaseous mixture.

APPLICATIONS FOR LETTERS PATENT.

- 8532.—THOMPSON, W. P., "Improvements in or relating to gas-lamps." A communication from J. Herzfeld. June 11.
 8551.—WESTWOOD, W. H., and WRIGHT, E. T., "Improvements in the mouthpieces and lids, doors, or covers of gas-retorts and ovens, and other vessels and articles requiring gas and air tight joints." June 11.
 8559.—THE GAS PATENTS SYNDICATE, LIMITED, "Apparatus for the manufacture of gas." A communication from J. B. Archer. June 11.
 8560.—THE GAS PATENTS SYNDICATE, LIMITED, "An improvement in fuel-gas burners." A communication from J. B. Archer. June 11.
 8592.—TRIPIFFIT, W., "Improvements in gas or other cocks." June 12.
 8640.—SUGG, W. T., "Improvements in gas regulators or governors." June 12.
 8680.—WHITE, A. F., "Improvements in hot-water apparatus heated by gas." June 13.
 8696.—PINKNEY, C. W., "Improvements in gas motor engines." June 13.
 8745.—TEIDEMAN, G., "Improvements in liquid-meters." June 14.
 8849.—BENNETT, S., "Improvements in gas-lamps and burners." June 16.
 8894.—BENNETT, J., "Improvements in gas pipes or burners for the purification of gas." June 18.
 8859.—LUX, F., "Improvements in gas-burner regulators." June 19.
 8982.—KEY, W., "An improved liquid-meter." June 19.
 9062.—THEERMANN, W. P., "Improvements in motor engines operated by the ignition of explosive mixtures of air and petroleum or other hydrocarbon or gas." June 21.
 9121.—RICHARDS, H. D., "Improvements in valves, applicable in the manufacture of coal gas." June 22.
 9174.—PILKINGTON, W. L., "Improvements in lanterns for gas-jets." June 23.
 9239.—NICHOLSON, T., "Improvements in gas and coke producers, and in the apparatus for collecting the bye-products therefrom." June 25.
 9249.—DELAMARE-DEBOUTTEVILLE, E. F., and MALANDIN, L. P. C., "Improvements in governors for gas-engines and other like motors." June 25.
 9310.—ROOTS, J., "Improvements in gas-engines." June 26.
 9358.—LIND, J., "Improvements in stoves for burning mineral oils, or gas, &c." June 27.
 9363.—PIKE, W. H., "Improvements in gas-burners." June 27.

PATENTS WHICH HAVE BECOME VOID.

[AFTER THE FOURTH YEAR.]

- 4075.—M'FARLANE, J., "Gas producers."
 4236.—CLARK, A. M. (Popp), "Gas lighting."
 4240.—CLARK, A. M. (Popp), "Incandescent gas-burners."
 4334.—CHAMBERS, F., "Rotary fluid-meter."
 4467.—HEARINGTON, A. H., "Gas burners."
 4577.—KEIRBY, J. E., "Portable gas-lamp."
 4591.—MUNDEN, W. J., "Gas motor engines."
 4622.—RIDEALGH, C., "Preventing contamination of water by sewage."
 4639.—POLLOCK, R., "Valves for gas-engines."
 4705.—PELLEGRIN, L. A. V. (Duchamps), "Carburetted air."
 4776.—SPENCE, J., "Gas-engines."
 4777.—CROSSLEY, F. W., "Gas motor engines."
 4880.—WEATHERHOGG, G. W., "Gas motor engines."
 4969.—LANGDON, W. E., "Regulating supply of gas in railway trains."

In the advertisement of "Bell's Asbestoline," in last week's JOURNAL, p. 1164, the price (through a figure slipping out in printing) was given as 2s.—instead of 2s. 3d.—per lb.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

THE PHOTOMETER QUESTION AT THE GAS INSTITUTE MEETING.

SIR,—Having undertaken to make myself as useful as possible to our friends and my colleagues of the Société Technique during their visit, I was unavoidably absent, "personally conducting" a party, at the time when Mr. Dibdin's paper was read at the recent meeting of The Gas Institute.

If I had read rightly the augury from the appearance of the skies, I might have inferred that the poor old Evans photometer, together with others, were in stormy weather, with variable currents, in Great George Street. But though I had been favoured with a sight of Mr. Dibdin's paper, I did not anticipate that the results of his experiments, or the enthusiasm of the author, would have so completely carried away The Gas Institute as it appears to have done. I congratulate Mr. Dibdin on the success of his communication. I am told that the "open photometer" (?) was generally approved of, and that the Evans photometer was relegated to the dust-bin, or to some other proper place where such exceedingly badly-conducted instruments (they are said, I am told, to cause a very respectable class of men to commit "a nightly fraud") ought to go.

I do not deny that I am surprised at the deft manner in which the photometer question was, as I was informed, settled. I have devoted many years of my life to the subject of photometers and photometry; and although I do not now consider it to be a difficult thing to make a scientifically accurate photometer, I think it is a very difficult thing—considering the important and complicated questions involved in the verification of the illuminating power of the gas supplied to the public, under existing Acts of Parliament—to settle a form of photometer satisfactory to all parties, particularly for London. But "*Audi alteram partem*" is a motto not often lost sight of by scientific men; and I ask leave to freely translate it thus: Hear the maker of the Evans photometer before you condemn it. The discussion of Mr. Dibdin's paper at The Gas Institute meeting is past and gone, and I cannot now conveniently join in it; but I will ask your permission to put before your readers some remarks on photometers and photometry, including the Evans photometer, after I have read your report of the discussion which took place at the Institute meeting.

I intended to have read at the recent meeting a paper on "Standards of Light." But, from some cause or other, my name did not appear on the list; and I may say that I am not sorry for it, considering the great importance of the subject, and the limited time the Institute had at its disposal for scientific work. I think that the subject of photometers, "open" and "closed" is of such a nature that the columns of the JOURNAL are much better adapted for its thorough consideration than The Gas Institute meeting. Mr. Dibdin has made a valuable contribution to the literature of the question, although I hope to be able to show your readers that his experiments will bear another interpretation of the conclusions he draws from them than that which he gives to them.

33, Bold Street, Liverpool, June 23, 1888.

WILLIAM SUGG.

MR. CARPENTER'S PAPER ON THE PRINCIPLES OF GASEOUS FIRING.

SIR,—I am sorry not to have been present at the meeting to hear Mr. Carpenter's paper, although I have to confess to a feeling of disappointment on reading it in your last week's issue. It betrays on the part of the author a superficial acquaintance with his subject, for which I was scarcely prepared; and this is coupled with a sort of happy ignorance of much that has been achieved outside his own immediate sphere.

It is surely idle to advance the fact that air takes up heat rapidly, for the purpose of proving that it becomes heated in its passage through a single narrow flue, when his own experience proves the inferiority of this treatment—regarded simply as a means of heating air—as compared with that which is secured in a regenerative furnace. It must be equally idle to deny the possibility of restoring an appreciable amount of waste heat to the furnace, when we have the testimony of one of his own supporters, Mr. Valon, to the contrary. Nor does it appear any more reasonable on his part to raise, for the purpose of vindicating his position, the old and well-worn bugbears of cost and failure, or to attract the imagination of his audience by highly-drawn references to "cunningly devised titles, &c." Our faith in a thin conducting medium is by no means so extinct as Mr. Carpenter would have it to be supposed; nor, as to comparative cost, is he entitled to indulge in unlimited self-congratulation; while failure, from which he has, it is true, not ingloriously secured himself, has, to others, largely proved but the prelude to signal success.

Without, however, pursuing the many errors with which it abounds, the paper fairly suggests a reflection upon the present position of the subject of it. It is now about ten years since it became pretty generally known in this country that all, and more than all, the advantages claimed by Mr. Carpenter for his system of simple firing were being obtained in many places abroad by one or other of the various adaptations of the regenerative system. Fully five years ago, these advantages had begun to be secured amongst ourselves; and at the present time it is no uncommon thing to hear in the provinces of a production per mouthpiece of 8000 or 9000, or 10,000 feet and upwards. What part has London taken in this great advancement? What has she, with her picked intelligence and resources practically unlimited, contributed to this result? Absolutely nothing; and Mr. Carpenter's paper indicating—as may be reasonably supposed—the extreme height to which our Metropolitan brethren have managed to rise after ten years of effort, may indeed be said to "point a moral," if not to "adorn a tale."

Birmingham, June 30, 1888.

CHAS. HUNT.

MECHANICAL V. HAND STOKING AT THE MANCHESTER CORPORATION GAS-WORKS.

SIR,—Referring to the letter and figures of Alderman King respecting the cost of carbonizing by my machinery, I wish to say that, in writing to Mr. May, I endeavoured to state every point of the cost I asked for so fully in detail that no one could mistake what was included in it. But Mr. King has evidently fallen into the common error of supposing the

words "cost of carbonizing" to mean that in every place the same items are charged to the carbonizing account. That is a supposition quite at variance with fact, and should be carefully avoided.

If Mr. King will kindly read the letter which I wrote to Mr. May, he will find that I ask for the cost including "wages for coal wheeling, breaking, elevating, conveying it into the hoppers, stokers, firemen, coke wheelers—in fact, all charges from the taking of coal from the coal stores to the tipping of the coke in the yard." My principal object in so carefully defining the work included in my figures, was to enable engineers who might honour me by reading the letter, to compare for themselves the cost of doing their work under the existing conditions, with the cost by machinery.

When these expenses are taken for the Rochdale Road works of the Manchester Corporation, my figures will be found to be correct; and no mistake whatever has been made by me. The number of men employed, and the wages paid to them for doing the work at Manchester, are as follows:—

No. 1 House (with "Manual" Machinery).

The amount of coal carbonized per day of 24 hours is 183 tons 15 cwt.

	Per Day.	s. d.	£ s. d.
48 men to draw and charge the retorts, open and close the lids, auger pipes, wheel coke into the yard, and attend to the furnaces	5 0	=	12 0 0
10 coal wheelers and coke quenchers	4 2	=	2 1 8
2 engine-drivers	5 0	=	0 10 0
			£14 11 8

Which works out 1s. 7d. per ton of coal carbonized.

No. 2 House (with "Compressed Air" Machinery).

The amount of coal carbonized per day of 24 hours is 192 tons 10 cwt.

	Per Day.	s. d.	£ s. d.
12 men to draw and charge the retorts and close lids	5 6	=	3 6 0
8 men to open lids, auger pipes, and wheel away coke	5 0	=	2 0 0
16 firemen	5 0	=	4 0 0
10 coal wheelers and coke quenchers	4 2	=	2 1 8
2 engine-drivers	5 0	=	0 10 0
			£11 17 8

Which works out 1s. 2-82d. per ton carbonized.

For the same work done by hand at Manchester, Mr. King will know that the Corporation pay 2s. 6d. per ton.

The cost of superintendence, retort setters, and men repairing retorts, included in the carbonizing account at Manchester, would require to be added to the cost per ton given above; but this item would be exactly the same either for machine work or hand stoking, and does not affect the comparison.

As regards the figure given by Mr. King for repairs to machinery, I should like to point out that the machinery in No. 1 house received its first thorough overhaul during the nine months selected by Mr. King. It had then been at work for three seasons, and had dealt with about 163,000 tons of coal during that period. Before being stopped for repairs it had been working that season for 240 days continuously. The machinery in No. 2 house had been running, night and day without intermission, for 546 days, up to July, 1883, during which period about 104,500 tons of coals were carbonized. It was then thoroughly overhauled and repaired during the nine months in question.

As the portion of the wear and tear account due to the general overhaul was caused by wear which had taken place during the whole time the machinery had been in operation, surely Mr. King should have calculated that large proportion of his cost upon the larger weight of 163,000 tons in one case and 104,500 tons in the other.

In order to make a correct comparison between hand and machine stoking, the wear and tear of rakes, scoops, and shovels should be added to the figure for hand stoking. This is a detail of considerable amount; but, as it is inevitable, it has generally been overlooked in such comparison.

JOHN WEST.

Manchester, June 30, 1888. Late Chief Engineer to the Manchester Corporation Gas Department.

THE SEALING OF REGISTERS OF SHAREHOLDERS.

SIR,—In reply to the question which "Limited Company" addresses to me in your last issue, will you permit me to say that the terms of your original correspondent's inquiry obviously refer to incorporated companies which are subject to the provisions of the Companies' Clauses Acts, and not to companies registered under the Limited Liability Acts. The latter contain no provisions as to sealing the register, but section 9 of the Companies' Clauses Consolidation Act, 1845, enacts that "the Company shall keep a book, to be called the 'Register of Shareholders;'" . . . and such book shall be authenticated by the common seal of the company being affixed thereto; and such authentication shall take place at the first ordinary meeting, or at the next subsequent meeting of the company."

Points of company law and practice possess an interest for me; and I shall be pleased to hear from "Limited Company" and your original correspondent if they care to go further into the matter.

Commercial Gas-Works, Stepney, E., June 17, 1888.

H. D. ELLIS.

MR. N. H. HUMPHRYS ON PURIFICATION BY OXIDE OF IRON.

SIR,—I have read somewhere of an old lady whose feelings were, on occasions, apt to be "too much for her;" and Mr. John T. Sheard, in his letter published in the last number of the JOURNAL, shows strong indications of similar tendencies. Possibly it is the turmoil of conflicting emotions that has obfuscated his reasoning powers. Firstly, we have him struggling with "considerable reluctance;" but this is speedily overcome by the prospect of some reader, taking "his first lessons on the scientific aspects of an important branch of modern (I) gas manufacture," being misled whilst undergoing that operation, and turning an accusing eye on him (Mr. J. T. Sheard) for his "injustice and ungenerosity" in refraining from setting forth the truth. Then a little further on he tells

us that the reason of his writing is the fear that my article, if uncorrected (!), must tend to "aggravate the former confusion." How the use of such unmeaning terms is to assist towards perspicuity is a mystery to me. After this, he is troubled with a fear lest certain "ignorant" readers should interpret one of the columns in a table as meaning something entirely different from the full explanation of it given in the article—an explanation quite as full and complete as that which he has thought necessary to add. If any reader is so foolish as to pick out one portion from this or any other article, and put his own construction upon it, without regard to the context, he is certainly likely to go wrong, even with the advantage of Mr. Sheard to correct and explain. All this sort of thing is simply a transparent device intended to conceal his real object in writing, whatever it may be.

Having "briefly" stated his principal objection in a sentence of about eighty words, Mr. Sheard proceeds to make uncalled-for assumption as to my ignorance, or otherwise, respecting a certain contribution to the Chemical Society, and also of a communication to the JOURNAL. The said contribution and communication, in his opinion, settle the whole question of the "scientific aspects," &c.

Taking the contribution first, I have simply to remark that it cannot be taken as *directly proving* anything about the behaviour of ordinary "oxide" in coal gas purifiers. The material used by Mr. Lewis T. Wright was not ordinary commercial oxide, but a compound prepared by precipitating a solution of a ferric salt, carefully washing the precipitate, drying at 212°, and keeping in a desiccator till required. This compound was proved to have a composition represented by the formula $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$. Some experiments were tried by passing dry sulphuretted hydrogen, containing 15 to 20 per cent. of free hydrogen, through it, until saturation. The results obtained under these conditions appear so remarkably conclusive to the mind of Mr. Sheard, as to render it imperative not to allow even the mention of any theory that does not wholly agree with them. I wish it to be observed that, in my article, the existing theories were simply stated; no opinion was expressed upon them, and no attempt was made in the way of controverting the three principles so dogmatically laid down by my critic. I certainly wrote down the formula $\text{Fe}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$; and the alteration of this to $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$ appears to be the only genuine correction he wishes to make. Looking at the facts that Mr. Wright had to take careful precautions in order to obtain the compound $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$; that some of his samples contained a considerable excess of water beyond that allowable by that formula; that he refers to the substance above mentioned whilst in the moist state (a condition similar to that in which it would probably exist in ordinary purifiers, as an excess of water is always present) as $\text{Fe}_2\text{H}_2\text{O}_6$ or as $\text{Fe}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$ —it appears to me that the endeavour to drag in this paper in support of the idea that the proper formula for the active principle in "oxide" as it exists in the purifier is $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$ is simply a perversion of fact. I quite agree that Mr. Wright's experiments are conclusive and incontrovertible, so far as the particular compound used is concerned; but I cannot also consent to the assertion that they prove, in an equally certain manner, the reactions that take place with an impure ferric hydrate in the presence of an excess of water, treated with a gas containing perhaps less than 1 per cent. of sulphuretted hydrogen.

Now we come to Mr. Sheard's communication. His method of procedure is so different from that obtaining in ordinary practice, that, whilst cheerfully admitting that it throws valuable light on the subject, I cannot accept it as so conclusive as to prove every other theory to be utterly absurd and unworthy even of mention. My reason for giving prominence to Professor Wanklyn's views is the fact that they are based, if I am rightly informed, on actual study and experiment in the purifier-house itself; and as such I consider them preferable to those based on laboratory experiments, coupled with conditions of an artificial character to a greater or less extent. They certainly deserve more respect than Mr. Sheard extends to them.

In concluding, I may remark that the appearance of Mr. Sheard's letter in the same issue of the JOURNAL which contains the editorial remarks under the head of "The First Two Gas Institute Papers" is a strange coincidence. He fully illustrates the manner in which the defects to which speakers in *viva voce* discussions are liable may also extend to written discussions. The speaker on a paper which he has only just heard, perhaps more or less imperfectly, certainly has some claim to indulgence if he strays from the reader's meaning; but similar consideration can scarcely be extended to one who, having had the opportunity to read a paper carefully and at leisure, misrepresents the same, and confuses the points at issue by bringing in extraneous matter.

Salisbury, June 30, 1888.

N. H. HUMPHRIES.

AN IMPROVEMENT IN LIGHTING.

SIR,—Although regenerative gas-burners are useful for a certain class of lighting, it may safely be said that they are by no means suited for all-round domestic use, owing to their cost, their absolute failure if a glass is broken, and the attention required to keep the glasses clean, with the consequent extra liability to breakage from the necessary handling. I have for many years advocated the use, for workshop purposes, of ordinary flat flames placed horizontally, in which position they give no shadow downwards, and with an ungoverned service the light is undoubtedly increased as compared with a vertical flame. But this system is not suited for ordinary sitting rooms, partly on account of its appearance, and also because the flame cannot be turned partially down without causing flickering and smoke.

I have recently adopted an arrangement which, whilst increasing the downward light by about 40 per cent., causes no unpleasant upward shadow, and is free from all objections for ordinary domestic service. It is simply an ordinary flat-flame burner with one of the recent patterns of opal globe with a wide opening about six inches diameter at the bottom. The new departure consists of the use of a special gallery or holder which raises the bottom of the globe at least an inch above the top of the burner—converting the globe into a reflector. The toning down of the top light is hardly appreciable, whilst the opal globe throws a strong and shadowless light downwards exactly where it is required. For practical lighting one No. 4 burner with this arrangement will do at least as much as three with ordinary close opal moons, and as much as two with partially ground clear-glass globes. The light will, in fact, compare favourably with many, probably with

most of the regenerator burners in use; and it has the advantage of being cheap, simple, unpatentable, and satisfactory from a decorative point of view.

I have forwarded one of the arrangements, exactly as we use them in my own house, and as made for many friends. They are well adapted for replacing sun-burners for top lights in shops and windows, giving a warm shadowless light which is exceedingly pleasant. We shall shortly have these lights fixed in our London show-rooms; and as they are both cheap and easy to copy, no doubt they will soon come into extended use.

Warrington, June 29, 1888.

THOS. FLETCHER.

Parliamentary Intelligence.

HOUSE OF LORDS.

MONDAY, JUNE 25.

The Hexham Local Board Bill was reported from the Select Committee with amendments.

TUESDAY, JUNE 26.

The Frodsham Gas and Water Bill was reported, with amendments.

The Llanelly Local Board Bill was brought from the Commons, read the first time, and referred to the Examiners.

The Gas Provisional Orders (No. 1) Bill was brought from the Commons, read for the first time, and referred to the Examiners.

The Nelson Local Board Bill was referred to a Select Committee, consisting of Lord Basing (Chairman), Viscount Torrington, Lord Brougham and Vaux, Lord Hamilton of Dalzell, and Lord St. Levan; to meet on Thursday, July 5.

THURSDAY, JUNE 28.

The following Bills received the Royal Assent by Commission:—Barnstaple Water Bill, Electric Lighting Act, 1882, Amendment Bill, Folkestone Water Bill, Glasgow Corporation Bill, Halifax Corporation Water Bill, Hamilton Water Bill, Helston and Porthleven Water Bill, Keswick Gas Bill, Riddings District Gas Bill.

The Examiners reported that the Standing Order applicable to the Gas Provisional Orders (No. 1) Bill has been complied with.

The Limsfield and Oxted Water Bill was reported, with amendments.

The Water Provisional Orders (No. 2) Bill and the Gas and Water Provisional Orders Bill were read a second time, and referred to a Committee of the Whole House.

FRIDAY, JUNE 29.

The Examiners reported that the further Standing Orders applicable to the Llanelly Local Board Bill have been complied with.

The Frodsham Gas and Water Bill was read the third time, with the amendments, passed, and sent to the Commons.

The Gas Provisional Orders (No. 1) Bill was read a second time.

ELECTRIC LIGHTING ACT 1882 (PROCEEDINGS).

A report by the Board of Trade respecting the applications to, and proceedings of the Board under the Electric Lighting Act, 1882, during the year 1887 was presented.

HOUSE OF COMMONS.

MONDAY, JUNE 25.

The Hamilton Water Bill (Lords) was read the third time and passed, without amendment.

The Llanelly Local Board Bill, as amended, was considered, read the third time, and passed.

The Lincoln Corporation Bill (Lords) was read a second time, and committed.

TUESDAY, JUNE 26.

The Henley-on-Thames Gas Bill (Lords) and the Hinckley Local Board Water Bill (Lords) were read the third time and passed, with amendments.

The Gas Provisional Orders (No. 1) Bill was read the third time, and passed.

The Edinburgh and Leith Corporations' Gas Bill (Lords) was referred to a Select Committee, consisting of Mr. Abel Smith (Chairman), Mr. W. L. Bright, Mr. Seager Hunt, and Mr. McCartan; to meet on Thursday, July 5.

WEDNESDAY, JUNE 27.

The *locus standi* of gas consumers, ratepayers, and owners of property in Edinburgh and Leith, petitioners against the Edinburgh and Leith Corporations' Gas Bill (Lords), has been disallowed.

THURSDAY, JUNE 28.

The South Lincolnshire Fen Water Bill (Lords) was read the third time and passed, with amendments.

THE NORTHERN COAL TRADE.—There has been increased activity in the steam-coal trade of the North during the past week. The shipments have risen considerably, and the local requirements have also been greater; so that the collieries have been generally fully employed. Price are said to be "stiffer;" but there have been no higher rates generally paid. For best steam coal the price has been about 7s. 6d. per ton net, though old contracts are running even lower. Second-class coal varies from 7s. down to 6s. 6d. per ton; but the small steam coal is weaker. For gas coal the demand is very low, except in one or two instances; and it is said that as low as 5s. 6d. has been accepted for good gas coal. The great contracts for The Gaslight and Coke Company are believed to have been renewed on terms which do not show much change from those they will replace. House coal is extremely dull just now. Coke is steady; and good gas coke is in demand.

OPENING OF WATER-WORKS AT HOWDEN.—On the 25th ult. the water-works at Howden were formally opened by Mrs. Clark, of Knedlington Hall, the wife of the Chairman of the Howland Water Company. The water has been obtained from a deep boring on land purchased of Mr. T. S. Clark. Mr. Clark said the Company had been actuated with the desire to give the people of Howden a supply of pure water, from the want of which they had suffered greatly. Mr. Fairbank, C.E., the Engineer, having explained the details of the scheme, and invited the people of Howden to inspect the works at Asselby, the Rev. W. Hutchinson (Vicar of Howden) referred to the fact that some of the sickness in Howden which had been ascribed to the interposition of Providence was really due to bad water. He congratulated them heartily on the completion of the works that day. Amid cheers Mrs. Clark then turned on the water, and declared the Howden Water-Works duly and formally opened.

Legal Intelligence.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

SATURDAY, JUNE 23.

(Before Justices CAVE and WILLS.)

SLATER v. MAYOR AND CORPORATION OF BURNLEY.

This was an appeal from the County Court of Lancashire, held at Burnley, and was a test case, raising a question as to the basis of water-rental for the borough for the quarter ending Dec. 25, 1887, and also as to the general point whether an overpayment of water-rent can be considered a compulsory payment, and therefore not recoverable, simply because the corporation supplying the water have power to cut it off in case of default in payment.

Mr. HENN COLLINS, Q.C., and Mr. SUTTON appeared for the Corporation of Burnley; Mr. PHILBRICK, Q.C., and Mr. D. WARD for the respondent (Mr. Slater).

The proceedings in the first instance were reported in the JOURNAL for May 22 last (p. 922); and the facts were not disputed. The Corporation, who under their Local Acts supply water to the borough, charged £8 15s. 4d. for the water-rent on several houses; such amount being 5 per cent. on the gross rental. The sum if based on the rateable value (which Mr. Slater contended for) would have been £7 3s. 10d., the provisions of the Local Act allowing a charge of 5 per cent. on the annual value. The plaintiff paid on the full amount asked, and then brought an action to recover the difference (£1 11s. 6d.), as being paid under duress. The Corporation have power to cut off the water if the water-rent due is not paid; the County Court Judge held therefore that the payment was not voluntary, and might accordingly be recovered. Judgment was entered for the plaintiff for the amount claimed. It appeared that the Corporation had based the next water-rate on the net rateable, and not on the gross annual value; and the case was therefore important in relation to the right of all the other ratepayers who had paid the rate in question to recover the excess. It was now argued for the Corporation that, as there had been no threat to cut off the water, whatever their powers might be, there had been no compulsion, and the payment by the plaintiff was voluntary and could not be recovered by him. There was also a question, on the construction of the Local Acts, 34 & 35 Vict., cap. 154, and 46 & 47 Vict., cap. 77, as to whether the Water-Works Clauses Act, 1847, was incorporated. The appellants argued that it was; and contended that this was a dispute as to annual value under section 68 of that Act, and ought therefore to have gone before two Justices, and not the County Court Judge.

Judgment was delivered to-day.

Justice CAVE held that the payment was a voluntary one, and therefore was not recoverable; consequently there must be judgment for the Corporation. The ground on which the County Court Judge decided that the payment was not voluntary was simply that the Corporation had the power to cut off the water. There had not even been a threat of so doing, or of any legal proceedings. This was not a sufficient ground; and as it was the only ground, the judgment must be reversed. As to the next point, though not now necessary for the decision of the case, for the benefit of the County Court Judge, he (the learned Judge) would deal with it. On the construction of the Acts, it was clear that the Water-Works Clauses Act, 1847, was not incorporated either by the Burnley Improvement Acts of 1871 or 1883; and therefore the County Court Judge was right in this respect, under the circumstances. There would be judgment for the defendants, but without costs.

Justice WILLS concurred in holding the payment voluntary. As to the second point, the Local Act of 1883, by section 5, provided that that Act should be carried into execution by the Corporation according to the Municipal Corporations Act, 1882, the Public Health Act, 1875, the Local Act of 1871, and "other Acts respectively for the time being in force and affecting the Corporation as a municipal corporation and sanitary authority;" and by section 6 it enacted that certain Acts, so far as they were "applicable and not inconsistent with that part of the Act," should be incorporated. The Water-Works Clauses Act was one of these. This was a specimen of a very slovenly system of drafting Acts of Parliament, which was most unsatisfactory, and a source of perpetual uncertainty. In such a case it was necessary to go backwards and forwards from Private Acts to the Public Acts, and then back again to the Private Acts, and so on. It was enough to say here that section 68 of the Water-Works Clauses Act, 1847, was not applicable to that part of the Local Act of 1883, and was, therefore, not incorporated.

FRIDAY, JUNE 29.

(Before Justice CAVE.)

SOUTHWARK AND VAUXHALL WATER COMPANY v. DICKENSON.

This was an action to recover the sum of £46 14s. for water supplied to premises of which the defendant is the owner.

Mr. M'CALL, who appeared for the plaintiffs, said that on May 30, 1883, the defendant entered into a contract with the Company by which he agreed to pay at the rate of 1s. per 1000 gallons for a "domestic" supply of water; and if this agreement was binding, the action was really undefended. The defendant owned a large block of buildings, and he was anxious to have them supplied by one communication-pipe and cistern; and, with a view of saving £700 or £800, the cost of the fittings for a domestic supply, he made a contract with the Company, specifying in substance, that if they would supply him with water for domestic purposes in a way in which he could not compel them to supply him, he would pay 1s. per 1000 gallons for it. The water was supplied, and now, when asked for payment, the defendant raised the contention that by the Company's Act of Parliament the Company were prohibited from charging more than 6d. per 1000 gallons. The Act really said nothing of the kind.

Mr. MIRAMS contended that the contract was *ultra vires*, and could not be enforced. If the defendant paid according to the rateable value of the premises, the charge would only amount to £26 4s. 6d.; and therefore the Company had for some time been overcharging. The arrangement between the parties was really for the benefit of the Company, as they had one responsible person, instead of 230 poor tenants, to look to for the water-rate. They might, if they thought fit, put an end to the agreement, and supply on the rateable value. Having made a charge beyond the rate allowed by the statute, the Company could not recover it. The defendant, by way of counter-claim, asked for repayment of £104, being the amount of the alleged overcharge.

Justice CAVE: I am of opinion that judgment must be entered for the plaintiffs. The relations between the Company and the public are to be found in sections 53 and 57 of the Act. By section 53, an owner can compel the Company to supply water for domestic purposes at a certain rate, which depends upon the value of the house. By section 57, the Company may insist on the owner having his water by meter; and the owner, if he wants water for other than domestic purposes, may insist upon the Company supplying it, but in that case he can only insist on their supplying it by meter. Now, neither of these proceedings has been adopted in this

case. The owner has not required a supply on the footing of section 53; and the Company did not, at their own instance, require him to have water by meter. The purposes for which the water was supplied were ordinary domestic purposes; and, consequently, the owner could not come under section 57. This particular case, therefore, is one which was not provided for by the Act of Parliament. The Act proceeds to say that the parties shall make agreements on their own terms, if it suits them to depart from those provisions which have been enacted for their mutual protection. If it suits the owner better to have his water for domestic purposes by meter, he cannot compel the Company to supply it to him by meter; but if he says, "I know I cannot make you give it by meter, but I will pay you so much per 1000 gallons if you give me a supply by meter," I see nothing in the Act which could make such a contract *ultra vires*. The express purpose for which the Company is formed is that of supplying water to the public. There are things which, no doubt, limit the charge that can be made if the person requiring a supply of water chooses to adopt the provisions in his favor that are to be found in the Act. If, for instance, he gives the necessary notice provided by section 53, he can have the water at the prices mentioned in that section. If it does not suit him to do this, and he asks to have the supply in some other way which suits him better, I see nothing in the Act of Parliament which says it is *ultra vires*. He does not want the protection—he prefers not to have the protection provided for him by section 53; and this being so, I do not see why, on ordinary principles, he should not be allowed to make his own terms as to the amount he will pay for the water. Section 57 does not apply to the case, for he cannot demand a supply for ordinary domestic purposes under that section. I think there is no defence to the action; and consequently there must be judgment for the plaintiffs on the claim and counterclaim for £46 14s., with costs.

On the application of defendant, his Lordship granted a stay of execution, with a view to an appeal, upon the sum of £70 (in addition to the £46) being brought into Court.

SOUTHWARK POLICE COURT.—MONDAY, JUNE 25.

(Before Mr. SLADE.)

CHARGE OF STEALING WATER.

To-day Arthur Linsey was summoned for stealing a quantity of water belonging to the Southwark and Vauxhall Water Company. The defendant is the occupier of No. 443, Old Kent Road; and in 1886, the defendant not paying the water-rate, the supply was cut off. Although the defendant and his family remained in possession, he did not apply for a fresh supply of water. After a time, this aroused the suspicion of the officers of the Company; and the back premises were visited by an inspector, who, thinking that probably the defendant obtained his water from the supply to No. 441, removed the pipe some distance away. Subsequently a detective, acting on instructions, placed himself in the garden, and late at night on the 7th of June he saw a portion of the fence removed from the defendant's place, and a hand put out which affixed some tubing to the supply. In this way the defendant's water-butt was filled. When this was done, the hand was again put out to get the tube away; and on this the officer seized the hand, which, after a struggle, was found to be the defendant's. The defendant was told that he would be charged with stealing the water; and he said, "I'm done."

Mr. WILKINS, who prosecuted, said the Company knew that this kind of larceny was more frequent than could be supposed, but there was very great difficulty in proving the offence, and the prosecution therefore desired that some term of imprisonment should be inflicted on the defendant, if the case were settled at that Court.

Defendant declined to submit to the Magistrate's jurisdiction; and he was committed to take his trial at the next Surrey Sessions.

DAMAGED SEWERS AT BIRKENHEAD.—A Local Government Board inquiry has lately been held by Mr. S. H. Terry at Birkenhead, with reference to the application of the Corporation of that town for sanction to borrow £6000 for the repair of sewers and gas and water pipes damaged by the Mersey Railway Company. The Company was represented by Mr. Tobin, who contended that the work could be done for very much less; the Company being ultimately responsible for the cost. The result of the inquiry has not transpired.

THE PUBLIC LIGHTING OF BECKENHAM.—As a result of the discussion at Beckenham in regard to the adoption of oil lighting, to which reference has been made in the previous issues of the JOURNAL, the Bromley Gas Company have made a reduction of 2s. per lamp per annum in connection with the lighting of the portion of Beckenham parish in the Bromley district; and though the price, notwithstanding the reduction, is still higher than that charged by the Crystal Palace Gas Company in another part of the parish, the Local Board have accepted the new arrangement.

PLYMOUTH GAS COMPANY.—The annual general meeting of this Company was held last Thursday, under the presidency of Mr. G. Henderson, the Chairman. The Directors in their report stated that after paying the authorized half-yearly dividend, in January last, the balance remaining to the credit of the profit and loss account amounted to £28,970 17s. 11d. At Michaelmas last, the price of gas to private consumers was reduced from 1s. 10d. to 1s. 9d. per 1000 cubic feet, and the public lamps from £2 12s. 7d. to £2 11s. 3d. per light per annum. The Directors recommended that, in accordance with the Act of 1879, a dividend of 12s. 3d. per share on the original shares, and 9s. 9d. per share on the additional shares, free of income-tax, should be declared for the half year ending March 31 last; being at the rate of 12½ per cent. on the original, and 9½ per cent. on the additional shares—the balance to be carried to the next account. The Chairman moved the adoption of the report, and the motion was carried; as were also the customary resolutions with respect to the dividends.

HAYWARDS HEATH WATER SUPPLY.—In a recent issue of the *Mid-Sussex Times* appeared the report of a speech made by Mr. G. W. Bailey at a dinner at Hurstpierpoint, in the course of which, referring to the water supply of the district, and to the delay by the Mid-Sussex Company in commencing work, he said that "if the so-called 'bogus company' [the Haywards Heath and District Water Company] had obtained their Provisional Order, it would have been started by that time." Mr. H. J. Robus, the Chairman of the Mid-Sussex Water Company, has written to the Editor on this matter. He points out that the requirements of the opposition Company were put down at £17,000; and yet one of their own witnesses at the inquiry proved this to be insufficient by £6000. He expressed the belief that had the inquiry lasted one more day, they would have acknowledged that their scheme would require £50,000 to complete, and then be the most extravagant and ill-advised scheme that could possibly have been introduced. He says the Directors of the Mid-Sussex Water Company are anxious to commence operations; and as soon as the Royal Assent is obtained for their Provisional Order, the work will be commenced forthwith, and pushed forward with all the vigour possible. He regrets the delay, and hopes that by this time next year the district will have an abundant supply of pure water.

Miscellaneous News.

GAS-LIQUOR WORKS AND THE ALKALI ACT.

In another part of the JOURNAL to-day, we give an epitome of the twenty-fourth annual report of the Chief Inspector under the Alkali, &c., Works Regulation Act, 1881 (Mr. A. E. Fletcher). As there stated, it embraces the proceedings during the past year of himself and his colleagues, the various District Inspectors—the reports of the latter gentlemen following his own. As gas-works come under inspection, so far as concerns the manufacture of sulphate of ammonia, the portions of the reports dealing with this matter are of interest to our readers, and we therefore reproduce them practically in their entirety. It should be stated that the entire area in England and Ireland under the supervision of the Chief Inspector is divided into seven districts, each having a Sub-Inspector, as follows:—(1) Ireland, Mr. W. S. Curphey, F.I.C., F.C.S.; (2) North of England, Mr. B. E. Smith, F.I.C., F.C.S.; (3) Cheshire, North Wales, and part of Lancashire, Mr. E. G. Ballard, with whom is associated Mr. J. Affleck, M.A., D.Sc., as an additional Sub-Inspector for the Widnes sub-district, comprising Widnes and Runcorn; (4) East Lancashire and Yorkshire, Mr. R. Forbes Carpenter, F.I.C.; (5) South Midland, Mr. E. Jackson, F.C.S.; (6) South-West of England and South Wales, Mr. A. C. Fryer, Ph.D., M.A.; (7) South-East of England, Mr. Brereton Todd. Scotland—which is divided between Dr. Blatherwick and Mr. W. S. Curphey—is the subject of a separate report. The reports of all these gentlemen are, of course, addressed to the Chief Inspector.

In No. 1 district there are 15 sulphate of ammonia works, in which 2130 tons of sulphate were manufactured last year. Operations were much restricted in many of the smaller works. In some cases the scarcity of water led to a decrease in the quantity of liquor produced; and in one instance the liquor was used for direct application to the land in the vicinity—thus entirely stopping the manufacture of the sulphate. The use of oxide of iron purifiers continues to be extended; and in three instances these were introduced during the past year, and are working satisfactorily. A further improvement to be noted in two works is the substitution of continuous stills heated by steam in place of the older form of still in which each charge of liquor is heated and boiled off separately. The newer mode of working lessens considerably the proportion of steam driven off during the distillation, and renders the evolution of the noxious gases more regular and constant; thus facilitating the cooling and subsequent treatment of these gases. The general average acidity of chimney smoke in works of this class, where the escaping gases continue to be burned, was 0.26 grains of sulphuric anhydride per cubic foot. This figure, Mr. Curphey remarks, is very low, but is not, however, a proper measure of the total quantity of sulphurous acid driven into the air from these works. Repeatedly, distinct quantities of ammonia have been observed to pass away from the saturators with the waste gases. This ammonia combining with and neutralizing an equivalent quantity of sulphurous acid prevents this combined sulphurous acid from increasing the acidity of the smoke.

The number of sulphate of ammonia works in No. 2 district is not given; but it is stated that among the 137 separate processes under inspection, 29 relate to sulphate making, and 1 is for the treatment of gas liquor. Particulars are furnished by the Inspector of the various alterations and improvements carried out last year in the works coming within his purview; and in all cases the effect was the reduction of nuisance. In one works, instead of burning the sulphuretted hydrogen, the following plant was erected and connected with the sulphate of ammonia apparatus put up during the latter part of the previous year:—Two condensers packed with coke 14 feet high and 3 feet in diameter, the first of which is supplied with a constant stream of water; and two oxide purifiers 7 ft. by 7 ft. 6 in. by 5 ft. 6 in. The distance beyond this through which gas has to travel in 6-inch pipes is 10.2 feet. The improvement in sulphate of ammonia works mentioned by Mr. Smith in his previous report continued last year, both as regards the condition of the plant and in the method of dealing with the foul gases evolved during the manufacture of the salt. The quantity of sulphate made in the course of the past year at gas-works and at works where the tar and liquor collected from gas-works is employed was 2306 tons, whilst at coke-works 311 tons were made; making a total for the entire district of 2617 tons, which is an increase of 233 tons over 1886. Mr. Smith states that after a lengthened trial, oxide of iron purifiers have undoubtedly proved themselves the most efficient vehicle for the removal of sulphuretted hydrogen from the foul gases evolved from sulphate plant at work. For numerous reasons any attempt to fix an arbitrary limit to the size of purifiers on the lines of the weekly make of sulphate is impossible. In the first place, in no two gas-works (or, indeed, in the same works for any length of time) is the quality of the foul gas constant as regards the percentage of sulphuretted hydrogen; neither are the various oxides employed at different works the same as regards their absorbent or decomposing power—some qualities of oxide becoming much more rapidly spent than others. Then, again, the oxide rapidly loses power after each revivification. The more sulphur it contains, the less room is there for active oxide. He adds: "Putting the above on one side, one great reason I have for not attempting to have the purifiers of any particular design or size is that the majority of plants are built at gas-works long after the works have been erected. They are necessarily, therefore, built to fit the space at disposal—the purifiers having to follow suite. It then becomes a question to the manager as to which is most valuable, space or labour; and the latter, as regards the shifting of small quantities of oxide, counts for little. The usual and most convenient size, irrespective of make per week, is, I find about 30 cubic yards of oxide, arranged so as to allow the gas to pass through a layer of oxide 3 feet thick (bricks say 5 ft. by 5 ft. by 4 ft.). I find that it is always best to have two purifiers, using them alternately; or having one in reserve in case of accidents. They should be protected from rain, but not closely covered; and provided the oxide is kept dry, I find one layer an improvement on two or three, also a saving on the more costly construction on account of increase in number of grids required."

In No. 3 district there are 27 sulphate of ammonia works and 3 gas-liquor works—an increase of 3 of the former works since the previous report. The gas-liquor works gave little or no trouble last year; there being no escapes of sulphuretted hydrogen therefrom. With regard to the sulphate of ammonia works, Mr. Ballard says: "There is a tendency on the part of these works to change from the intermittent to the continuous process of distillation, which is a satisfactory step to be able to report, since the purifiers are less liable to be suddenly overtaxed, and the risk arising from the escape of sulphuretted hydrogen is correspondingly diminished. With a few exceptions, this class of works has been found to be in a fairly satisfactory condition. There is yet some room for improvement by the general adoption of oxide purifiers in place of dealing with the sulphuretted hydrogen by burning it." He gives particulars of the system of distillation adopted in 22 gas-works in his district. In 15 the process is intermittent; in the rest continuous. In six of the works where the intermittent process is carried on, the sulphuretted hydrogen evolved is burnt; in the other cases it is passed through oxide purifiers. In only

one instance where the continuous process is in use is the above-named impurity got rid of by burning. The quantity of coal carbonized last year in the 22 works was 184,065 tons; the amount of sulphate produced, 1830 tons—the total for the entire district being 2592 tons. In the Widnes sub-district, the manufacture of sulphate of ammonia last year did not call for any remark.

With regard to the East Lancashire and Yorkshire district (No. 4), Mr. R. Forbes Carpenter has rather a long story to tell. Seven additional works were registered last year; but, owing to the transference of three old works to No. 5 district, the net increase was only four. Of the new works, two manufacture liquid ammonia, the remainder sulphate of ammonia. About 19,000 tons of the latter commodity were made in the district in 1887. Increase has occurred at most gas-works; but in coal carbonizing works less was produced. As to works manufacturing sulphate, Mr. Carpenter says it is satisfactory to be able to report that none now make use of the combustion method of dealing with the foul gases from the saturator. By "combustion method" is meant simply burning the sulphuretted hydrogen in the previously dried gases to sulphur dioxide, and passing the products direct to the chimney. In seven works the gases after combustion form part of the sulphur supply to the vitriol chambers; three works are using the Claus process of limited combustion for the recovery of sulphur; and the remaining works make use of hydrated oxide of iron purifiers. The first-mentioned method, we are told, gives great satisfaction; but a little more watchfulness is required of the chamber operations at the starting and stopping of the sulphate plant. It is perhaps necessary to observe that this method (and the same remark applies to the Claus process) is only practicable where the supply of sulphuretted hydrogen is rendered as regular as possible by the use of the Coffey still. Greater experience has been gained of the Claus process during the year, through its introduction at two large sulphate-works. At one the proprietor was desirous of commencing operations without the use of the final alkaline wash-tower, but with a final catch oxide purifier, intending to work with a supply of air on the under side of that necessary for perfect re-action, hoping thereby to have no sulphur dioxide, but only sulphuretted hydrogen to deal with. He has found, however, that the presence of a very small quantity of the former impurity is sufficient to render the catch purifier quite ineffective; and, moreover, that the fine sulphur dust carried forward with the gases to the oxide, and washed out with the sulphur dioxide in the alkaline wash-tower, where this precedes the purifier, acts as a serious clog, causing back pressure on the saturators, and necessitates the daily turning over of the oxide. At the other works, where operations with the process only commenced at the close of the year, this defect has been avoided (and at the other remedied), and the plant was found to be quite efficient for its work. The form of kiln or decomposer, however, seems open to criticism; the gases passing through horizontally. The best form seems to be that in which the gases work downwards through the active material (in manner similar to that found so successful in the Deacon process. There is also this great advantage—that on the starting of the process after a long stoppage, if the material is at first sluggish, and will not rapidly heat, it becomes a very easy matter to scatter a little fresh hydrated oxide on the surface of the old, and activity will rapidly ensue. In this process, as in some other analogous ones, success depends on the regularity and constancy of the supply of gases involved in the re-action. It takes a day or two to reach the steady average of most favourable working conditions; and, unfortunately for the process, the week-end break comes to interrupt conditions when perhaps they are most favourable. At another works, 48 tons of sulphur were recovered last year; the average total acidity as sulphur trioxide at the exit of the collecting chambers was 1.90 grains. On two occasions when tested, sulphuretted hydrogen was present in mere traces; one of these being the occasion when the lowest amount (0.35 grain) of sulphur trioxide was found; on only one occasion was the amount of acidity above 4 grains of sulphur trioxide. Mr. Carpenter thinks that experience certainly confirms the statement made in a previous report of sulphur trioxide, that when the process is not working well in the decomposer the escape of both sulphurous acid and sulphuretted hydrogen is high.

Mr. Carpenter further observes: "As regards the working of oxide purifiers and their best size and construction, I have in previous reports made some remarks on the subject. As regards the construction of the purifier, doubtless cast iron is the best material; but brick purifiers can be easily made gas-tight by building them with a 1 inch cavity wall and filling in with melted pitch—grouting the bottom with the same. If revivification *in situ* is practised, the cavity should be separated by a 9-inch, not 4½-inch, thickness from the oxide (in the latter case I have seen the pitch disappear slowly into the ground). But my experience certainly leads me to distrust the efficiency of ordinary brick and cement built purifiers. Two tiers of grids are more efficient per given quantity of oxide than one tier, probably three are more efficient than two. Certainly the gases have a better chance of even distribution, and do not tend so readily to choose one point of less resistance. Large superficies with only one set of grids may be overdone, and become unmanageable; 200 superficial feet is as large as my experience shows to be desirable for use at one time. All purifiers should be open; revivification *in situ* being carried on by reversal of draught through the oxide by means of one three-way valve. It is impossible to give a standard size of purifier for a given quantity of gas liquor. This latter varies greatly in composition, especially in the percentage of ammonia combined with sulphur, because the method of scrubbing varies in different gas-works, as well as the composition of the coal used. Again, the treatment of the gas liquor is the principal factor determining the size of the purifier. If the simple distillation method is pursued, provision has to be made for the evolution and treatment of the whole of the sulphuretted hydrogen in the early stage of the batch, instead of its evolution being equally spread over the time of working, as in the Coffey-still arrangement. In the construction of condensing plant, particular attention should be paid to the point named in the previous year's report—viz., the removal of condensed water from the system at the point where the gases are hottest. Further experiment has confirmed the figures there given, that, where taken off at the cooler end, the water may carry away 5 per cent. of the sulphuretted hydrogen in solution. This, of course, leads strongly to the condemnation of the method (formerly in use, but no longer so, in two works in this district) of cooling the gases by an internal spray of cold water, where the water finds its way subsequently into the sewers. Not only will the volume be much larger, but every gallon will carry away more sulphuretted hydrogen than is carried away under the system first mentioned. The quantity removed in solution, indeed, bears such a considerable proportion to the whole that the method can no longer be classed under the head of 'the best practicable means' of dealing with this noxious gas. If, however, the spray is used in quantity only barely sufficient to condense the whole of the steam present, and the plant is so arranged that the products of condensation flow through the apparatus in a reverse current to that of the hot gases issuing from the saturator—care being observed to take off the water of condensation and that from the spray at the hottest possible point, so that they issue from

the seal at boiling temperature—the objection to the internal use of water in the condensers is minimized. Care must be taken to cool this so-called 'devil water' before it runs into sewers. The peculiar offensive and characteristic odour is due to the presence of pyridine, now in demand in Germany for addition to alcohol used for manufacturing purposes, to prevent any being drunk by the workmen employed; 'methylating' the alcohol having proved quite inefficient for the end. Further cases have been noticed during the year of failure of oxide to revivify, and of oxidation to ferric and ferrous sulphates. This latter phenomenon has shown itself almost exclusively, I believe, in works working on the simple distillation method, to which class, however, the first-named difficulty has not been confined.

Further extracts from the District Inspectors' reports, as well as from the report for Scotland, are reserved till next week.

SERIOUS ALLEGATIONS AS TO THE HALIFAX GAS COAL CONTRACTS.

The following correspondence has, we understand, passed between the Town Clerk of Halifax (Mr. Keighley Walton) and the parties whose names are given below, and its publication was last Friday authorized by the Gas Committee of the Corporation; the Committee at the same time deciding to recommend the Town Council to take Counsel's opinion on the matter:—

CORRESPONDENCE BETWEEN MR. ELLIS LEVER AND THE TOWN CLERK.

No. 1.—*Mr. Ellis Lever to the Town Clerk.*

May 22, 1888.—I am in receipt of your circular letter dated the 19th inst., informing me that my firm's offer of cannel has been declined by the Gas-Works Committee, which, with the information in my possession, does not surprise me. In the interests of fair and honourable trading, as also of the ratepayers and gas consumers of Halifax, I must ask you for an appointment to enable me to show you how the Committee have been dealt with in the past.

No. 2.—*The Town Clerk to Mr. Ellis Lever.*

May 24, 1888.—Absence from home has prevented an earlier reply to your letter of the 22nd inst. I shall be at the office all next week, and shall be glad to see you any time between ten and five o'clock.

[No further communication has been received from Mr. Lever, neither has he called to see the Town Clerk.]

CORRESPONDENCE BETWEEN THE TOWN CLERK AND THE EDITOR OF THE "PALL MALL GAZETTE."

No. 3.—*The Town Clerk to the Editor.*

June 22, 1888.—Corrupt Practices in the Gas Industry.—I am desired by the Mayor of this borough to draw your attention to an article headed as above in your issue of the 7th inst., and which concludes with the following sentence—viz., "We should hear shortly of disclosures in Halifax, if the parties concerned dare to court inquiry." This article has been copied into a local paper called the *Halifax Times* (a copy of which is sent herewith). The Editor, in commenting on your article, alleges that it is a distinct charge of corruption against the Gas Committee of the Halifax Corporation, or their servants, or both, and they are dared to court inquiry; and very properly ends by stating that neither the Corporation, nor Committee, nor their servants, can afford to remain silent. The allegation is now a matter of the greatest interest in the town, and the general opinion is that the question should be sifted to the bottom. In the first place, I should be glad to know from you whether the complexion put upon your article is a correct one, and if so whether you will assist the Mayor to get to the bottom of the matter. The Corporation court the earliest and the fullest inquiry.

The following appeared in the *Pall Mall Gazette* of June 7:—

CORRUPT PRACTICES IN THE GAS INDUSTRY.—The existence of corruption in the gas industry has been sufficiently demonstrated by the notorious Salford case; but whether it is the laggard way in which that criminal has been treated, or that the evil is too deeply seated, it does not appear that there has been any change for the better. Similar charges have been brought against officials in other towns; but it is left to private individuals to run the risk of actions for criminal libel. The surprising thing is that the ratepayers do not make a stir and demand an inquiry, for certainly a Royal Commission would disclose much grosser corruption than that which is astonishing the public in the case of the Metropolitan Board of Works. We have just received from Mr. George Bray, of Leeds, a pamphlet in which he deals with this evil, and in which he expresses the opinion that "corruption in the gas industry has been largely fostered by the policy pursued by the Council of The Gas Institute." Mr. Bray's fight with that body has been a protracted one, but it is not yet over, as the Council intend to propose, at the annual meeting of the Institute on June 12, to expel him unless he withdraws his charges of malpractices against some of the officials and Mr. George T. Livesey, a Past-President of the Institute, and now Chairman of the South Metropolitan Gas Company. But why does the Institute not insist upon an inquiry into the charges brought against its officials? After the grave disclosures in other quarters, the Institute will not act wisely in taking this method of silencing the accuser. Mr. Hunter was remarkably virtuous when in the witness-box; but when in the dock he is ready to make restitution to the extent, it is understood, of £25,000. We should hear shortly of disclosures in Halifax, if the parties concerned dare to court inquiry.

No. 4.—*The Editor to the Town Clerk.*

June 23, 1888.—I beg to acknowledge the receipt of your letter of the 22nd inst., and to say that I do not propose at present to add anything to the note to which you call my attention. At the same time I must ask you not to draw from this reply the conclusion that I am prepared to become responsible for constructions which other persons or papers may have placed on a note published in the *Pall Mall Gazette*.

No. 5.—*The Town Clerk to the Editor.*

June 27, 1888.—Your letter of the 23rd, in reply to mine of the 22nd inst., was only received here yesterday, and is not satisfactory. The article in your paper, headed "Corrupt Practices in the Gas Industry," first refers to the notorious Salford case, then states that similar charges have been brought against officials in other towns, and ends by stating that we should hear shortly of disclosures in Halifax, if the parties concerned dare to court inquiry. The gas-works in Halifax are the property of the Corporation, and are managed by them and their officials. They therefore can be the only persons meant by the "parties concerned." This is the universal construction put upon your words; and, indeed, it seems to be the only natural construction that can be placed upon them. The Corporation, as stated in my letter, accept the challenge made by you; and not only dare, but do court the fullest inquiry. Your letter seems to me to repudiate the construction put upon the words in the *Pall Mall Gazette* by the public and the press, and to shirk the responsibility attaching to the words used. The Gas Committee will meet on Friday next; and I shall be glad to be informed whether your remarks had reference to any member of the Corporation or their officials; and if they had not, whether you are willing to publish the correspondence in the *Pall Mall Gazette*.

No. 6.—*The Editor to the Town Clerk.*

June 28, 1888.—I beg to acknowledge your letter of the 27th inst., and have only to repeat that I do not at present propose to add anything to

the note in question. I would have no objection to publishing the material portion of the correspondence, if you so desire.

CORRESPONDENCE BETWEEN MR. T. FOX, OF THE SILKESTONE COAL COMPANY, AND THE TOWN CLERK.

No. 7.—*From Mr. T. Fox to the Town Clerk.*

June 2, 1888.—I wish to know why my firm were not asked to send sample trucks of gas coal, as resolved by the Committee. Our tender has been declined without giving the coal a trial; and I am confident the material we offered is worth far more than some of that you have purchased. It is not in the interests of the Corporation that the ratepayers should not have the best value for their money; and the Halifax Corporation will be well advised to inquire into the charge I now make before putting their seal to any contracts. I am informed, on very good authority, that one man has an interest, directly or indirectly, in many contracts with the Gas Department of the Corporation of Halifax; and it would be well that this matter should be sifted to the bottom. Halifax cannot desire a repetition of the Salford scandal.

No. 8.—*Telegram from the Town Clerk to Mr. Fox.*

Council meet to-night to seal contracts. Am I to read your letter to the Council?

No. 9.—*Telegram from Mr. Fox to the Town Clerk.*

Just received your yesterday's wire. See or write to-morrow.

No. 10.—*From Mr. Fox to the Town Clerk.*

June 8, 1888.—I regret that when your telegram arrived on Wednesday I was in London; and as I did not return until late last evening I was not able to reply. I shall be glad to hear whether your Council have confirmed the action of the Gas Committee with reference to the gas contracts, and, on hearing, will communicate further with you.

No. 11.—*The Town Clerk to Mr. Fox.*

June 9, 1888.—In reply to your letter of yesterday's date, I beg to state that the Council on Wednesday last confirmed the minutes and proceedings of the Gas-Works Committee with reference to the gas contracts.

No. 12.—*The Town Clerk to Mr. Fox.*

June 18, 1888.—I have read your letters to the Gas Committee, and am instructed to state that they are prepared to give you every opportunity of proving the charge referred to in yours of the 2nd inst., and quite agree with you that the matter should be sifted to the bottom. I assure you Halifax does not desire a repetition of the Salford scandal. In your last letter, dated the 8th inst. (now ten days ago), you stated that you would communicate further with me; and I am very much surprised that I have not heard from you since. The matter has now become one of public comment; and the Gas Committee are anxious that the charges should be inquired into without any unnecessary delay, and court the fullest and earliest inquiry.

No. 13.—*The Town Clerk to Mr. Fox.*

June 21, 1888.—I am greatly surprised at not receiving any reply to my two last letters. Your earliest attention is specially requested.

No. 14.—*Mr. Fox to the Town Clerk.*

June 23, 1888.—I am in receipt of your two favours of the 18th and 21st inst., and have not been able to reply ere now, as I have been laid up with illness for over a week. Before going into details, please reply to the inquiry contained in the first paragraph of my letter dated the 2nd inst.

No. 15.—*From the Town Clerk to Mr. Fox.*

June 26, 1888.—In reply to yours of the 23rd inst., I beg to state that the Committee did not resolve to ask you to send a sample truck of gas coal, as assumed in your letter of the 2nd inst.

No. 16.—*From Mr. Fox to the Town Clerk.*

June 26, 1888.—Referring to your favours dated the 18th and 21st inst., I may further say that as your Council confirmed the purchase of the Gas Committee, notwithstanding my letter of the 2nd inst., I am not now disposed to furnish you with any specific information unless I receive a complete indemnity against all costs in the event of my charges being proved, which they can be.

No. 17.—*From the Town Clerk to Mr. Fox.*

June 27, 1888.—Before I reply to yours of yesterday's date, will you be good enough to state by return whether the one man referred to in yours of the 2nd inst., as being interested in contracts with the Gas Department, is a member of the Halifax Town Council or a servant of the Corporation, or neither one nor the other. The Gas Committee meet on Friday forenoon; and I shall feel obliged by your answer before then, as I shall lay the correspondence before them on that day.

No. 18.—*From Mr. Fox to the Town Clerk.*

June 28, 1888.—Your letter of the 27th inst. to hand this morning. In reply, I beg to refer you to my letter of the 26th inst., which I now confirm. Beyond this I cannot go; and I think you ought not to ask more than that. On receiving a full indemnity, I am prepared to give you the information you ask.

WEST HARTLEPOOL GAS SUPPLY.—The extension of works which is now in progress at West Hartlepool will, with the winter, largely increase the consumption of gas. A new shipbuilding yard is commencing; and new steel-works will be brought into operation this month. Other extensions going on must very soon largely increase the need for illuminants, as well as foster their use by the larger population being brought together.

FENTON LOCAL BOARD GAS SUPPLY.—At the last meeting of the Fenton Local Board, the Gas Committee reported that during the year ended March 25, 37,781,000 cubic feet of gas were manufactured, which was an increase of 2,611,000 cubic feet as compared with the previous twelve months. The gross receipts were £5866 5s. 7d., an increase of £532 14s. 8d.; and the working expenses £3307 9s. 8d., or an increase of £157 0s. 11d. The net profit was £2558 16s. 1d.; being an increase of £375 13s. 9d.

POYNTON WATER SUPPLY.—During and since the excessive drought of last year, the village of Poynton, in common with a great many other places, has been very short of water, and at present the main supply from springs in the neighbourhood is very nearly exhausted. Lord Vernon, however, has just added a new supply, which will place Poynton in a very much better position than it has ever been in before, and will be a great boon to the inhabitants. The main supply of water is collected from springs near Poynton Towers into a covered reservoir, and is distributed to the village by means of pipes, which in some cases deliver direct to the houses, and in others to stand-pipes placed at various points for the convenience of the inhabitants. Lord Vernon has now sunk a well 84 feet in depth to the new red sandstone, about half a mile from the reservoir, and is arranging to pump the water, which has been analyzed by Dr. Voelcker, of London, and pronounced to be of most excellent quality, and convey it in pipes to the reservoir, and so supplement the present service. The supply of water from the new red sandstone is practically inexhaustible; and therefore the inhabitants of Poynton may be congratulated on being relieved from a very unpleasant situation. The pumping machinery is worked by electricity.

THE PROPOSED PURCHASE OF THE EDINBURGH AND LEITH GAS-WORKS BY THE CORPORATIONS.

AGREEMENT WITH THE EDINBURGH AND LEITH COMPANY.

Last Friday night the negotiations between the Edinburgh and Leith Gas Company and the Edinburgh and Leith Corporations, for the transfer of the Company's undertaking to these Authorities, were brought to a termination by the adoption of an agreement which is regarded as satisfactory by both sides. After a long period, in which the subject was handled in a very apathetic manner, active operations began on the 26th of May last, and were kept up without intermission until their happy conclusion at the end of the past week. A conference was held in the offices of the Company on the 21st ult., between representatives of the two bodies, at which a draft agreement was adopted, embodying the terms upon which the concern was to be taken over, provided that a favourable report as to the Company's position was obtained. It was agreed that the books of the Company should be examined by Mr. Alfred Lass, F.C.A., and that the works and plant should be inspected by Mr. George Livesey; that these two gentlemen should then report jointly whether or not the proposed bargain was fair and reasonable to both parties; and that if it were, the agreement should at once come in force, but that if it were not the agreement should be considered as never having existed—the Corporations being precluded from referring to or founding upon it, as well as from putting either Mr. Lass or Mr. Livesey into the witness-box to be questioned on any information they obtained in the course of their investigations. On these conditions Mr. Lass examined the Company's books in their office on Monday, Tuesday, and Wednesday last week; and Mr. Livesey inspected the works on Thursday. Their report, which was submitted on Thursday night, was to the effect that, in their opinion, the proposed bargain was fair and reasonable to both the contracting parties. On Friday the agreement was signed and sealed; and was then made public. The terms of the purchase are these: The Corporations are to acquire the whole undertaking of the Company, including all property and assets—heritable and moveable, real and personal—of whatever kind, and wheresoever situated; but there are to be excepted from the undertaking all cash in hand, including the sum of £12,500 lent to the Leith Dock Commission, £723 10s. 6d. invested in Edinburgh Water Annuities, and the value of the Company's property in St. Andrew's Square, standing in the books of the Company at £8500—together, £21,723 10s. 6d. The agreement proceeds thus: The Corporations shall pay to the Company as the price of the undertaking (1) the sum of £11,000; (2) annuities, as hereinafter specified, to the amount of £14,000 per annum, equal to 9½ per cent. on the paid-up share capital; and (3) the value of all stocks as may be agreed on or as shall be fixed by arbiters mutually chosen by the Corporations on the one part and the Company on the other part, or by an oversman named by such arbiters. The date of transfer of the undertaking shall be the 1st day of August, 1888; and the money price shall be payable upon that date, and the annuity certificates shall be delivered on that date, or as soon after as may be. Until the said 1st day of August, 1888, the Company shall, as hereinafter mentioned, continue to carry on and manage their undertaking at their own discretion as heretofore, and shall continue to keep the works in good working order, and shall also continue to keep proper accounts. The Company shall have right to all the revenue and profit derived from, or earned by the undertaking to the date of transfer, and shall pay all the revenue debts and liabilities up to such date. The Company shall not be entitled, in so carrying on the undertaking, to enter into any contract extending for a longer period than one year beyond the 1st day of August, 1888, except with the consent in writing of the Corporations, or, after the constitution by Parliament of the intended Commission or Trust, with the consent in writing of the Commissioners or Trustees. The Corporations at the date of the transfer shall take over and pay the mortgage or debenture debts of the Company, amounting in all to the sum of £20,000, and the bank loan debt of the Company, amounting to the sum of £11,700, in so far as the bank loan debt has been applied to capital expenditure. The Company shall not, as from the date of this agreement, expend any sum or sums on capital account without the sanction in writing of the Corporations or of persons appointed by them to dispose of the matter, or, after the constitution by Parliament of the intended Commission or Trust, without the consent in writing of the Commissioners or Trustees; and all such capital expenditure so sanctioned shall be paid by the Corporations in addition to the price. Provided always that the Company, on payment to them of any such sums which may be so expended on capital account, shall be bound to exhibit vouchers or discharges or other evidence for the same. The Corporations shall, subject to the previously obtained sanction as to capital expenditure provided for herein, pay and fulfil the whole debts and liabilities of the Company outstanding at the 1st day of August, 1888, and shall free and relieve the Company therefrom, save and except debts and obligations undertaken or incurred by the Company on revenue account; among such debts and liabilities to be paid and fulfilled by the Corporations to be included pensions and retiring allowances to officers or employees of the Company. Provided always that the same pensions shall be payable only during the respective lives of such officers or employees whose names and the amount of pensions payable to each are communicated in writing by the Company to the Corporation simultaneously with the execution of this agreement, and the whole amount shall not exceed the sum of £1150 at the date when such pensions shall begin to be payable by the Corporations; and provided, further, that it shall be lawful for the Corporations to continue the Manager of the Company in an office similar to that which he now holds, or to appoint him to such other office as may be mutually agreed to, and to appoint the Treasurer and Statutory Clerk of the Company to such offices as the Commissioners may see fit, and that, while the officials respectively hold their offices, the retiring allowances provided for them respectively—amounting in all, conformably to the list, to £965—shall be imputed towards the salaries attached to such offices respectively. Provided always that so long as the Commissioners shall be willing to employ the said Manager, Treasurer, or Statutory Clerk, or any of them, in the manner above provided, and at salaries not less than presently paid to any such officials, the said officials shall not—in the event of their voluntarily leaving the service of the Commissioners for the purpose of entering another service at higher remuneration in all than the salaries they may at the time be respectively receiving—he be entitled to claim such pensions. It is provided that the annuities are to be terminable at 28½ years' purchase after the lapse of 20 years, similarly to those which are to be paid to the Edinburgh Company. Provision is also made for the insertion of clauses in the Corporations' Bill giving effect to the foregoing agreement and the withdrawal of the opposition of the Company to the Bill. The total annual charge against the Corporations will be £18,809, under the agreement, made up as follows:—£14,000 annuities; interest upon £11,000 of cash to be paid to the Company; on £31,700 of mortgage and loan debt; on £20,000 to pay for stocks and stores, assuming that the Corporations will be able to borrow at 3½ per cent.; 1 per cent. of sinking fund on money borrowed, £620; and ½ per cent. upon the capitalized value of the annuities, £1995. The profits earned by the Leith Company for 1887 were £23,300; for 1888, about £27,000.

Following upon the agreement, representatives of the Corporations and of the Gas Company left Edinburgh on Saturday morning for London, to adjust the necessary clauses, so as to be ready for the hearing of the Corporations' Bill before the House of Commons Committee, which was originally fixed for to-morrow, but now stands in the paper for Thursday.

BIRMINGHAM CORPORATION GAS SUPPLY.

REPORT BY THE GAS COMMITTEE.

At the Meeting of the Birmingham Town Council to-day, the Gas Committee will present a report on the progress of the gas undertaking of the Corporation. The following is an abstract of the document:—

The report opens with a reference to the death of Alderman Hart, and to the appointment of Mr. Bishop as his successor in the chairmanship of the Committee. A resolution was passed recording their sorrow at his loss, their sympathy with his family in their bereavement, and their sense of the ability and zeal which he had devoted to the work of the Gas Department. Another personal matter mentioned in the report is the resignation of Mr. J. Haynes of his appointment as Fittings Superintendent, in order to take a similar position in the Liverpool Gas-Fittings Company, Limited; and the selection of Mr. S. R. Barrett to succeed him.

The Committee have informed the gas consumers within the Quinton district that the additional charge of 6d. per 1000 cubic feet for gas supplied to them has been withdrawn, as from the March reading of the meters. The question of the right of the Corporation to continue this charge, which amounts only to a small sum per annum, came under consideration on an application from a resident in the district for a supply of gas. The Town Clerk has advised that a new consumer is entitled, under the Corporation (Consolidation) Act, to a supply at the price charged in the remainder of the area, and is not bound by the agreement made with the consumers when the mains were extended to this district. The Committee have therefore thought it desirable, although the consumption in the district has not reached the quantity at which the agreement provided that the additional charge should terminate, to abolish this distinctive charge.

The Committee have been in correspondence with the Bilston Gas Company as to the supply by that Company of a small portion of the district of Moxley, in the parish of Darlaston, within the Corporation area. They have ascertained that the Company claim that this supply forms a portion of the sale to them by the Birmingham and Staffordshire Gas Company of the supply in Bilston. The Company are, however, unable to produce the agreement under which the sale is claimed to have been made; and a reference to the minutes of the Staffordshire Gas Company, recording the transfer of the Bilston supply, does not support the claim. The Town Clerk having advised that the rights of consumers in the respective areas of supply as defined by the Acts of Parliament cannot be set aside by an agreement, the Committee have informed the Company that they will comply with the requirements of the Corporation Act, which includes the whole of the parish of Darlaston, and will, on the application of the consumers in the area in dispute, supply them with gas.

A memorial has been received from the workmen at the Windsor Street station other than those employed in carbonization, asking for a holiday or holidays similar to those given to the workmen in other departments of the Corporation. The Committee not having complete information as to the practice in other departments, and being reluctant to take any action which might affect those departments, recommend that the memorial be referred to the General Purposes Committee for the purpose of obtaining information as to the practice followed in the other departments as regards Bank Holidays, and of determining the principle to be observed in this respect throughout the Corporation as regards the staff paid by salaries or fixed wages and the men paid by time. A memorial has also been received by the Committee from the workmen employed in carbonization at the various works of the department, asking for "one week's holiday during the summer months of each year, under the same conditions as the employees and officials under the Corporation generally." The Committee recommend that this memorial should also be referred to the General Purposes Committee, on the ground that the Gas Committee cannot deal with the prayer of the memorialists in any direction without affecting the position of other Committees, especially having regard to the recent vote of the Council on the subject.

The Local Authorities of Aston and Balsall Heath having undertaken to light and extinguish lamps in courts without charge, the charge for gas to such lamps in these districts has been reduced to 1s. 1d. per 1000 cubic feet; and an arrangement has been made with these Authorities that they shall undertake the maintenance of such lamps on the usual terms.

The Cherterton Coal and Iron Company, Limited, having failed to continue deliveries of coal to the Adderley Street works under their contract, and having since gone into liquidation, coal has been purchased against the Company under its unexpired contracts, to June 30, 1889, both for the Adderley Street and Windsor Street works; and the amount of the loss on these repurchases has been deducted from the amount owing by the Corporation to the Company.

A contract has been made with Messrs. L. Demuth and Co. for the sale to them of the whole of the tar produced at the works of the Corporation from the 1st inst. The contract is for ten years; but it is terminable, in the event of dispute arising out of the periodical revision of prices for which it provides. Under this contract there will be a considerable increase in the income derived from this residual during the coming year.

Having regard to the scarcity of coke in this district in the present summer months, and to the higher prices offered for it by large buyers under contract, the Committee advanced the prices for all contracts from March 31, and for the retail trade from the 14th of May. The quantity of coke in stock on June 21 was 763 tons, as against 19,124 tons at the corresponding period of last year.

The quantity of gas sold in the quarter ended March 31 last was 1,185,884,900 cubic feet, as against 1,144,240,000 cubic feet in the corresponding quarter of 1887; being an increase of 41,644,900 cubic feet, or nearly 3½ per cent. There were 52 official tests of the illuminating power of the gas made during the quarter ended March 31; the highest being 17·89 candles, the lowest 16·97 candles, and the average 17·35 candles, or 2·35 candles in excess of the parliamentary standard.

VISIT OF THE MANCHESTER CORPORATION TO THE THIRLMERE WORKS.—Last Thursday the members of the Manchester Corporation visited the works now being carried out in the Lake district for the conveyance of the Thirlmere water to Manchester. The present area of the lake is 328½ acres. If it is raised 50 feet, as sanctioned by Parliament, the area will be increased to 793 acres, and the capacity to 8,130,686,693 gallons. It is, however, in contemplation at present to raise the level only 30 feet. In the pipe-laying there are 13½ miles of tunnelling, 37 miles of cut-and-cover, and 44 miles of syphon pipes; the total length from Thirlmere to Prestwich being 95½ miles. The party stayed for the night at Grasmere, and on Friday completed their inspection of the works; returning to Manchester from Kendal.

IMPORTANT SALES OF GAS SHARES.

At the Mart, Tokenhouse Yard, last Friday, Messrs. Thurgood and Martin offered for sale (by order of the Royal College of Surgeons of England), £24,780 of stock, producing dividends at the rates of 10, 7, and 6 per cent. per annum, and new 375 £6 (fully paid) shares, earning a dividend of 7 per cent., in the Crystal Palace District Gas Company. As notified in the JOURNAL last week, under the will of the late Sir Erasmus Wilson, the bulk of his property has passed to the Royal College of Surgeons, including his holding in this Company, of which for many years he was Chairman. The auctioneer (Mr. Howard Martin), in the course of a few preliminary remarks, said he had been told that they had taken a bold step in offering so large a quantity of this stock and shares in the Crystal Palace Gas Company at one time; but he had so much confidence in the Company that he did not think this would make any difference in the price. He then remarked upon the prosperity and prudent management of the concern during past years; and quoted some statistics from the speech of the Chairman at the last half-yearly meeting to show the progress made during the past ten years. The whole of the stock and shares were sold *cum div.* The first lots consisted of £6325 of 10 per cent. ordinary stock, disposed of as follows:—£500 sold at £213 per cent.; £500, at £211; £1000, at £209; £500, at £208; £2500, at £207 10s.; and £1325, at £207. The second parcel comprised £13,585 of 7 per cent. ordinary stock, which fetched the following prices:—£5000, £154 10s. per cent.; £1500, £154; £1000, £151; £500, £148; £1000, £147; £1000, £146 10s.; £3585, £146. The final portion of stock was £4870 of 6 per cent. preference stock; and it sold as follows:—£120 at £126 per cent.; £2750 at £125 10s.; £750 at £125; and £1250 at £123 10s. The 375 £6 new fully paid ordinary shares were all readily disposed of at the uniform price of £8 17s. 6d. per share.

On Tuesday last, Messrs. Baxter, Payne, and Lepper, sold the following gas shares, at the Mart, Tokenhouse Yard:—Fifteen £10 fully paid-up shares in the Crays Gas Company, now paying 10 per cent., at £18 15s. per share; and 20 similar shares, at £18 5s. Forty £10 new ordinary shares in the Croydon Commercial Gas and Coke Company realized £20 15s. each; 70 similar shares, £20 17s. 6d.; and 10, £20 18s. A parcel of 25 £5 shares in the same Company produced £11 each; and £300 of the ordinary "B" stock in the South Metropolitan Gas Company, £720.

BUXTON LOCAL BOARD GAS SUPPLY.

The Gas Engineer of the Buxton Local Board (Mr. George Smedley) has presented to the Gas Committee the following report on the gas production during the year ending the 25th of March last:—The gas produced during the year was 45,303,100 cubic feet, and the quantity distributed 43,283,300 cubic feet, composed as follows:—Consumers' meters, 40,516,700 feet; public lamps, 3,211,100 feet; works, offices, clock, &c., 1,036,000 feet—making the gas not accounted for 2,019,800 cubic feet, or at the rate of 4.458 per cent. The coal carbonized was 2406 tons 18 cwt.; the cannel, 1905 tons 3 cwt.—total, 4312 tons 1 cwt. The average production was 10,506 cubic feet per ton; and the gas distributed, 10,151 cubic feet. The amount booked in the rental is £6454 6s. 4d.; estimated for public lamps, £479 12s. 11d.—total, £6933 19s. 3d. This makes the average return per ton of coal £1 12s. 1½d. The average illuminating power of the gas was 20.33 candles. The cost of gas into the holders, after deducting the value of the residuals, was 10.208d. per 1000 cubic feet. The increase in the quantity of gas produced in the year, as compared with the year 1886-7, was 680,500 cubic feet; in that distributed, 2,029,000 cubic feet; and in the cash, £226 5s. The net cost into the holders was 2.409d. per 1000 feet less than in the year 1886-7. The coal cost £2481 3s.; being £33 8s. 5d. below 1887. There were 106 meters fixed and 90 removed during the year; being an increase of 16. The wages paid amounted to £1343 19s. 11d., which is £51 16s. 9d. less than in the preceding year, and averages 7.188d. per 1000 cubic feet, including production, distribution, repairs, fittings, &c.

THE GAS SUPPLY OF BIRKENSHAW AND GOMERSAL.

RIVAL GAS COMPANIES AND THEIR DISTRICTS.

The following article, dealing with the position of the gas supply of Birkenshaw and Gomersal, recently appeared in the *Bradford Observer*:—For many years the majority of people at Birkenshaw and Gomersal—more especially at the former place—have been dissatisfied with the charges made by the Gomersal Gas Company, and now it is probable that they will agitate for a considerable reduction. Seven or eight years ago a similar agitation took place; the price then charged by the Company being 5s. 5d. per 1000 cubic feet. Many of the consumers in both places cut off the supply, and for one or two seasons the Birkenshaw Local Board declined to light the public lamps. The agitation was successful; the price being reduced to 4s. 2d. per 1000 cubic feet, with 5d. discount to ordinary consumers and an extra 3d. to the large consumers, while to the public lamps the price was fixed at 3s. 6d. net. This being as great a reduction as could be obtained at the time, most of the ratepayers again commenced using the gas; but a considerable number who then cut off their supply never resumed it. The Gomersal Company's Act fixes its area of supply as Gomersal, Birkenshaw, and Hunsworth, with the exception of the hamlet of East Bierley and Toftshaw, which are included in the area of the Drighlington and Gildersome Gas Company. As there are no boundaries of the hamlet of East Bierley defined, it has always been a disputed point between the two Companies as to where the rights of the one end and the rights of the other begin. When the Drighlington Company attempted a short time ago to get an Act to prevent Mr. Matthew Hillas from supplying gas in their district at Dudley Hill, they also sought to obtain a definition on this point; but as Gomersal had established themselves in part of the disputed district, to which they were supplying largely, the latter offered opposition to the Bill, which, as is generally known, was thrown out. To compete with Mr. Hillas, therefore, the Drighlington Company reduced their price to 2s. 6d. per 1000 cubic feet, with the same discounts as before. They state that in consequence of this they cannot make the gas so profitably as they previously did with a much greater consumption. Looking for opportunities for increasing the sale of their gas, one of their officers intimated to the collector of the Birkenshaw Board that the Company would supply the public lamps in the Birkenshaw district at 2s. 6d. per 1000 cubic feet. This offer was reported to the Gas Committee, who instructed the collector to make further inquiries. That officer accordingly went to Drighlington; and there the offer was again verbally given, provided that the Board would take the gas for not less than seven years. It was then stated that the Company had received notice to supply Messrs. Oddy, of the Moorside Mills—a firm in the disputed district—which Gomersal had previously supplied; but this having come to the knowledge of the Gomersal Company, they took such measures as will lead to a continuance of their supply there. A few days later the Gomersal Company issued notices as to increased discounts, under which the household consumer will pay 3s. 6d. per 1000 net, against 3s. 9d. previously; while much greater discounts were offered to the large consumers—the net price to these graduating from 3s. down to 2s. 3d. This notice, however, was not satis-

factory to many of the Birkenshaw consumers; and various preliminaries were agreed upon with regard to getting up an agitation for the benefit of the household consumers, who, it was considered, had been practically ignored in the reduction, while in the case of the large consumers the reductions were tangible. A town's meeting was on the point of being called; but it was decided to delay the matter until the Board had considered the offer of the Drighlington Company. This the Board did; and it was decided to send a deputation to each Company. There the matter rests at present, as no steps will be taken until the result of the efforts of the Board is made known. The feeling on the matter is so strong in Birkenshaw that nothing but a substantial reduction will be accepted; the opinions of the Local Board are quite as strong. Unless such a reduction is made, they will either refuse to light the lamps or take the Drighlington gas, as it is within their power to do. The Drighlington Company state that it would not pay them to take the public lamps alone in Birkenshaw; but they think that if the Gomersal Company do not reduce the price, some person in Birkenshaw will take a similar course to that pursued by Mr. Hillas at Dudley Hill. They say that they would have no option, as the Bradford Corporation pleaded, but to supply to such person as much gas as he wished if he only placed a meter in their district. They would not consent, however, to the Birkenshaw people only using them to "force the hand" of Gomersal, and then dropping them, but state that if they are called upon to supply Birkenshaw, they must have an agreement for seven years, or some such term. Should Birkenshaw decide to take this course, there are two points where the Drighlington mains approach the boundary of the district—viz., at the station and at the Mirfield Institute, Westgate Hill; and the mains to Westgate Hill will be greatly enlarged so as to send the supply into Birkenshaw by way of the Bradford Road. In Gomersal the feeling of the people is not so openly developed as at Birkenshaw, partly because they have no chance of getting a cheaper supply, even indirectly, as at Birkenshaw, and partly because of interest in the Gas Company. But should an agitation be commenced at Birkenshaw, there are many who took part in the previous agitation who will be ready to join with Birkenshaw again. A proposal to light the streets of Gomersal is in abeyance, because the few members of the Board who are not interested in the Gas Company will not consent to pay 3s. 6d. per 1000 cubic feet—the price stipulated by the Company on being approached on the subject at the end of 1887 and again a month ago. The Company consider they are most unjustly abused for what the people consider the "high charges," because there are several things which prevent them from making gas as cheaply as other companies. They possess a very extended area, which they are compelled to supply; but considering how large their district is, the consumption is exceedingly limited. For a number of years the full dividends allowed by their Act have not been paid; and what is required before they can profitably reduce the prices of the gas is a greatly increased consumption. They have collated a list of the charges made by other companies in Yorkshire; and with this as a basis, they state that very few are lower in price than themselves, when the amount of consumption and attendant expense are taken into consideration. The action taken by the Drighlington Company is regarded as one prompted by revenge for the part taken by Gomersal in opposing their recent Bill; and as the failure of Drighlington gave the death-blow to the notion that a gas company had a right to the monopoly of the supply in any prescribed district, the feeling seems to be general among the shareholders of the Gomersal Company that if Drighlington is determined to fight them, they will have no option but to fight also, and reduce their prices, even if by doing so they preclude the possibility of as good dividends as before. The position of affairs between the two Companies is very peculiar; and the Birkenshaw people are fully alive to the advisability of taking advantage of the state of things.

WILTON CORPORATION GAS SUPPLY.

REPAIRS AND EXTENSIONS AT THE GAS-WORKS.

At the last Meeting of the Wilton Town Council—the Mayor (Alderman W. V. Moore) presiding—the subject of the condition of the gas-works of the Corporation was under consideration.

The Town Clerk (Mr. King) stated that at the previous meeting of the Council, it was decided that the consideration of the repairs to the gas-works should be left to a Committee, and that they should report. The Committee met on the 11th of June, and, by request, Mr. Norton H. Humphrys, Assoc. M. Inst. C.E., gas engineer, of Salisbury, was present, and joined them in an inspection of the works. He had submitted a report to the Committee as a result of his examination of the present condition of the undertaking, and the probable cost of carrying out the necessary repairs to put the works in a thoroughly efficient state; and this report was now placed before the Council. In it Mr. Humphrys stated that the whole of the apparatus, with the exception of the holder, was in a very dilapidated state and completely worn out. Having enumerated the kind of works necessary to be carried out, Mr. Humphrys remarked that, the Corporation having acquired an undertaking the plant of which was to a great extent useless and worn out, the future prosperity and stability would be greatly promoted by their action at the present crisis. Boldness and energy would place them in a sound position; but any attempt in the way of patching would only result in annoyance, trouble, and loss. A permanent addition to their existing large capital would be a perpetual hindrance to progress; therefore he strongly recommended that the balance required to make up, with the moneys they had in hand, the sum needed to carry out the work, should be raised by a temporary loan. It would be readily taken up at low interest, and the new plant would admit of such economy in working expenses that it could be easily liquidated, and in a few years' time leave their undertaking in a sound condition, and themselves in a position to supply good gas at about 4s. 2d. per 1000 cubic feet. The work, he urged, should be proceeded with at once, as a great part of it ought to be completed before Michaelmas.

Mr. CARSE said the Council all knew that something would have to be done soon. When the Corporation took over the gas-works they knew they would have to spend about £1500 upon them. He thought the only thing they could do then was to adopt the report, so that Mr. Humphrys could proceed to prepare plans; after which the Council could ask Messrs. E. Cockey and Sons, Limited, of Frome, to tender for carrying out the work. It was necessary that something should be done quickly, or they would be without gas in the coming winter. He moved a resolution in accordance with his suggestion.

Mr. HOLDSWORTH, in seconding the proposition, said he thought the report ought to be adopted, and that Mr. Humphrys should be requested to get out plans as soon as possible. This would not bind the Council in any way to the expenditure of a large sum forthwith; but would enable them to ascertain all they desired to know before doing so.

Mr. YATES moved an amendment that the report be further considered at a special meeting of the Council to be at once convened.

Mr. THRESHER seconded this proposition.

After some conversation, the matter was put to the vote, when the amendment received the support of the mover and seconder only. The original proposition was then carried.

BLACKPOOL CORPORATION GAS SUPPLY.

NEW CONDENSING PLANT.

The new condenser which has been erected at the Blackpool Corporation Gas-Works by Messrs. R. Dempster and Sons, of Elland, from the designs and under the supervision of the Corporation Gas Engineer (Mr. John Chew) was recently started by the Chairman of the Gas Committee (Alderman Hall), in the presence of a full gathering of the Committee—Mr. J. Chew and Mr. W. Chew (the Assistant Manager) being in attendance. The condenser is of the annular type, and consists of two rows of pipes, 20 feet high and 3 feet in diameter, placed ten in each row. They stand on an open stone plinth, having cast-iron moulded bases; the tops being finished with a cast-iron cornice, and surmounted with ornamental balustrade, which, while giving a finished appearance, serves as a guard in high winds. After the condenser had been started, the company adjourned to the Committee-room, where refreshments were served. In the course of a few remarks made by the Chairman on the occasion, he gave a retrospect of the progress of the gas undertaking from the time when the gas was 7s. 6d. per 1000 cubic feet and rates to the extent of 6d. and 7d. in the pound were levied towards making good the deficiency on the works. Reverting to the time since the erection of the old condensers in 1875, when the price was 5s. per 1000 feet, to the present, when it is 2s. 6d. per 1000 feet, he said that during this period of 13 years the amount of profit earned towards the relief of the rates in Blackpool was £43,500—a sum which, had it been employed otherwise, would nearly have extinguished the cost of the gas-works. The question whether some steps should not be taken in future to more quickly pay off the debt instead of extending it, he thought was well worthy their consideration (a sentiment which was re-echoed all round the room). The progress of the works had been remarkable. In 1875 the annual output was 30 million cubic feet; while last year it was 120 millions. The preparation of buildings and appliances for making and distributing this rapidly increasing bulk of gas for consumption was a great strain upon their officials, who he was glad to say had been able to meet it, at the same time keeping the capital account per 1000 cubic feet of gas made as low as any in the country. Speeches by the other members followed, and the proceedings terminated.

THE FLEETWOOD IMPROVEMENT COMMISSIONERS
AND THE GAS-WORKS.

At the last Meeting of the Fleetwood Improvement Commissioners, the Chairman (Mr. T. Seed), in accordance with previous notice, moved—"That the Commissioners consider the purchase of the gas-works." He said he had consulted several members of the Board on this matter, and some of the most influential men in the town, and they approved of it. He thought the time had arrived for the Commissioners to enter into negotiations with the Gas Company. He was on the Committee which last approached the Directors to ask for a reduction in the price of gas; and though they said that nothing would give them greater pleasure than to lower the price, no concession had yet been made. He did not wish to say anything to disturb the good relations existing between the Company and the Commissioners; but he thought the Directors should be waited upon with the object of transferring the gas-works to the local authority. It was essential that the town—in fact all towns—should own both gas and water works; and he would like the Commissioners to agree on this business, and appoint a Committee to enter into negotiations, but not to conclude a bargain. If the works could be secured at a reasonable price, he would advise the town to buy. He moved that a Committee be appointed to deal with the subject. Mr. Loft-house seconded the motion. He said he thought that if the works could be bought at a reasonable price, the town ought to have them. If the Company would not sell the works, let them reduce the price of gas. The consumers ought not to be paying more than 3s. 6d. per 1000 cubic feet for gas in Fleetwood; and it would pay the Company at that price. If they would not meet the Board in a reasonable manner, he would suggest that a company should be formed, and that they burn paraffin oil for twelve months. The Chairman said he had had offers from two electric lighting companies to furnish the town with the electric light. He thought, however, that the purchase question should be fully discussed before they considered electricity. Mr. Foster, in answer to a member, said the Board did not make the Company any definite offer before, but £25,000 was mentioned. The Company intimated that they could not think of accepting anything less than £35,000. Mr. Marginson thought they should approach the Company in a friendly manner, and point out the advantages that would accrue to the inhabitants of the town by the purchase. The Chairman believed the Board would be supported by the ratepayers. If the Company would not negotiate with them in a reasonable manner, it would be necessary to call a meeting of ratepayers on the subject. A Committee was then appointed to wait upon the Directors of the Company.

HUELVA GAS COMPANY, LIMITED.

The Directors of the Huelva Gas Company, Limited, the stock of which is chiefly owned in Glasgow, have issued the balance-sheet and statement of accounts for the year ended March 31 last. In the course of their report they state that they are gratified to find a continuance of the steady progress which has hitherto characterized the history of the Company. The number of meters on hire, the lights employed, and the consumption of gas have all increased, yielding results which have correspondingly augmented the revenue of the Company. Coke was in steady demand during the year, and a ready sale was found for a large proportion of the production. The demand is being encouraged, and seems likely to increase. Tar was not so freely sold as formerly, owing to the competition from other towns (even from Gibraltar, where the Gas Company are glad to get rid of it), and was offered at much lower prices than were being secured by the Huelva Company. To meet this, the Directors authorized the reduction of the price to a point that would meet any competition, and this had the desired effect. Regarding the condition of the works, &c., the Directors remark that the whole of the plant, pipes, services, &c., have been maintained in good order, and that all renewals have been effected from revenue. The property account stands at £22,120; being £3565 more than at March 31, 1887. This addition is accounted for by the payments to date for the new gasholder, smithy, and meter-shop mentioned in the report for the previous year, and for the usual extensions consequent on an increasing business. The contract for the new holder was entrusted to Messrs. Laidlaw, Sons, and Caine, Limited, of Glasgow, who have carried out the work under the superintendence of Mr. W. R. Copland, C.E., also of Glasgow, and Mr. Adam, the Manager of the Company in Huelva. The holder is now completed and at work; and will benefit the operations of the Company, which hitherto have been hampered by the limited storage accommodation. The profit and loss account shows a balance of £2589. Bearing in mind that the capital upon which dividend will fall to be paid in the ensuing year will be £25,000, the Directors have considered it more prudent to recommend the distribution of 6½ per cent. only, being the same as last year, to be paid one-half on Aug. 28, 1888, and the other half on Feb. 28, 1889, free of income-tax, which will absorb £1364; that £350 be added to the reserve fund, bringing it up to £2500; that £200 be written

off meters; and that the balance of £675 be carried forward. The Directors consider that by the writing off against meters in the floating stocks account, they will have dealt with this account in such form as will leave it subject only to very moderate writings off in future. It may be remarked that the Company have now been in existence about eight years. The dividend began at 3 per cent.; then it was 5 per cent. for two years, 6 per cent. for one year, and 6½ per cent. for three years.

HAWICK GAS COMPANY.

The annual report of the Directors of the Hawick Gas Company, together with the statement of accounts and balance-sheet for the year ending the 26th ult., which will be submitted at the meeting of shareholders next Friday, has been issued. In their report the Directors express much regret in having to inform the shareholders that, in consequence of continued ill-health, Mr. John Melrose, who had been Chairman of the Board for the long period of 25 years, had felt himself compelled in the course of the past year to resign the duties of the chairmanship. In place of Mr. Melrose they had appointed as their Chairman Mr. Thomas Laidlaw, one of the oldest Directors. They bear testimony to the zealous and efficient manner in which Mr. Melrose performed his duties. The Directors have recently entered into a very favourable contract for the sale of the residual products at a greatly enhanced figure; and, having in view the increase to be derived for such products during the next few years, and also the large unapplied balance in hand, the Directors feel justified in recommending that the price of gas for the ensuing year be reduced to 3s. 1½d. per 1000 cubic feet, being a reduction of 2½d. per 1000 cubic feet. It may be mentioned, in connection with this matter, that the shareholders receive a fixed dividend of 10 per cent.; and that, according to arrangement with the consumers, the balance, after meeting expenses, goes to reducing the price of gas. Last year a similar reduction was made. The fact of the Company being in a position to recommend such a reduction at the forthcoming annual meeting testifies to the excellent management of the Directors, and to the value of the services of Mr. J. Smith, their Manager. During the past year 4405 tons of coal and shale were purchased, at a cost of £3205 18s. 3d. The payments for lime, wages and salaries, taxes, discounts, interest, &c. amounted to £2070 6s. 2d. The cooking-stoves and meters purchased during the year for re-sale involved an outlay of £96 15s. 1d. On meters and cooking stoves to be hired out, and pipes, &c., there was an expenditure of £205 9s. 6d. As dividends for the year ending Whitsunday, 1887, and for the previous year, the sum of £1583 10s. was paid. Then the paid-up deposits, the loans on promissory notes, and the payment into the bank on deposit receipt, amounted to £800. The total disbursements were £7961 19s. The amount received for gas for the year ending Feb. 1, 1888, with a small amount for arrears, was £6608 3s.; the total receipts during the year were £7961 19s. The share capital of the Company at last year's balance was £15,750. The premium realized on the issue of new stock and the amount of the reserve fund brings this up to £23,375 15s. 6d. The amount borrowed on promissory notes stands at £2524; the deposits received from consumers up to May 26, 1888, stand at £266 15s. On May 26, 1887, the balance was £4486 18s. 4d., out of which the dividend was paid, amounting to £1575; so that carried to this year's account there is a balance of £2911 18s. 4d., to which is added £1194 6s., as profit on the year's trade—making £4106 4s. 5d. The grand total of the liabilities, therefore, is £30,272 14s. 11d. The chief asset is the works and plant, standing now at £26,039 13s. The quantity of gas sold during the year, at 3s. 4d. per 1000 cubic feet, was 39,100,700 cubic feet.

DUNDEE WATER SUPPLY.

A Special Meeting of the Dundee Water Commission was recently held to receive the accounts for the past financial year.

Mr. CRAIG (the Convener of the Finance Committee) moved that the accounts be remitted to the Finance and Works Committee, to bring up estimates for the ensuing year. In doing so, he said it was his honour and privilege to announce that the Commission had the handsome surplus of £1758. He explained how this had been brought about. The estimated assessable rental of the town had increased, which was satisfactory in more ways than one—indicating, as it did, the occupation of more houses, and perhaps also the use of more property for trading purposes. The amount estimated last year from the domestic rate was £18,125; and the actual sum obtained had been £18,243—a surplus of £118. The public rate had yielded more. It was estimated that the income would be £2833 6s. 8d., and it had turned out to be £2884 19s. 4d. But the great increase had arisen on the special rates. These were estimated to produce £20,600; whereas they had actually yielded £22,615. They expected to get from the Police Commission £500 more than they had allowed for public purposes; but notwithstanding the loss of this money, they were in the happy position of having the large surplus already mentioned. The total income was estimated at £41,158 6s. 8d., while the sum actually received amounted to £42,851 11s. 4d. The surplus anticipated was only £28 6s. 8d.; but, as he had already said, it amounted to £1758. This large increase was mostly due to the revenue from special rates, and chiefly from meters. It might partly be attributed to the dry season last year; and so might be looked upon as temporary, and not to be depended upon for the current year. Up to May, 1887, the Commissioners had expended £390,910. During the year ending in May last they spent on the second Lintrathen main £16,081; for town extensions, £1328; for the new Tay Bridge main, £2194; and other matters, £133—making a total expenditure on capital account for the year of £19,737. Adding these figures to the amount previously spent, the total was £411,648. Then there was a balance of £18,446—consisting of the amount due to the revenue account, stores in hand, and cash in Royal Bank; thus making the total capital account £802,919. Turning to the revenue account, the domestic rate yielded £18,243; the public rate, £2888; and the special rate, £22,615. The total revenue, deducting £900 as irrecoverable, was £42,851; while the total expenditure was £41,093—leaving a surplus of £1758. The estimated expenditure was £41,130; while the actual expenditure had been £41,093—being £36 under the estimate. Although they had the surplus he had mentioned, the members need not imagine that there would be a reduction of the domestic rate. There would be a heavy amount of extra interest to meet this year, on account of the construction of the second pipe to Lintrathen. He calculated that £1800 to £2000 more would be needed for payment of interest; and in this case the whole of the surplus would be required. In laying so satisfactory a statement before the Commission, the Committee could not do less than express their thanks for the deep interest taken in the works by their officials, Mr. J. Watson, M. Inst. C.E., and Mr. Smith. They had been very assiduous in their respective departments; and he believed it would be impossible to get a better staff of officials.

Mr. ROBERTSON seconded the motion.

The CHAIRMAN (Baillie Tulloch, who was for several years Convener of the Finance Committee) also bore testimony to the admirable way in which Mr. Watson and Mr. Smith performed their duties.

It was agreed that the statement of accounts should be printed and circulated; and it was remitted to the Finance and Works Committees to bring up estimates at the annual meeting to be held this month.

NOTES FROM SCOTLAND.
(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

I feel inclined to be jubilant to-day over the announcement of an agreement between the Edinburgh and Leith Gas Company and the Edinburgh and Leith Corporations, because the terms agreed upon have fully borne out what I have all along contended for—viz., that the Joint Committee had not sufficiently studied the question or properly approached it; and that they had not offered value for the undertaking which they wished to acquire. All this is past now. The Corporations have adopted the position which was offered them by the Company in December last—the examination of their works by Mr. George Livesey; and they have advanced their offer a good deal beyond the 8 per cent. which they started with as the basis of their offer. Negotiations were carried on almost without intermission, but with great secrecy, during the whole week. In the preceding week, it had transpired, the parties agreed on the terms on which the transfer was to be effected, provided a favourable report on the Company's financial position was obtained from Mr. Lass, and on the condition of its works and plant from Mr. Livesey. The Company had no reason to fear that even a hostile examiner would report unfavourably; and they must have felt that, with the two gentlemen named, they were perfectly safe. A joint report by Mr. Lass and Mr. Livesey was submitted on Thursday night; and, being favourable, the provisional agreement of June 21 was, on the succeeding day, adopted by the parties. There was need for expedition in carrying through the agreement, because the Corporations' Bill must soon be up for hearing before the House of Commons Committee to which it has been referred. It would appear that the negotiations proceeded much more amicably than the public were led by the Joint Committee to expect they would be. Readers of my "Notes" must know that I have constantly endeavoured to counteract utterances, official and otherwise, of the Joint Committee which were calculated to throw odium upon the Company for the attitude they had taken up. The doctrine I have held by was that, in approaching a matter of this important kind, every description of bias should be laid aside; and the only question which should be considered was what the concern was absolutely worth. Unfortunately, the Joint Committee seemed to think they were engaged with an enemy; and instead of taking the sensible course of disarming criticism by themselves acting altogether fairly and above-board, they took to damaging the reputation of the Company in the eyes of the public, hoping, I suppose, to create a hostile public opinion before which the Company would have had to succumb. Fortunately, however, the tactics of the Committee did not succeed. I expect the supporters of the Committee will now come forward with the information that their superior handling of the question has brought about the settlement; and that the terms which they have secured are much lower than the "grasping" and "unreasonable" Company were prepared to accept. Indeed, we have not to wait for an instalment of this policy. On Thursday the *Scotsman*, which has all through this matter blindly followed the Joint Committee, told its readers, in a leading article, that the Company had most wisely departed from their recent stand-off attitude, and had entered into negotiations with the Corporations. It would have been correct to have said that the Joint Committee, seeing the futility of the policy they were pursuing, and fearing to incur further needless expense, had agreed to a proposal which the Company made months ago—that the agreement should be based upon a report by Mr. Livesey. The only variation upon that proposal is that Mr. Lass is associated with Mr. Livesey in the examination, and that the basis of agreement is now made before, and not after the examination. The Company have succeeded upon the matter of terms; and on the question of policy they have undoubtedly also had the best of it, because they have vindicated their position of last December, both by the augmented offer which was made to them in London, and by the adoption now of their proposal for an examination of their works and books. On the side of the Company the affair has been well conducted. There has been no panic; but a careful survey of the question, and a firm determination to secure an adequate price—the Directors knowing that their undertaking was worth more than had been tendered to them. On the other side, I am compelled to say that if the Joint Committee acted all through in the public interest, they did not show much capacity for dealing with the subject. I fancy they were troubled over the fact that the Leith Company at one time appeared to be willing to accept much less than they will now get; but the Committee ought to have remembered that this was before the agreement with the Edinburgh Company. As soon as this agreement was effected, it became the standard by which to fix the price for the Leith Company. The Committee all through ignored this; and they somehow seemed to regard the Edinburgh price as an exceptional one, suited to the exceptional position of that Company. There was a considerable amount of justification for their taking this view; but where they failed, if they really wished to settle the question (which I very much doubt), was in their refusal to accept explanation at the hands of the Leith Company, or to satisfy themselves as to the position of the Company. The hostility of their attitude, and the way in which they have at last fallen in with the proposals of the Company, force me to the conclusion that up till now the Committee did not really desire to have the matter settled.

The agreement between the Joint Committee and the Leith Company, as might have been expected, has largely affected the stock of the latter. Starting on Monday at £62 10s. per £25 share, it rose on Tuesday to £64; on Wednesday to £66; on Friday to £70; and to-day is quoted at £71. The stock of the Edinburgh Company began the week at £77; rose on Wednesday to £77 10s.; and on Friday to £78, at which it now stands.

Perhaps the only other notable incident of the week in connection with the Edinburgh and Leith Gas-Works transfer is the collapse of the ratepayers' opposition in Parliament to the Corporations' Bill. When the Bill was before the Referees in the House of Commons on Wednesday, no one appeared for the 86 ratepayers who had petitioned against the measure; and they were accordingly deprived of *locus standi*. This is a very practical comment on the argument which has been sometimes used, that the opposition of the ratepayers had been the cause of much expenditure in connection with the negotiations; it never was worth the slightest serious consideration.

The Dunfermline Gas Company held their annual meeting on Wednesday. The report stated that an increased sale of gas, equal to 4 per cent., had been experienced, and highly satisfactory returns from the carbonizing and purifying departments were being obtained. The Directors recommended that a dividend at the rate of 9½ per cent. per annum should be declared upon the issued stock of the Company, and a reduction of 2d. per 1000 cubic feet made in the price of the gas for the current year. The revenue from the sale of gas had been £8290. It was also reported that the total assets of the Company amounted to £28,552 11s. 8d., as compared with £28,423 10s. 5d. last year; and the total revenue to £8931—a considerable increase on last year. The dividend for the previous year was at the rate of 9 per cent.; the payment on the present occasion being the highest which has been made.

The Forres Gas Company, at their annual meeting on Monday, declared a dividend at the rate of 7½ per cent. per annum; and decided to reduce

the price of gas from 7s. 1d. to 6s. 8d. per 1000 cubic feet. The Company gives a discount of 10d. per 1000 feet for prompt payment.

Twenty shares of the Stirling Gas Company were recently sold for £7 9s. each.

The accounts of the Edinburgh and District Water Trust for the year ending May 15 last, which have been made up, show that the ordinary revenue from water-rates was £81,666 14s. 4d., and that the receipts from other sources come to £2573 7s. 10d.—in all, £84,240 2s. 2d., or an increase of £2001 11s. The property account shows a balance of £1,137,708 1s. 1½d.; and the sinking fund a balance of £2839 4s. 9d. The total expenditure for the year, including annuities to holders of debentures, amounted to £81,864 16s. 3d., as compared with £77,707 6s. 3d. in the preceding year—being an increase of £4157 10s. The apparently large rise in the outlays is due to increased renewals and repairs of pipes. For example, the repairs up to the end of the financial year in 1887 was £2616 4s. 6d.; whereas during last year these cost £4194 18s. For renewals in 1887, £1322 1s. 11d. was spent, as against £4217 1s. last year. Otherwise, under such heads as salaries, wages, taxes, &c., there has been a decrease in the expenditure. The balance-sheet shows a sum of about £14,000 at the credit of the bank account; and in the account of charge and discharge there appears an accumulated cash balance of £6274 8s. 7½d. Up to the end of the financial year, about £8000 had been expended in connection with the new filter at Alnwickhill.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

At the annual meeting of the Stewarton Gaslight Company, a satisfactory report was submitted by the Directors; and a dividend of 12s. 6d. per share was declared. On Monday evening of this week, a special meeting of the Company was held, at which it was unanimously agreed to erect a new bench of retorts, at a probable expense of £200. When the contemplated alterations and repairs have been completed, the Directors anticipate that they will be able to carry on the works with greater economy, and thereby earn higher profits.

The annual meeting of the Kilmalcolm Gas Company was held on Thursday, when it was agreed to declare a dividend of 6 per cent. It was also resolved to reduce the price of gas to consumers by 5d. per 1000 cubic feet; the price for the ensuing year being 5s. 10d.

At the annual meeting of the Kelso Gas Company, held on Wednesday, it was resolved that the price of gas to ordinary consumers be reduced 5d. per 1000 cubic feet—from 4s. 7d. to 4s. 2d. It may be mentioned that since the year 1881 the price of gas at Kelso has been reduced to the extent of 1s. 3d. per 1000 feet. It was also unanimously agreed that the contract price to the Police Commissioners for supplying the public lamps should be reduced from 23s. 6d. to 22s. per lamp. The usual dividend of 10 per cent. was declared.

At the annual meeting of the Jedburgh Gas Company on Wednesday, it was desired to declare a dividend of 7½ per cent. From the accounts for the past year, it appears that £1668 9s. was received for gas, as against £1677 11s. 7d. in the previous year.

I understand that the price of gas in Galashiels, for the year 1888-9 will be 2s. 11d. per 1000 cubic feet; being a reduction of 3d.

It is worthy of mention that, in connection with the new sewage-works in process of construction for the burgh of Kirkintilloch, an "Otto" gas-engine of 8-horse power nominal is to be erected for driving the pumping machinery. This will involve the laying down of a 3-inch pipe from the gas-works to the sewage-works to supply the engine.

Glasgow Corporation 9 per cent. gas annuities changed hands this week on the Glasgow Stock Exchange at £280 per share.

The Jedburgh Police Commissioners have resolved to apply to the Public Works Loan Commissioners for a loan of £2300 in connection with the additional supply of water that is about to be brought into the town. The works have been commenced, and are now being pushed forward.

A steady tone has ruled in the Glasgow pig-iron market this week; and values have been well maintained at, and slightly above 38s. per ton cash for Scotch warrants. The quantity of pig iron in store is practically a million tons; and it remains to be seen how much more the market can carry without breaking down. Still there does not seem to be any prospect of the deliveries into the warrant stores undergoing any check. There have been a number of transactions in hematite warrants this week; the top price reached being 42s. 2d. per ton cash. Cleveland warrants have not been much in demand. Some more activity is likely to show itself alike in the local foundries and in the malleable iron and steel works.

The coal trade has been somewhat active during the past week; and prices are decidedly hardening in tone. Steam coal is going away freely; and most of the collieries are now working full time. The prices generally rule from 7s. 3d. to 7s. 9d. per ton f.o.b. at Clyde ports. Splint coal for gas-making purposes is selling at easier rates; and it is publicly stated that in first-class qualities of cannel coal, contracts have been concluded at a reduction of as much as 4s. per ton in some cases.

NANTWICH WATER SUPPLY.—The Nantwich Local Board have finally decided to adopt the smaller of the two schemes which have been under consideration for a long time, for providing an extra reservoir at Baddiley. The new works will be equal to the storage of 22 million gallons. The land required (15 acres), is owned by Mr. G. E. Wicksted; and as he refuses to put a price upon it, the Board will have to take action to acquire it compulsorily. Meanwhile, the work of laying new service-pipes in the town is being proceeded with, and the river has been temporarily diverted to allow the workmen to lay a main across the bed.

THE SMOKE ABATEMENT MOVEMENT IN THE MANCHESTER DISTRICT.—At a recent meeting of the Committee of the Manchester and Salford Noxious Vapours Abatement Association, the question of popularizing the use of gas-stoves, cookers, &c., as a means of diminishing the smoke nuisance, was again under consideration; and it was resolved to once more approach the Gas Committee of the Manchester Corporation on the subject. It was determined to take steps for making known the extent of the action taken by the Nuisance Committee against offenders under the smoke bye-laws, and the penalties imposed by the Magistrates. The Secretary was authorized to arrange for excursions by firemen and others to see certain systems of smokeless firing of steam-boilers; and it was determined to publish a tract on smoke prevention, explaining various efficient methods. In connection with these proceedings, Mr. T. Fletcher, of Warrington, wrote to a local paper to call attention to the fact that his works, where about 200 hands are employed, are carried on absolutely without smoke, and have been so since their first erection. He added: "Our smokeless chimneys include steam-boiler, smithy fires, and japanning-stove. Further than this, my own house is, and has been for many years, practically smokeless, the whole work (including fires, baths, laundry work, cooking, and conservatory heating) being carried on without other smoke, dust, or dirt. The absence of smoke has not been studied—it is simply an incidental result of a system which we carry out, because it is convenient, and is economical in labour and in cost."

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, June 30, 1888.

Sulphate of Ammonia.—The market has been very quiet; but, notwithstanding the general remark that business is at a standstill, all parcels which have been placed on the market have readily found buyers. It may therefore be assumed that any weakness apparent is but on the surface; and the insignificant decline, in spite of all attempts to bring about a rapid fall, is assuredly an indication of the underlying strength of the position. It is, in fact, clear that any existing weakness has been created entirely by reports from this side, which have been wilfully perverted, and are simply intended to keep foreign consumers off the market. Consequently, as the dealers were the only buyers, such producers as wished to sell their make before the end of the half year, had to accept the lower prices offered; and thus in some instances £11 10s. has been accepted. A fair portion of the near production being already sold, while the repairs usually undertaken at many works in July will still further curtail the available parcels, it seems most unlikely that prices will suffer further in July. Unless symptoms are very deceptive, an upward movement would be more probable.

P.S.—Special attention has been called in a French agricultural journal to the small shipments from Hull during the week ending June 16—viz., 20 tons. Such reports being apt to be very misleading, it seems a pity that it was not at the same time pointed out that the sulphate which used to be shipped from or *via* Hull, is now being largely diverted to other ports; and a few simple facts discountenance the idea, which the above statement conveyed, that the export demand has ceased. Some 700 tons arrived in Hamburg during the corresponding week; and the total shipments during the first fortnight in June exceed those of the corresponding period in 1887.

LONDON, June 30.

Tar Products.—The higher products are uniformly weak and unsaleable. There is little demand for naphthalene, but at prices which scarcely pay distillers to extract. Carbolic acid is in better request, but is still dull for the time of the year. The price of anthracene is maintained; but very little business is doing in this article—the make of all the tar products being for the moment at a minimum. Prices: Tar, 15s. to 20s. per ton, according to position. Benzol, 90 per cent., 2s. 5d. per gallon; 50 per cent., 2s. per gallon. Toluol, 1s. 4d. per gallon. Solvent naphtha, 1s. 1½d. per gallon. Crude naphtha, 30 per cent., 11d. per gallon. Light oil, 3½d. per gallon. Creosote, 1½d. per gallon. Pitch, 12s. to 15s. per ton. Carbolic acid (crude), 3s. 5d. per gallon. Cresylic acid, 10d. per gallon. Tar salts, 15s. per ton. Anthracene, 30 per cent., “A” quality, 1s. 4d. per unit; “B” quality, 1s.

Ammonia Products.—The manure season having closed, shipments of sulphate have been small; and what buying there is is chiefly of a speculative character. A good deal of comment is being made on the mode of selling sulphate. An effort to sell on a percentage instead of a given strength is being attempted; and again the different conditions of selling that obtain in London and in the country respectively have long been a standing anomaly. This would be avoided if sales were made on percentage of ammonia. Prices are as follows:—Sulphate of ammonia, £11 10s. to £11 15s. per ton, less discount. Gas liquor (5° Twaddell), 8s. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 2d. per lb. Carbonate of ammonia, 3½d. per lb. Muriate of ammonia, brown, £18 per ton; white, £23. Sal ammoniac, £30 per ton.

[From the *Chemical Trade Journal*, June 30.]

Sulphate of Ammonia.—The absence of orders in this market makes it difficult to fix the value. In fact, there are no buyers at the present moment; and every parcel that is offered tends to bring down the price to a level that will make speculation profitable. A fair quantity is being shipped, however; but this is not the result of any very recent business. Beekton price is £11 15s.; but we hear that some quantity has been sold on Beekton terms at £11 7s. 6d. At Hull business has been done at £11 12s. 6d. to £11 11s. 3d.; while Liverpool and Leith quotations stand at £11 10s. Buyers are holding off, in the expectation of seeing lower prices; but stocks are still low, and there is no inordinate quantity pressing on the market.

Tar Products.—Slackness and absence of demand for benzol continues to reign supreme in this market, with the result that 50/90's has fallen to 2s. 3d. d/d London, which is equal to 2s. 1½d. f.o.b. Goole or Hull. Solvent naphtha is a trifle weaker, though there is a fair demand for this article. A rumour is current that the Government has bought up the picric explosive patents; and, on this account, some makers are holding to carbolic acid rather than offering it for forward. For July-December, 3s. 4d. has been offered for 60's; but we believe not accepted. Anthracene remains *in statu quo*; there being no buyers at present. Pitch remains, as stated in our last prices current, at 13s. Garston; and it is very doubtful whether the higher prices said to have been obtained recently were *bona fide*.

It is reported that a Company has been formed, with a nominal capital of 12 million dollars, for the purpose of introducing natural gas into Chicago.

The Brynbo Water Company, at a meeting held last Friday week, decided to raise further capital to the extent of £10,000, in ordinary shares of £10 each.

The last of the vacation visits of the students of the Institution of Civil Engineers for the present session took place last Thursday, when the party left Liverpool Street Station at 1.35 p.m. for the East London Water-Works at Lea Bridge.

The Automatic Electrical Corporation, Limited, has recently been registered, with a capital of £75,000, in £20 shares, with the object of supplying electricity for lighting and other purposes within the United Kingdom and elsewhere.

The Godalming Gas Company, having decided to manufacture sulphate of ammonia, have placed an order for the necessary plant with Messrs. R. and J. Dempster, of Manchester; and the work will be carried out under the direction of Mr. S. Bark, the Company's Engineer.

The Engineer of the Llanelly Gas Company (Mr. A. G. Browning), having considered the various systems of regenerative firing, has decided on adopting that of Messrs. R. and J. Dempster, of Manchester, who will at once proceed with the erection of four complete benches.

We are informed that the sulphate of ammonia plant ordered from Mr. Henry Simon, of Manchester, by the London and North-Western Railway Company for their works at Crewe (to which reference has been made in the JOURNAL) has now been successfully started. We also learn that Mr. Simon has been favoured with an order by Messrs. Mitsui and Co., of London, to supply them with one of his 10-ton plants for the continuous manufacture of sulphate of ammonia. It is to contain all Mr. Simon's most recent improvements, and is for erection at Yokohama.

REDUCTIONS IN PRICE.—The Directors of the *Burnham Gas Company* have given notice that, on and after the 24th ult., the price of gas will be reduced from 5s. to 4s. 7d. per 1000 cubic feet.—Messrs. Wilson Bros., of Cornholme, have entered into an arrangement with the Directors of the Todmorden Gas Company, whereby the Burnley Valley district will be supplied with gas by the Cornholme Gas Company under the supervision of the Manager of the former Company. The price will be 4s. 6d. per 1000 cubic feet on and after the 1st inst.; and it will be subject to a discount of 9d. per 1000 feet to consumers of 25,000 feet and upwards, and 6d. per 1000 feet to those burning less than this quantity, if the accounts are paid within 28 days.

DAMAGES FOR ANNOYANCE CAUSED BY ELECTRIC LIGHTING MACHINERY.—The Chancery Court of the County Palatine of Lancaster, sitting in Liverpool, was recently occupied for several days in hearing a motion for an injunction to restrain the Liverpool Electric Supply Company, Limited, from working the engines and machines at their supply station in Tithe-barn Street in such a manner as to annoy the plaintiff, a Mr. Pierce, an emigration agent and hotel proprietor, carrying on business at 13, Highfield Street, adjacent to the Company's premises. The plaintiff contended that the noise and vibration arising from the working of the machinery depreciated the value of his hotel premises, and seriously injured his own health and that of his wife and sister. For the defence it was contended that there was no nuisance. In the result, the Vice-Chancellor (Sir H. F. Bristowe) assessed the damages at £100, and directed the Company to pay the costs.

EXTRAORDINARY SEIZURE AT THE CLITHEROE WATER-WORKS.—Last Thursday week a firm of local tradesmen (Messrs. Bailey Bros.) went to the reservoir now being made for supplying Clitheroe with water, and seized the carts, horses, wheel-barrow, &c., for debt. Only a few barrows and spades were left; so that there will be a temporary stoppage of the works until fresh plant has been procured. The next day a meeting of the New Reservoir Committee of the Town Council was held relative to the seizure. On the advice of the Town Clerk, it was decided to make an effort to recover the property. The members of the Committee, accompanied by a number of policemen and Corporation workmen, accordingly went to Messrs. Bailey's premises, and took possession of the horses, carts, and implements seized on the previous night. Mr. J. H. Bailey, who was present, protested against the proceeding; but no forcible resistance was made. It is stated that the Corporation are entitled to the plant on the terms of an agreement entered into with the contractor.

CLAIM FOR DAMAGES THROUGH THE BURSTING OF A WATER-MAIN.—At the Waltham Abbey County Court, on the 20th ult., Mr. Warren, of No. 1, Forest Road, Loughton, sued the East London Water-Works Company for £39 2s., compensation for damage alleged to have been sustained by him owing to the bursting of one of their mains on Feb. 15 last. When the accident occurred, the water poured down the chimney and through the house, damaging the furniture and causing great inconvenience. For the defence it was contended that the Company were not liable, inasmuch as their pipes were well made, and were carefully tested before being laid. The Company's Engineer (Mr. W. B. Bryan, M. Inst. C.E.) explained the mode of testing the pipes; and stated that, notwithstanding all precautions, they occasionally burst, especially in the winter months. The pipe that gave way in the present case had been in use about 15 years; and when removed from the ground, the iron was discovered to have undergone a chemical change, which had rendered it soft. In his opinion, this change could not be avoided by the exercise of any reasonable care or skill. For the plaintiff it was argued that the pipes were under the defendants' control, and that therefore they were responsible for them. His Honour (Judge Abdy) thought the plaintiff had failed to adduce evidence of neglect; and consequently he gave judgment for the defendants, with costs.

THE CHARGES FOR WATER AT OLDHAM.—A deputation, representing some of the large consumers, waited on the Oldham Corporation Water Committee last Wednesday to ask for a reduction in the charges made to them. It was stated that the price came in some cases to as much as 1s. per 1000 gallons for all the water used in certain mills and factories; and a suggestion was made that, instead of taking the quarterly consumption, the Committee should charge for the yearly total, which would entitle some of those concerned to come on the very lowest scale. Some figures produced to the Committee showed that at Birmingham the charge up to 10,000 gallons was 1s. 6d. per 1000, and for 1,000,000 gallons it was only 6d. per 1000; whereas at Oldham up to 2,000,000 gallons it was practically 7d. per 1000. At Bradford, up to 400,000 gallons it was 9d.; beyond, 6½d. At Halifax, up to 70,000 gallons, 8d.; beyond, 6d. At Huddersfield, 7d. per 1000 all round. At Leeds, 6d. all round. The charge at Oldham was formerly as low as 3d. per 1000 gallons, when the consumers took a certain quantity; but the prices had gone up, and old mills were consequently unable to compete with the new ones. Mr. Waddington said it was unfair in some cases to make comparisons. At Leeds the cost of the water-works was nothing compared to Oldham. They drew their supply from a river; and it had never been known to fail. The Chairman (Alderman Buckley) said that when they made comparisons they had to take all the circumstances into consideration. When they charged 3d. per 1000 gallons they were losing a big amount annually; and they had a large sum handed over to them from the Gas Committee. The Committee adjourned the consideration of the subject.

THE BELFAST WATER COMMISSIONERS AND THEIR STONYFORD RESERVOIR.—In the Chancery Division of the High Court of Justice of Ireland, the Belfast Water Commissioners were recently plaintiffs in an action brought against the contractors for their Stonyford reservoir (Messrs. Anwell, Dyson, and Wainwright). The Commissioners were authorized by an Act of 1884 to construct a reservoir and other water-works at Stonyford, County Antrim, for increasing the supply of water in Belfast. The works were to be completed within six years. In May, 1886, the defendants put in a tender to execute the work for £39,905; and, the tender having been accepted, a contract was entered into by which the defendants agreed that the work should be completed in two years. There were other provisions by which the plaintiffs would have power to terminate the contract if the defendants neglected to carry out the works in accordance with the specification and to the satisfaction of the plaintiff's Engineer, or if, by delay or stoppage of the works, the Commissioners believed they would not be completed within the specified time; and that if the contractors failed to make good such a breach within six days after notice, the Commissioners might take over the works and plant. In June last year an interlocutory injunction was obtained to prevent the contractors from further interfering with the work, on the ground that it was not being done according to the terms of the contract; the plaintiffs undertaking to indemnify the defendants for any loss they might sustain if on the hearing of the action judgment was given in their favour. The trial was commenced on Wednesday; and it was expected to last three weeks. An arrangement was, however, come to, by which the Commissioners have agreed to pay the defendants £6000 in full discharge of their claim; the Commissioners to retain possession of the plant and material at the works, and all further proceedings to be stayed.

DEANHEAD WATER COMPANY.—This Company, which was registered on the 18th ult., with a capital of £10,000, in £10 shares, has been formed for the purpose of supplying water within the township of Stainland, Barkisland, and Elland-cum-Greetland, in the parish of Halifax.

IMPROVED VALUE OF TAR AND AMMONIACAL LIQUOR.—At the last meeting of the Darlington Town Council, Mr. E. D. Walker submitted a motion for the adoption of the minutes of the Gas Committee, containing a recommendation that offers which had been received for the tar and ammoniacal liquor produced at the gas-works—viz., £1,000 per annum for the latter and 15s. per ton for the former, for three years from Jan. 1, 1889—be accepted. In reply to questions, Mr. Walker said this price was about £450 better than the average receipts for the liquor during the past five years; and therefore the Committee deemed it inexpedient to erect plant of their own for dealing with this residual.

THE MANAGEMENT OF THE WARRINGTON GAS-WORKS.—A deputation waited on the Mayor of Warrington last Wednesday to ask him to call a public meeting "to take into consideration the recommendations of the Corporation Gas Committee with reference to the future management of the gas-works." The object of the deputation was to hold a meeting prior to the Council meeting to-day (Tuesday), in order that they might, in particular, get an expression of opinion adverse to the retention of Mr. J. Paterson's services as Consulting Engineer. The Mayor declined to call a meeting to consider the recommendations of a Committee which had not been submitted to the Council, but promised to lay before that body any resolution or petition which might be forwarded to him. It was stated by the deputation that the proposal of the Committee has excited a large amount of feeling in the town.

THE WATER QUESTION AT YEADON.—At the meeting of the Yeadon Local Board last Wednesday week, the Clerk (Mr. C. J. Newstead) submitted a draft letter he had prepared in reply to the communication read at the previous meeting of the Board from the Solicitors of the Yeadon Water Works Company. The letter was approved by a majority of the members present; and it was decided that a copy should be forwarded to the Local Government Board. Mr. Newstead, in his reply, dealt with each part of the letter which the Company's Solicitors had sent to the Local Government Board. He said the principal point raised was as to the validity of the award. The other points appeared to the Local Board to be immaterial, and more in the nature of an appeal *ad misericordiam* than real objections. He pointed out that the letter did not venture to assert that the award was invalid, but merely that the Company believed it to be so. After detailing the circumstances attending the arbitration proceedings, the Clerk said the Local Board contended that the award was valid and binding upon the parties. They submitted that it was good on the face of it, and that it must be taken to be binding until it was set aside by a Court of competent jurisdiction.

THE TRANSFER OF THE WINDSOR AND ETON WATER-WORKS TO THE CORPORATION.—On Saturday, the 23rd ult., the Windsor and Eton Water-Works were formally handed over to the Corporation of Windsor. The Directors of the Company had invited the Mayor (Mr. G. H. Peters), the Town Clerk (Mr. G. H. Long), and the members of the Water-Works Audit Committee to meet them at the works in Tangier Lane, Eton, where the ceremony took place. The works having been surveyed, the Mayor and members of the Committee were invited to partake of refreshments in the Board-room. Mr. K. Buckland, as Chairman of the Directors, proposed "The Health of the Corporation of Windsor;" and in the course of a few remarks, expressed a hope that the purchase of the works would prove a satisfactory transaction to the Corporation. The Mayor responded; observing that whilst differences of opinion on matters of this sort would always occur, the Corporation, in acquiring the Windsor and Eton Water-Works, had done what they thought would be for the interest and benefit of the town. Other speeches followed, and the proceedings closed. The works are now under the direction of the Audit Committee; Mr. Chapman, the Company's Manager and Collector, having been appointed to the same position at the works under the Corporation which he held under the Company. Last Wednesday evening, in commemoration of the Corporation having taken possession of the water-works, the Mayor entertained the members of the Corporation at dinner at the White Hart Hotel.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.
(For Stock Market Intelligence, see ante, p. 19.)

Issue.	Share	When ex Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.					£ s. d.
GAS COMPANIES.								
590,000	10	12 Apr.	10½	Alliance & Dublin 10 p. c.	10	183-192	..	5 7 8
100,000	10	"	7½	Do. 7 p. c.	10	183-184	..	5 7 2
900,000	100	8 Jan.	5	Australian (Sydney) 5½ p. c. Deb.	100	111-118	..	4 8 6
100,000	20	30 May	10	Bahia, Limited	20	22-24	+1	8 6 8
200,000	5	11 May	7½	Bombay, Limited	5	7-7½	..	5 0 0
40,000	5	"	7½	Do. New	4	5-5½	..	5 9 1
280,000	Stock.	15 Feb.	11½	Brentford Consolidated	100	228-228	..	4 18 8
110,000	"	"	8½	Do. New	100	162-167	..	4 18 9
220,000	20	14 Mar.	10½	Brighton & Hove, Original	20	43-45	..	4 13 4
920,000	20	12 Apr.	11½	British	20	44-46	..	4 17 10
50,000	10	14 Mar.	11	Bromley, Ordinary 10 p. c.	10	20-22	..	5 0 0
39,000	10	"	8	Do.	10	183-184	..	5 10 4
328,750	10	30 May	8	Buenos Ayres (New) Limited	10	183-184	..	5 10 4
200,000	100	8 Jan.	6	Do. 6 p. c. Deb.	100	108-111	..	5 8 1
150,000	20	29 Feb.	7	Cagliari, Limited	20	25-27	..	5 8 8
550,000	Stock.	12 Apr.	13½	Commercial, Old Stock	100	264-269	-8½	5 0 4
180,000	"	"	10½	Do. New do.	100	205-210	..	5 0 1
121,234	"	28 June	4½	Do. 4½ p. c. Deb. do.	100	120-125*	..	3 12 0
557,320	20	14 June	12	Continental Union, Limited	20	434-443	+½	5 7 10
242,680	20	"	12	Do. New '69 & '72	14	23-30	..	5 12 0
200,000	20	"	9	Do. 7 p. c. Pref.	20	35-37	..	4 17 8
75,000	Stock.	28 Mar.	10	Crystal Palace District	100	200-210	..	4 15 8
234,060	10	27 Jan.	12	European, Limited	10	244-254	..	4 14 1
120,030	10	"	12	Do. New.	7½	17-18½	..	4 17 7
354,060	10	"	12	Do. do.	5	114-124	..	4 16 0
5,468,350	Stock.	15 Feb.	12½	Gaslight & Coke, A, Ordinary	100	250-254	+2½	4 16 5
100,000	"	"	4	Do. B, 4 p. c. max.	100	97-102	..	3 18 5
665,000	"	"	10	Do. C, D, & E, 10 p. c. Pf.	100	259-264	..	3 15 9
30,000	"	"	5	Do. F, 5 p. c. Pf.	100	125-130	..	3 16 11
60,000	"	"	7½	Do. G, 7½ p. c. do.	100	188-188	..	3 19 9
1,300,000	"	"	7	Do. H, 7 p. c. max.	100	168-173	..	4 0 11
463,000	"	"	10	Do. J, 10 p. c. Pf.	100	258-263	..	3 16 1
1,061,150	"	14 June	4	Do. 4 p. c. Deb. Stk.	100	116-119	..	3 7 3
124,850	"	"	4½	Do. 4½ p. c. do.	100	125-130	..	3 9 8
650,000	"	"	6	Do. 6 p. c. do.	100	172-177	..	3 7 10
3,600,000	Stock.	11 May.	10	Imperial Continental	100	201-205	..	4 17 7
75,000	5	14 June	6	Malta & Mediterranean, Ltd	5	42-54	..	5 14 3
560,000	100	3 Apr.	5	Met. of Melbourne, 5 p. c. Deb.	100	114-116	..	4 6 2
541,920	20	14 June	6	Monte Video, Limited	20	194-204	..	5 17 1
150,000	5	30 May	10	Oriental, Limited	5	24-24½	..	5 2 7
60,000	5	28 Mar.	7	Ottoman, Limited	5	6-7	..	5 0 0
People's Gas of Chicago—								
420,000	100	2 May	6	1st Mtg. Bds.	100	104-109	..	5 10 1
500,000	100	1 June	6	2nd Do.	100	92-97	..	6 8 9
100,000	10	26 Apr.	10	San Paulo, Limited	10	154-164	..	6 1 2
500,000	Stock.	29 Feb.	15½	South Metropolitan, A Stock	100	315-320	..	4 16 10
1,350,000	"	"	12	Do. B do.	100	240-244	..	4 18 4
141,500	"	"	13	Do. C do.	100	250-255*	..	5 0 0
550,000	"	28 June	5	Do. 5 p. c. Deb. Stk.	100	135-140*	+½	3 11 5
60,000	5	29 Feb.	11	Tottenham & Edm'ton, Orig.	5	11-13	..	4 4 0
WATER COMPANIES.								
717,467	Stock.	28 June	9	Chelsea, Ordinary	100	248-252*	..	3 11 5
1,720,560	Stock.	12 Apr.	7	East London, Ordinary	100	192-197	-1½	3 11 1
700,000	50	14 June	9	Grand Junction	50	120-124	..	3 12 7
708,000	Stock.	29 Feb.	10½	Kent	100	267-272	..	3 10 7
1,048,800	100	28 June	9	Lambeth, 10 p. c. max.	100	250-255*	..	3 17 2
406,200	100	"	7½	Do. 7½ p. c. max.	100	197-203*	+½	3 14 3
200,000	Stock.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	117-120	..	3 6 8
500,000	100	27 Jan.	12½	New River, New Shares	100	347-352	..	3 8 10
1,000,000	Stock.	"	4	Do. 4 p. c. Deb. Stk.	100	122-127	..	3 8 0
902,900	Stock.	14 June	6	S'th'wk & V'x'hall, 10 p. c. max.	100	155-160	+1	3 15 0
126,500	100	"	6	Do. 7½ p. c. do.	100	151-156	..	3 16 11
1,155,066	Stock.	14 June	10	West Middlesex	100	264-269	..	3 14 4
*Ex div.								

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

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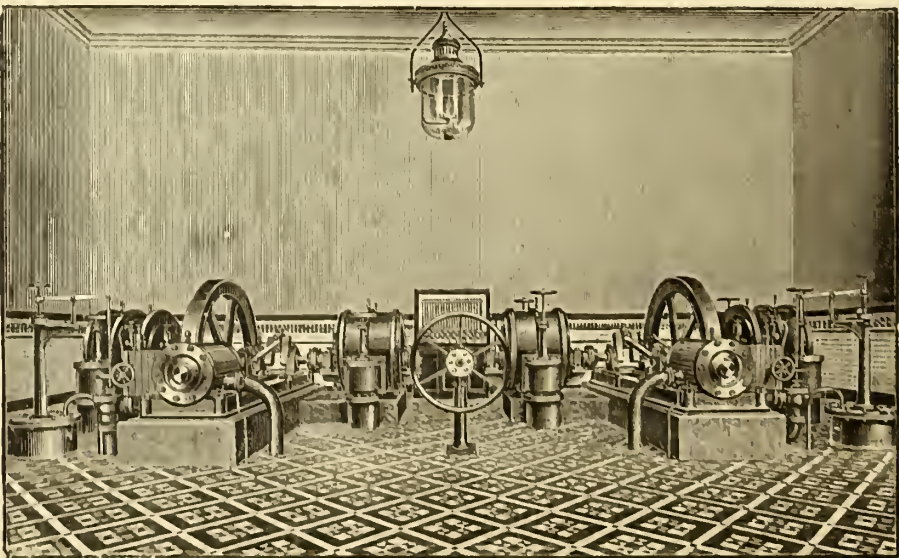
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NOTICE TO SUBSCRIBERS

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TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion; but as the Advertisement sheet of the JOURNAL is sent to Press the first thing on Monday Morning, Advertisers will please bear in mind that Orders for Alterations in or Stoppages of PERMANENT Advertisements should be received Not Later than Two o'clock on SATURDAYS.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JULY 10, 1888.

THE MONTREAL DISASTER.

In the present issue of the JOURNAL, we reproduce the very interesting pictures and description of the effect of the Montreal gasholder explosion which appeared in the last number of the *American Gaslight Journal*. The illustrations, which are from photographs taken from opposite sides of the wrecked house, convey a vivid idea of the scene of destruction; and although the accompanying letterpress is not all that might be desired, it must be remembered that it does not pretend to be the statement of an eye-witness. Probably most gas engineers who will look at the illustrations

will be able to see the occurrence distinctly enough without the aid of a "graphic" description. At the same time it cannot but be deplored that the only accounts of the disaster that have appeared in the newspapers, as well as this specially prepared notice, leave the most important question of all in the darkest mystery. Quitting this point for the moment, however, we may address a few observations upon the appearance of the wreck, as recorded by the faithful camera. The most striking thing about these pictures is the characteristic indication of the nature of the catastrophe which they present. The question has sometimes arisen in regard to an explosion, as to whether it was due to a gaseous mixture, or to gunpowder or dynamite. In the present instance, we have a typical gas explosion, the character of which is easily perceived. It was disruptive, as distinguished from shattering. The iron sheeting was rent like so much paper; and the girders were tossed about and twisted like matchwood. The gasholder-house was razed to the ground; but the destroying force was large, expansive, and equal in action. The bricks of the gasholder-house remained unbroken in heaps round the site where they had stood as walls. The roof was lifted up, rent, and then settled down on the ground. Much of the heavier scantling of the iron portion of the structure can be used again. It is not without a shudder that one can think of the men who were in and about the wrecked holder and house when all this mass of material was brought, in a flash, into the pictured condition; but, notwithstanding the damage done, a student of explosives would be justified in regarding this ruin as due to an essentially weak expansive agency. If the demolition had been deliberately brought about, with the provision that the structure was to be destroyed instantaneously without damage to surrounding property, it could not have been better done. The photograph which shows two other gasholder-houses in the background, does not indicate that the nearest of these to the wrecked house suffered any injury, although the first reports of the disaster stated that surrounding property was much damaged. We cannot even be certain that the windows, if glazed, were broken; but at any rate the sashes were uninjured. These characteristics are worth remembering in connection with the general subject of gas explosions.

With regard to the circumstances and cause of the explosion, the present account occasions some surprise. The affair happened on Saturday, May 26; and Reuter's telegram published in the English newspapers stated that "the building was undergoing repairs"—thereby leading anyone to infer that it was an old one, containing a gasholder that had been in use for some length of time. No further intelligence concerning the matter reached us until the paper from which the present account has been taken came to hand; and here we learn for the first time that the structure was a new one, and that the tank had not even been filled with water to its full capacity. This information is of grave import, since it leads one to ask how it happened that a gaseous mixture could find its way into a gasholder that had never been blown up with air for the usual test for soundness. Let us recapitulate the published statements. The tank had received 10 feet of water when it sprang a leak, and the water was pumped out again. The leak was stopped, and the water again turned in. But before it had "risen to any extent," the flow was stopped; and the Manager ordered the manlids to be taken off, in order that he might personally inspect the tank bottom. When only one lid was off, the fitter took it upon himself to enter the holder with a lighted lantern. He lowered a ladder down through the manhole, got on it, and dangled the lantern at the end of a cord below him into the holder. A survivor who witnessed the action and whose testimony was taken "while he was writhing on his bed"—this is a touch of "graphic" writing in the American manner—says that he thereupon covered his face with his hands, because he knew what was coming. The explosion duly followed, and justified the witness's prescience. The man who fired the gas was killed, with four others; and five men were more or less seriously injured. The coroner's jury returned an utterly inconclusive verdict, from which we gather that the inquiry into the cause of the death of these men was conducted in a very perfunctory fashion. They found, of course, that they were killed by a gas explosion, and that one of them ignited the gas in his ignorance and imprudence; but beyond this the jury apparently could not go. The verdict seems to have satisfied the requirements of the law; but the whole story does not satisfy engineers, who naturally want to know how the gas got into the holder. The man who introduced the lighted lantern into the holder was rash perhaps; but his

imprudence would have been harmless except for the mismanagement, carelessness, or what it was, that allowed the gas to accumulate in a new holder standing in a tank containing very little water.

We are told that all the connections had been made, and that the inlet-valve was perfectly tight, while the outlet-valve "leaked slightly." It is remarked, moreover, that "the pipes" were said to be water-sealed." Here is the mystery. Our American contemporary, with great amiability towards the chiefs of the Gas Company's staff, observes that the fitter "had no fear that gas had escaped into the holder;" but such assurance is not to be allowed for a minute to go for anything in an attempt to extenuate the act of the "unfortunate" who fired the gas with the lantern. We hold that the responsibility for rendering such a disaster impossible did not rest with the fitter, but with the official in charge of the work in hand, whoever he might be. We have not had the advantage of seeing the full report of the examination of witnesses at the inquest; and therefore refrain from making any allegation. If the inlet and outlet syphons were sealed with water, as they ought to have been, it is scarcely too much to say that such an explosion as this could not possibly have happened. No gas manager or gasholder maker will believe that at Montreal or anywhere else gas goes wandering about through the air or in the ground, seeking entrance into a brand-new holder. If the holder had been an old one, or the water in the tank had had gas standing over it, as in the case of an old tank, the sole responsibility for hazarding a naked light inside the holder would have rested with the man who did the rash act. Men will be foolish sometimes, notwithstanding all rules, discipline, and experience. Seeing how often candles and lanterns are required inside new gasholders, however, before they are tested with gas, it would be outraging common sense to lay down the proposition that there is more risk in taking a candle into a gasholder under such conditions than into a steam-boiler. It is beyond the possibility of question that gas *did* get into this new Montreal holder; and it is impossible to get away from the query *how*? There is enough in the latest information (meagre as it is) to enable any gas engineer to form a pretty shrewd opinion on this point. It appears that the tank had been nearly half filled with water, and had been emptied again. The manholes were closed; so that there was no possibility of escape for any of the gas that found its way inside through the inlet or outlet pipe. A little water was then put into the tank—sufficient probably to seal the bottom of the holder; and then the manufacture of an explosive mixture went on until the whole inner lift was charged with it. We are told that the outlet-valve leaked. But, how did this fact become known? We should not be disposed to ask many more questions than this in order to clear up the mystery as perfectly as it is likely to be cleared up in this world.

The whole occurrence remains enshrouded in an atmosphere of doubt, which cannot be regarded as satisfactory to anybody. There should be no more mystery about gas explosions than there is about railway "accidents;" and it is doing an ill-turn to the gas industry to attempt to hush them up under the pretence that they are inexplicable by natural means. It is bad enough as it is, when the law gives residents of a district unnecessary rights of protest against the construction of gasholders in their vicinity; but matters are likely to be worse if the idea once gets abroad that new gasholders, never used for storing gas, are likely to blow up without notice, and without blame to anybody but an unfortunate fitter. The public are getting rid of the notion that railway accidents are due to signalmen and drivers, and are increasingly disposed to look higher for the personal causes of disaster that are preventible by the exercise of human foresight and care. So in the Montreal gas-holder case. We ask if the supervision was right; if the discipline of the works was perfect; and if an experienced engineer was in charge of the station, and of the new gas-holder. If there was such an officer, he should be called upon to explain how gas got into the new holder, or at any rate to prove that every precaution that could have been desired was duly taken against such a result. If there was no such official, then the Directors of the Company stand morally convicted of the gravest dereliction of duty which men in their position can commit. We have no desire to be unduly severe upon the Directors and higher officials of the Montreal Gas Company in respect of a deplorable occurrence which must have brought considerable trouble and sorrow upon them, apart from the money loss, which is great. At the

same time, regard for justice compels everyone who is able to look below the surface of statements relating to disasters of this order to speak out when, as in this instance, the record is not so clear as might be desired. It would have afforded us infinitely greater pleasure to have been able to declare that the Gas Company and their officials did everything in their power to render such an occurrence impossible, and to clear up the cause after it had happened. It may yet be possible to say the former, if the questions suggested by the imperfect account published by our American contemporary can be satisfactorily answered; but the wording of the verdict of the Coroner's jury forbids us to concede the latter.

THE SENTENCE ON SAMUEL HUNTER.

On Friday last, Samuel Hunter, formerly the Manager of the Salford Corporation Gas-Works, was sentenced by Mr. Justice Hawkins, at the Central Criminal Court, for the crimes to which he pleaded guilty at the March Sessions. The air of sensationalism that has surrounded the deplorable affair from the first was kept up to the last act of this drama of real life; for the first thing the Judge did, upon the case being called on, was to throw down to the Counsel engaged a packet of newspaper cuttings, relating to the reasons for the postponement of sentence, which appeared to have been sent to him from the office of the Town Clerk of Salford. No object for this communication was assigned or imputed; but the Judge protested with much emphasis against any attempt to subject him to the supposed influence of public opinion, if this was contemplated. It would be idle to deny, however, that an idea has been prevalent that the prisoner was being treated differently to ordinary persons in a similar position, and that the sentence had been deferred with a view to the possibility of his making restitution of some of the money of which he had defrauded the ratepayers of Salford. Indeed, it will be seen, by referring to the report of the trial appearing in our issue for March 27, that sentence was purposely deferred to await the issue of Chancery proceedings that were stated to be then pending—not, so far as can be understood, that the question of restitution could be held to affect the sentence, but for fear lest sentence should interfere with the civil proceedings, or any more expeditious arrangements for settlement that might grow out of them. The question that has most interested the people of Salford, and others who have watched this case during the past three months, has undoubtedly been whether any restitution has been made; but now the criminal part of the affair has been concluded without disclosing anything definite respecting its financial side, except that the civil proceedings are still dragging their slow length along, and that no money has yet been paid or promised by the prisoner. Interest to-day, therefore, centres once more in the sentence, which has been pronounced after all as though there was no question of restitution of illicit gains. The nature of the transactions of Friday may best be gathered from our special report; and we shall not attempt to enlarge upon the facts here. For the perjury committed in connection with the trial of Mr. Ellis Lever (which, as described by the Judge, was a crime of a very heinous order), sentence of five years' penal servitude was pronounced, to date from the day of conviction. For the other charges of the indictment, a concurrent sentence of one year's imprisonment, with hard labour, was entered. We do not offer any comment upon the oration with which Mr. Justice Hawkins prefaced his severe, if just sentence. Judges have their own standards of what is necessary, useful, and appropriate for such occasions; and it is idle to criticize them. Of more immediate interest, because of wider application, than the moral reflections addressed to the prisoner personally are the expressions employed by the Judge with reference to the "commission" system of which Samuel Hunter was a victim. Referring to the single case of the prisoner's dealings with Messrs. Pope and Pearson, Lim., Mr. Justice Hawkins said:

There can be no doubt that it was a very dishonest bargain, because if a person who is employed to buy from those who are to serve his employers insists upon having a commission upon the goods supplied, it makes it absolutely certain that those who have to supply the goods sell them at a dearer rate than they would do if no commissions were paid. In truth, it is depriving those who buy of the amount of commission which is paid to their servant. *I take this to be in itself a very dishonest course of dealing; and I am perfectly satisfied that you must have known, at the time you were receiving the various cheques that were paid to you, that it was so.*

Herein is our justification for all that has been published in these columns in denunciation of the "commission" system. With this extract, condemning the wrong which the unfortunate Samuel Hunter committed, we would fain conclude our remarks upon the fate that has overtaken him. We cannot, however, withhold an expression of pity for the

man; for, whatever his faults, his punishment is surely sufficiently severe to evoke a feeling of commiseration in all who acknowledge a common humanity, and recognize how little really divides the best of us from the worst.

THE INSINUATIONS AGAINST THE HALIFAX GAS ADMINISTRATION.

IN last week's issue of the JOURNAL we printed from the local papers some correspondence that had passed between the Town Clerk of Halifax, Mr. Ellis Lever, and Mr. T. Fox, of the Silkstone Coal Company, respecting certain coal contracts of the Halifax Corporation Gas Committee; and also a paragraph from the *Pall Mall Gazette*, and letters relating thereto from the Editor and the Town Clerk. This paragraph contained a very ugly insinuation of the possibility of disclosures in Halifax, "if the parties concerned dared to court inquiry," of something similar to the Salford malpractices. It was with much reluctance that we gave additional publicity to this matter. But the duty of a journalist is imperative; and we could not minimize any damage that might be done by an *ex parte* statement by restricting its circulation. The responsibility for all such statements rests with their originators. In the present case we have no hesitation in connecting the innuendo of the *Pall Mall Gazette* with Mr. Ellis Lever's high-flying protest "in the interests of fair and honourable trading," and the latter again with Mr. T. Fox's threat of a copy of the Salford scandal to be repeated in Halifax. The correspondence has now been completed by the letter from Mr. Ellis Lever which appears in another column; but it is happily possible to remark that this matter is not likely to end with the correspondence. If the letters and the newspaper article meant anything at all, they conveyed a distinct imputation upon the integrity of the Halifax Gas Committee and their Engineer and Manager, Mr. William Carr. Mr. Carr was at the time one of two selected candidates for the vacant post of General Manager of the Nottingham Corporation Gas-Works; but the Nottingham Gas Committee rejected him solely and expressly on account of this imputation upon his character. This is specific damage for which it is to be hoped somebody will be made to pay smartly. The *Pall Mall Gazette* has played a shameful part in this business, and will probably be taught a sharp lesson upon the subject of the danger of throwing about fire-brands in the shape of base insinuations. As to Mr. Ellis Lever, the least said is the better. His last letter is a transparent attempt to back out of his responsibility. But we are not disposed to indulge in comments upon a matter that must be dealt with judicially. Everybody will sympathize with Mr. Carr and the Halifax Gas Committee; but if the processes of law enable them to punish their assailants as the latter deserve, good will come out of evil, and the taste for innuendo specially directed against gas officials, which has lately been developed in certain quarters, will receive a salutary correction.

END OF THE COAL AND WINE DUES CONTINUANCE BILL.

THE hopeless attempt to perpetuate the London Coal and Wine Dues in the interest of the Corporation of the City and the Metropolitan Board of Works has at length been abandoned. The order for the second reading of the Bill for continuing the dues was discharged on Monday last week; and thus ended the forlorn hope of the Metropolitan Local Authorities. The impost is an old one; but it is not on any account venerable. It has long been an irritating hindrance to the natural development of the manufacturing interests of the capital; and it has accordingly been impossible to smile at an anachronism which, however absurd, yet retained the property of mischievous action in such a high degree. People laugh at the Lord Mayor's procession, and at some other of the harmless, if useless and not particularly edifying usages of the civic system; but there are points at which good-humoured tolerance yields to silent disgust, and this again to active protest. In the case of the Coal Dues, the incurious tolerance of the great mass of the population of London, upon which the municipal authorities largely relied in their attempt to perpetuate a bad old custom, has proved insufficient to support them under the determined onslaught of the clear-sighted enemies of the dues. The history of the now successful movement for putting an end to the customary taxing of coal consumed in the Metropolis is a very instructive story of the triumph of principle against expediency and self-interest. Everything appeared to favour the Corporation and the Metropolitan Board of Works, who shared the proceeds of the dues between them, when they began to move in the matter of

securing the continuance of the custom. It had been established for such a long time that everybody took it as a matter of course. The great bulk of coal consumers could not be said to feel it; and not many of them even knew of its existence. It was a tax easily and cheaply collected; and the proceeds had been applied for purposes admittedly beneficial to the Metropolitan community. Finally, and as a clinching argument, the ratepayers of the Metropolitan area were told, with terrifying emphasis, that if the dues were not renewed, the rates—that bugbear of the town resident's existence—would inevitably be increased by the dreadful increment of 3d. or 4d. in the pound. All this made a good solid body of argument in support of the dues; but the first approaches of the Metropolitan Authorities to the Government of the day, for the purpose of eliciting a promise of a renewal of the help that former Governments had extended, when the question of continuing the impost had been mooted, met with a decided check. The authorities were disappointed, but not discouraged. They thought the refusal of their request proceeded from a Minister inspired with too high a regard for the pure ethics of Free Trade, and possessed with a *doctrinaire* dislike of indirect taxation. They thereupon decided to wait for a change in the Administration before raising the question again; but meanwhile they endeavoured to gain outside support. They approached the House of Lords with one tale, and the ratepayers with another. A Ministry having succeeded to power which it was thought would not cherish a too pedantic esteem for Free Trade principles, they approached the Treasury with their petition for assistance; but, to their amazement, their reception was infinitely worse than it had been before. A frantic attempt to manufacture public opinion followed, and ignominiously failed. Then a glittering bribe of a share of the plunder was offered for the parliamentary aid of representatives of the suburban constituencies; and by this means a contingent of members, respectable at least in number, was marshalled in support of the Bill for the continuance of the dues which, as a last resource, was submitted to the House of Commons in the present session. It has all been in vain. The ratepayers have made no sign of desire for the Bill; and, to finish the matter, the Metropolitan Board of Works stand convicted at the bar of public opinion of unfitness for the charge of public funds, especially when derived from a source independent of the ratepayers. So the dues will die, and London will have cheaper coal, gas, and coke; and a great temptation to unwise and extravagant expenditure will be removed from the administrators of its local affairs.

THE MANAGEMENT OF THE NOTTINGHAM CORPORATION GAS AND WATER UNDERTAKINGS.—At the meeting of the Nottingham Town Council on Monday last week, the following report of the Gas Committee was adopted:—"That they have received from Mr. Wright, the General Manager, his resignation of the office he holds under your Committee. As it is urgent that the position should be filled up as early as possible, the Committee have advertised in the usual manner for a successor. They have offered the salary of £600 per annum, the amount paid to Mr. Wright when he first entered the service of the Corporation. Your Committee are of opinion this is a proper sum. The Committee cannot close this report without expressing their great regret at the loss of Mr. Wright's services, and their high estimation of his character and skill." As stated in another paragraph, Mr. W. R. Chester, of Manchester, has been appointed to the vacant position. On the same occasion, Alderman Gripper moved the appointment of Mr. L. T. Godfrey Evans, of Liverpool, as Engineer of the water undertaking, in place of Mr. Wharton, resigned.

SOCIETY OF CHEMICAL INDUSTRY.—The annual meeting of this Society was held last Thursday, in the Bute Hall of the Glasgow University, under the presidency of Professor Dewar, F.R.S. The General Secretary (Mr. C. G. Cresswell) submitted the report of the Council on the year's transactions. It stated that 209 new members had been elected, and 116 removed by death, resignation, and other causes, showing a net gain of 93. The total number of members was 2395. The papers read before the various Sections had maintained their character for general usefulness. The finances of the Society showed an ample surplus to provide for contingencies. On the 22nd of June last, the Treasurer reported that the Society had £2088 11s. 9d. invested, and £1761 12s. 9d. in the bank, as against £1039 10s. 4d. invested, and £1500 18s. 9d. in the bank, at the time of the previous annual meeting. Under these circumstances, the Council felt able to make some addition to the salaries of the Editor of the Society's *Journal* and of the General Secretary. The Secretary further intimated that that morning some new members had been elected, which brought the membership up to more than 2400. The report was adopted. The President then delivered his Inaugural Address, in which he dwelt on what had been done by Scotland in stimulating the theory of chemical action. Mr. Ludwig Mond was elected President for the current year; and it was decided to hold the next annual meeting in London.

The Gas Institute.

PROCEEDINGS AT THE TWENTY-FIFTH ANNUAL MEETING.

CHARLES GANDON, Esq., M. Inst. C.E., PRESIDENT.

PAPERS AND DISCUSSIONS.

(Continued from p. 19.)

[Owing to the illustrations to accompany Herr F. Lux's paper on "The Newest Forms of the Gas-Balance" (which followed that by Mr. Henry Woodall, given last week) not reaching us in time, we are compelled to defer till next week the publication of his communication. In the meanwhile we give Mr. Somerville's paper; and shall complete the papers and discussions in our next issue.]

THE VENTILATION OF GAS-LIGHTED ROOMS.

By JOHN SOMERVILLE, of London.

The ventilation of gas-lighted rooms is a question of the greatest importance when considered in connection with our special industry; and although the matter is beginning to be better understood than it formerly was, and more interest is attached to it, and ventilation is now regarded as a necessary of civilization and as an accompaniment of all well-lighted and properly heated rooms, yet there is still a vagueness and a rule-of-thumb manner of applying it to our houses—a sort of haphazard, come-as-you-like kind of way of letting in the external air, and getting rid somehow or other of the vitiated atmosphere of our living-rooms.

We are all conscious of the necessity and the importance of breathing pure air; and how it affects our health and very existence. What is more exhilarating and delightful than a brisk walk through the pure country air in an early spring morning; its agreeable freshness and reviving influence is greatly conducive to our pleasure, comfort, and well-being. This is the sort of influence we want imported into our homes; and although it may be very difficult to get pure country air into rooms in large towns, we ought to put forward our best endeavours to provide in them as much fresh air as possible. I am afraid that, even in this enlightened age, very many persons are not aware of the great necessity there is for thorough ventilation—or, as the JOURNAL OF GAS LIGHTING calls it, "Aërial sanitation," which, I think is a much better term when used in reference to dwelling-houses, halls, and theatres—because in their great anxiety to exclude cold and damp and the inclemency of the weather, they prevent, as much as they can, the external air from coming in to renew the atmosphere inside, which is essential to prevent its becoming stagnant, and consequently unfit to support human life. Our lives can be preserved for some time without food or water; but take away the air we breathe for only a very short space of time, and we cease to exist. We must have air; and it must not be the air breathed only 2 or 3 minutes before, but totally different, and fresh. As, by the laws of Nature, life is supported by the air, and as only about one-fifth of the ordinary atmosphere, or oxygen of the air, is capable of sustaining life, the rest, or the nitrogen, serves as a diluent to render the air more fit for respiration. At every breath, we inhale about a pint of air; and we breathe about 18 or 20 times a minute. In the lungs there is an admirable arrangement, by which the air is exposed to the action of the blood, which changes the vital air, or the oxygen, into carbonic acid, which is destructive of all animal life; but by a beautiful provision of Nature, in order to prevent this carbonic acid—this exhausted, contaminated, and now poisonous air—from being used a second time, while it was in the lungs the vital air takes up so much heat as to lessen its specific gravity, and it is so light as we breathe it out into the atmosphere that it rises at once above our heads. I may also remark here that we have learnt, within the last few years, during a noted controversy, how quickly air is heated, and likewise how quickly it gives the heat up again. In occupied rooms, the carbonic acid, as it is exhaled, rises between each breath to the ceilings; and a fresh and pure draught of air is thus secured each time we breathe. By the care, however, that some people take to prevent the entrance of external air, they are compelled to breathe over and over again, the same contaminated atmosphere.

To those who have experienced the grateful and refreshing effects of the sweet and pure morning air, there is little wonder at the lassitude, languor, and want of energy they

see consequent upon the continual breathing of a foul atmosphere in over-crowded and ill-ventilated rooms. It is perhaps a matter to be thankful for that the doors and windows now fixed in most modern houses are made at so much a dozen, by the "sweating system," from not over-dry and seasoned timber, as used in houses now-a-days by builders; so that a tolerable quantity of air finds its way into the rooms through the chinks and crevices of the woodwork, which satisfies the mind of the builder that he has thus provided sufficient ventilation, and that the fireplace and chimney will do the other part of the work. He also takes care, in laying the flooring-boards, that the materials shall not be too well seasoned, so that there shall be sufficient shrinkage before anyone occupies the house to allow of a $\frac{1}{4}$ -inch space between each board for air to enter to supply the fire with the necessary quantity, and at the same time causes the sensation of being at sea, by the heaving up and down of the carpets during sudden gusts of wind in stormy weather. Besides this he sometimes provides an iron grating, as a riser, at the front doorsteps, which admits light and air to the cellar; and from there the air finds access to other parts of the house. If it were not for these rough-and-ready means of admitting fresh air into houses, the majority of them would scarcely be habitable during winter time. No provision, however, other than the ordinary fireplace, is thought of for the exit of the vitiated air of the rooms; and anyone entering a room in the evening, after it has been occupied for a few hours, is met with a hot blast of impure air, at 5 or 6 feet above the floor-level—owing to the vitiated atmosphere not having descended low enough to come under the influence of the draught in the chimney. The occupants of the room are therefore sitting in a bath of hot, polluted, unwholesome air, which is such a fruitful source of coughs, colds, fevers, and disease.

Architects and designers of houses do not seem to attach sufficient importance to the aërial sanitation of our common dwellings; but if a hall or other large public building is to be erected, as a rule some means of ingress and egress for air are thought of, and an elaborate system of mechanical ventilation is arranged for, with the result of creating unbearable draughts, caused by the large volumes of cold air which is poured into the rooms or chambers haphazard, and which is allowed, or is supposed, to find its way out by the windows placed high up in the building, or other openings and chinks in the woodwork of the roof. Then these gentlemen appear to favour electricity for lighting, because they say such lights do not give off any heat, and so do not vitiate the air—forgetting or ignoring the fact that the heat evolved by a gas-flame is the best of all ventilating mediums, provided they would only arrange for a simple means of conveying the products of combustion out of the room—thus securing light, heat, and ventilation in the most perfect degree, and without a tithe of the first cost and expense of annual maintenance of the more elaborate system.

As a rule, architects do not yet recognize the necessity of providing for a constant change of air in the living-rooms of dwelling-houses, clubs, and hotels. They go on designing and building in the old groove, except when some special case requires a means of ventilation, or necessity points to some effort in that direction. Then they seem to think that it is quite sufficient if they arrange for a few air-bricks outside, and a hole in the wall near the ceiling, with a flapping arrangement on the inside, and a similar opening into the chimney; so that when one opens the door of the room, these things, like burglar alarms, set up a clatter if they are not put out of action, as they are very frequently, because of the downpour of cold air on to the heads of the inhabitants of the rooms or offices in the winter time. In summer, however, when the outside air is warmer, they are permitted to act, and the noise is tolerated, as they afford an opportunity of procuring a change of air in the rooms, when there is no fire to set up a circulation, and take the vitiated air away. Really, therefore, upon gas engineers and managers is thrown the onus of supplying means, or suggesting arrangements, for carrying away the products of combustion from rooms lighted, or about to be lighted, by gas—a duty which properly belongs to architects and builders, but who too often, to cover their own shortcomings or apathy, or want of invention in providing for the inlet and outlet of the air, do not trouble themselves much about it. No doubt there are obstacles and difficulties at times in the way, which seem to be too formidable to overcome by uninitiated and inexperienced men; and they, to get over the trouble, often recommend the electric light as a panacea. It is therefore the duty, as well as to the interest of all gas men to try and help, and, if possible, show these

men that the best and most approved means of ventilation is by gas-lights—that wherever a gas-light is fixed, a current of air is established, which only requires a little thought, and the exercise of a modicum of common sense, to use it for providing a constant change of air in any room, and so arranging for by far the best and most approved means of ventilation possible.

It is idle for us as gas engineers to ignore the fact that there is a widespread impression as to the use of gas in dwelling-rooms, &c., contaminating the air, and that the products of combustion from gas-lights destroy its purity, injure books, hangings, furniture, and plants; and it is downright affectation to pooh-pooh the arguments used, and to say: "Oh! nonsense; there is nothing in them, and the use of gas is no more unhealthy than any other illuminant." No doubt that is so; and according to Dr. Letheby's very instructive experiments (which will be found in the back numbers of the JOURNAL OF GAS LIGHTING, and need not be detailed here), as compared with candles or oil giving an equal illuminating value in any large or small room, gaslight vitiates the air to a much less extent. For instance, a common batwing or union-jet burner is credited with only about 4 per cent.; while oil stands at 11 per cent.; and candles at 13 per cent. Now we have ventilating gaslights standing lower still in the scale, or at only 2 to 2½ per cent. There is also to be considered the sulphur "bogey," which has been, and is still, greatly and grossly exaggerated; and it has not yet been thoroughly determined—because chemists, like doctors, disagree on the question, and have a difference of opinion—whether the harm done to books, &c., is really caused by the products of sulphur emanations, or by highly-heated carbon compounds. The latest theory, I believe, is that it is not due to the small amount of sulphur in the gas at all, but by what some chemists call carbon oxy-sulphide, or some compound of carbon—something not yet very well understood—condensing on any object a foot or so below the level of the ceilings, and which I will define in every-day phraseology, and free from any chemical ambiguity, as the senseless retention of a stratum of very highly heated aqueous vapour, 1 or 2 feet deep near the ceiling. Prevent this from accumulating, and you at once prevent the depositing of moisture on any objects 2 feet from the top of the room; and no harm can or will be done any more than if a dozen sperm candles were burning, and their products carried away in a similar manner. If there is injury, it indicates very plainly the want of, and the necessity for, an efficient means of ventilation to carry away these heated aqueous vapours and hot-air products; and if this is done, there will be pleasant and healthy rooms to live in. This is the best argument to use; and if we can supplement it by showing how to do it, and by pointing to examples, and saying "Do likewise," a great advance will be made.

All ventilating arrangements must and should be simple, and not expensive for the average householder to adopt. We know it has been suggested to put a number of jets in a tube, and carry the tube outside, terminating in a cowl or some other creaking arrangement; or put a solid flame Bunsen burner in a box in the ceiling under the flooring-boards, and carry a tube between the joists to the outside to exhaust—or, as described by some elementary writers "to suck" the vitiated air from a room. But, in my opinion, these means are too artificial. It requires only some natural aid; and, even in the matter of ventilation, the nearer we can copy Nature the better. Some also advocate admitting air at the ceiling-level to fall down to the floor, carrying with it—so they say—the vitiated air (we must put a big "Qy." to this); and then taking the air out at the floor-level. Others say let the air in at the floor-level behind the skirting boards of the room, and let it out into the chimney at the level of the ceiling and by the fire. But these appear to me to be what I must term "unnatural" schemes, which must be very unsatisfactory, and sure to end in failure and discomfort.

Some two or three months ago, I had an opportunity of seeing in action the latest improvement in artificial ventilation, known as D. C. Green's ventilating system. This consists of an air compressor driven by a gas-engine situated in the basement of the building to be ventilated, or in any position adjoining the building. The compressor supplies air at a pressure of from 3 to 5 lbs. per square inch, which is conveyed in small pipes similar to a house fitted with gas-pipes, and an automatic multiplying air nozzle fixed at or near to any place where the ventilation may be required. The air from these nozzles causes a large secondary or induced current to flow through a specially-shaped pipe or

orifice from the external air; and this secondary air current is some 20 to 30 times greater in volume than the amount of air coming from the nozzles. They can be fixed in any part of a building or rooms, and made to draw fresh air from any convenient place by a continuous light sheet-iron or wooden pipe from the special orifice to the outer air; and they can carry it forward and deliver it exactly when required, or distribute it in any direction. For exhausting foul air from a room, by reversing the direction of the nozzles, the impure air is drawn out, and ejected to the outside of the building. Where necessary, there can be one of these nozzles fixed for the delivery of fresh air, while another one is drawing out the vitiated air; so that the air of any room can be changed every five minutes if required. A great advantage in this arrangement is that the air can be supplied either warmed to any desired temperature in winter, or cooled to a pleasant degree in summer time. One of the nozzles, discharging 80 to 90 cubic feet of air per minute from the compressor, delivers at the other end of the special orifice about 2000 cubic feet per minute, which comes entirely from the outer air. In the absence therefore of any natural means of ventilation, here is an admirable system for renewing air by artificial means, applicable to all buildings, and at very little expense, or only a few pence per day in these times of cheap gas.

My first experience in the matter of ventilation was in 1852, when assisting in placing three large sun-lights in the news-rooms at Wolverhampton, for the purpose of lighting and ventilating, and renewing the atmosphere of the place, which was a thing greatly needed in that centre of the then smoky Black Country. They were most successful in doing this; and I believe this was one of the first attempts at introducing sun-lights for the purpose of ventilation. The centre-tubes were carried only about 5 or 6 feet above the level of the ceiling; and the heated air diffused itself perfectly in the space between the ceiling and roof, and found its way out through the over-lapping of the slates. As the tubes were not taken outside the roof, no cowl or butterfly valve was necessary, as gusts of wind did not reach them nor affect the draught in the tubes. There was therefore no down or back draught to interfere with their action; while the current of air rushing up the 6-inch centre tube was sufficient to carry a piece of cloth several feet up into the air. My next experience in this matter (in conjunction with Mr. Keeling, the architect of the Strand Music Hall, now the Gaiety Theatre) was in 1862, at which time I was Engineer of the Maidstone Gas Company. A glass ceiling had to be illuminated, and the ventilation of the Music Hall provided for. Two 500-light meters were fixed in the basement; and two 3-inch rising mains went to the roof, where there were a double row of sun-burners, about 2 ft. 6 in. above the ground, and stained glass which formed the ceiling; the centre tubes passing to the outside of a glass-covered roof, as the heat was too great, owing to the large number of burners, to allow it to remain inside. The end of the tubes were protected from the winds and weather by cowls. The ventilation was provided for by the panes of glass forming the ceiling being supported on clips in iron frames; thus leaving a margin of ⅜ inch between the panes and the frames for the passage of air from the hall, which also supplied the sun-lights. By this means perfect ventilation was secured, without draughts; while the hall was never over-heated, because of the absence of all gas-lights from it; and the change from daylight to darkness outside was imperceptible by the audience inside. This is an excellent method for ventilating and lighting any large hall.

My next special acquaintance with ventilation was in 1866, when I undertook the lighting and ventilation of Moat Park House—the residence of the Earl of Romney, about two miles out of Maidstone. His Lordship made it a *sine qua non* that the introduction of gas to his mansion should be accompanied by ventilation, so that all products of combustion from the gas should be conveyed away. I engaged to do this with some amount of fear and trembling; for I had failed in one or two small matters in the way of ventilating gas cooking stoves and gas fires, which had to be removed on account of the smell. But cooking-stoves in those days were not so perfect as they are made at the present time; although I must say some of them smell rather strongly now at times, when one enters the house of a friend, it is quite possible to intimate to him that he has a gas cooking-stove in action, because of the smell given off by cheap and imperfect atmospheric burners. A good and properly constructed Bunsen burner does not offend the nose very much; but

those attached to the cheap class of cooking-stoves are often very offensive. It is no uncommon thing to hear the remark: "I should like to have a gas-stove; but I cannot stand the smell of them." I am under the impression that these stoves would be more generally used if makers would take care and fit good Bunsen burners to them, as I have found that the ventilation of a gas-stove—i.e., carrying away the fumes—is in very many cases a very difficult matter to deal with. A hood, with 4-inch pipes running into the nearest chimney, will not always accomplish it; nor a 6-inch pipe, carried through the roof of the scullery, with a cowl fixed on, does not always answer the purpose. To prevent complaints always recommend those stoves which do not offend the nose. But this is a digression. As I was saying, I undertook to carry away all the products of combustion and the vitiated atmosphere from the rooms of Moat Park House, especially from the library, which was a fine, large apartment, occupying one-half of the South front of the house on the ground-floor; and it contained a splendid collection of rare and costly books. There were three fire-places in the room—one at each end, and one in the centre—with the old-fashioned andirons for burning logs of wood; no coal being allowed to be burnt in this room. The ceiling was panelled in three divisions; and so was suitable for three sunlights. These were inserted by cutting out part of the centre ornament, and fitting in strong galvanized iron boxes, double-cased; a 4-inch pipe being carried into each chimney between the joists. The ventilation of this room was perfect; as was also that of the other rooms, which were treated in a somewhat similar manner. Where chandeliers were used, the centre flower of the ceiling was perforated with a sufficient number of small holes, so as not to be noticeable from the rooms. A zinc box was then inserted over these holes under the floor, and between the joists; and a pipe conveyed the vitiated air and products of combustion into the chimney.

The only difficulty I met with was in his Lordship's private library, which was at the back part of the house, and with a northern aspect. It was lit with a large-sized Winfield's Argand library-lamp, with opal reflector, which was much in vogue in those days, and with the usual perfumage or smoke consumer or distributor, which was then almost a necessary adjunct to Argand burners; for the more scientific "London Argand" had not then been introduced. With the old-fashioned Argands, when a door was suddenly opened, they would smoke unless turned down low.

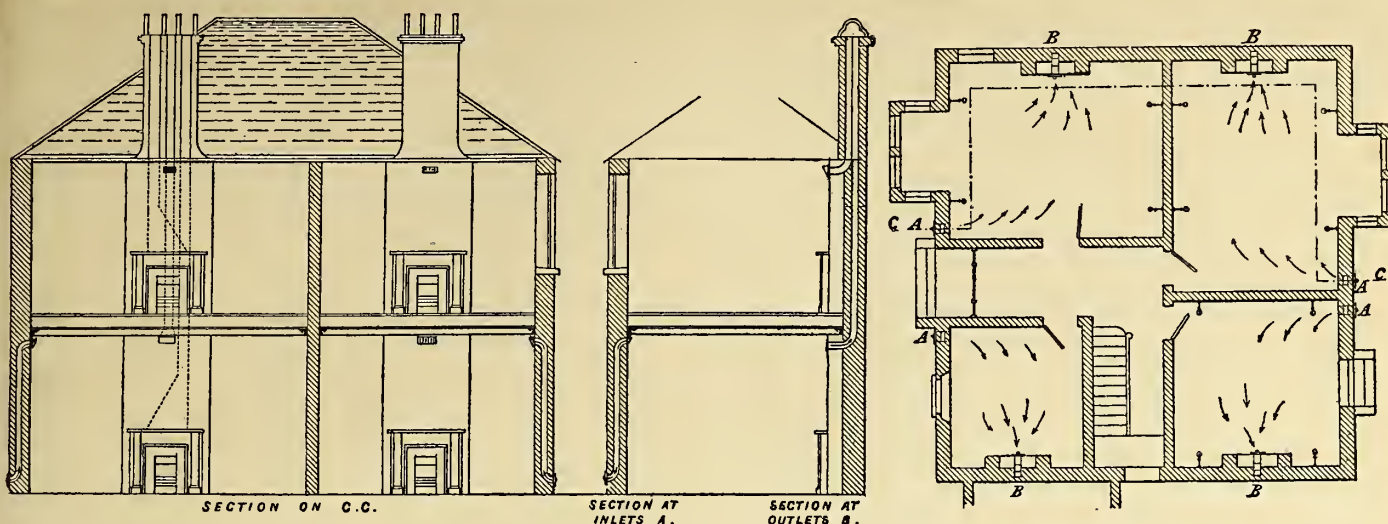
Well, the ventilation of this private library was a little troublesome. A 4-inch hole had been made in the ceiling, and covered by a stamped brass centre ornament 10-inches diameter. A zinc box between the joists collected the heated air, which was conveyed to the outside, as it was difficult to get to a chimney. The end of the 3-inch pipe was protected by a cowl; but there was occasionally a back draught, caused by a projecting wing of the building, which, when gusts of wind came, created eddies or gave a whirling motion to the outside air, causing the air in the eduction tube to strike back. This was at last overcome by placing in the end of the pipe a light flap-valve hanging slightly out of the perpendicular; so that the slightest breath of wind from the outside caused the valve to close against the opening of the pipe, but only for an instant or so, and not long enough to interfere with the ventilation—for, if any accumulation of heated air took place, it was only for the moment, and directly the valve was released, the proper action went on.

You will perhaps pardon me for entering into these minute details; my only object in doing so is that you may be enabled to give instructions to your foremen and fitters, when little difficulties of this kind crop up, how to overcome them. These little troubles will crop up in most all ventilating arrangements, and they are sometimes very perplexing. A peculiarity in ventilation is that an arrangement which is perhaps successful in a dozen cases, will in the thirteenth, although exactly the same means may be employed, be unsuccessful through some little obstruction—for instance a bend or an elbow too many, or in the wrong place, or some little flaw overlooked. Besides what may answer in a southern or western aspect will not always be suitable when applied to a northern or eastern look out. I would advise that ventilating flues such as I have described should always be taken into a chimney, where possible; and then, if the chimney is properly constructed, there will be a pull of $1\frac{1}{2}$ or 2 tenths of an inch vacuum, and never any back or down draught. Two-tenths constant pull

is sufficient in all cases to properly ventilate the largest room, provided the eduction-pipes are large enough to convey the whole of the products of combustion and vitiated air into the chimney.

I will now describe my latest efforts in ventilation. Some three years ago, I had occasion to assist in designing a dwelling-house about to be built; and I thought this a good opportunity of practically carrying out one's theories on the subject, and to see if it were possible to make practice square with theory, or *vice versa*, in the matter of ventilation. The object I sought to obtain was that the temperature of the air in the rooms should never at any time be more than 10° higher at a foot from the ceiling than a foot from the floor in the winter months of the year. For dwelling-houses in the summer months may be left to take care of themselves, as we all know ventilation is a simple and easy matter during the dog days. In the course of some experiments I made a few years ago in regulating the secondary air required for generating furnaces, I found that 2-10ths of an inch draught gave a velocity of air of about 6 feet per second; and from this data, I calculated the area of opening required for admission and eduction of air into and out of the rooms. Taking into account the natural pressure of the air as possessing an ascensional force of 1-10th of an inch for every 10 feet in height, the quantity of air needed every quarter of an hour was found; and, in order that there should be no stoppage or obstacle to prevent a constant flow of fresh air into each room, whatever winds or weather prevailed, I required it to be warmed, or warmer than the outside air, as being necessary to prevent the formation of draughts—seeing that the sudden admission of cold air into a warm room is sure to create currents in the process of diffusion; and currents of air should be avoided as much as possible indoors. I therefore arranged the inlets and outlets to each room as shown on the drawing in plan and sectional elevation; A A A A being inlets and B B B B outlets. The direction of the air currents are shown by the arrows.

The air is admitted through an iron grating (which is capable of adjustment) built in the wall at the ground-level outside. The house being built on virgin soil, I was not much concerned about the possibility of ground air entering; but in some localities in London, and other large towns too, ground air is perhaps not very desirable to admit into our houses, and is best to be avoided, which can be done by covering the whole area on which the house stands, and a margin of 5 feet on all sides, with a foot depth of concrete. The air is admitted by the grating; and it rises up the centre of the wall by a brick space being left out, so as to form a conduit 9 in. by $4\frac{1}{2}$ in.—equal to 40 square inches in area—and enters the rooms at 6 inches below the ceiling, through an iron ventilator capable of regulation by means of a flap-valve, which is usually set at an angle of 45° , in order to give the entering air an upward direction to sweep across the ceiling to the outlet-flue. The air entering by this inlet is warmed by absorbing heat from the walls whilst flowing upwards; and as a rule it takes up 14° to 18° of heat before passing into the room. In the winter, when the temperature of the room is about 58° to 60° Fahr., and the outside air 30° or 32° Fahr., and with one-tenth of an inch draught in the inlet conduit, the air which enters is warmed to about 46° to 48° Fahr., and mixing at once with the heated air of the rooms, does not fall, but slowly travels across the ceiling, over the gas-lights, to the outlet-flue, which is situated in the centre of the end wall of the room above the mantelpiece, and between the two smoke flues. An ornamental brass grating is all that is seen in the room; and this communicates with the air-flue, which is 6 in. by $6\frac{1}{2}$ in.—equal to 39 square inches in area, and generally has a draught of $1\frac{1}{2}$ tenths of an inch; but 2 to $2\frac{1}{2}$ tenths in windy days. There is therefore always a constant suction at any time of the day or night. If the flame of a lighted taper is held up within $\frac{1}{2}$ inch of this grating, it is pulled through it with sufficient force to extinguish it. The heated and vitiated air escapes through it at a temperature of 62° to 65° Fahr. This outlet air escape-flue is formed between the two other flues, and is 6 inches wide by $18\frac{1}{2}$ inches long, divided in the centre by a continuous slate partition; thus making two hot air escape-flues 6 in. by $6\frac{1}{2}$ in.—one serving the lower room, and the other one the bedroom above, where there is an adjustable ornamental ventilator fixed in the centre of the apartment over the mantelpiece, 6 inches below the level of the ceiling, and where there is generally a draught of one-tenth of an inch. The air entering by the doors and the windows, no special provision is necessary for the smaller



quantity of air required; the constant pull of one-tenth at the ventilator being all that is needed to keep the air of the bedrooms always fresh. By the hot-air flue being built up with and between the two smoke-flues, the heat of these flues from the lower fires creates a draught independently of the difference in height of the inlet and outlets; but it also answers well in the summer time when there are no fires in the grates, and keeps the rooms constantly replenished with fresh air by removing the heated vitiated air and products of combustion from the gas-lights.

I have on several occasions tested the inflow of air and the exit of heated air, and also the temperature of the rooms; and I have invariably found that I have succeeded in solving the problem I started with. In one room lighted by a 5 feet Sugg's "Cromartie" recuperative burner, I found in the winter time, while the thermometer outside stood at 32° Fahr., the air entering the room was 48° Fahr. At 6 inches above the "Cromartie" burner, the temperature was 72° Fahr.; 3 feet from it, and 3 feet from the outlet, 62° Fahr.; at the exit flue, 12 inches below the ceiling-level, 60° Fahr.; at 4 feet above the floor-level in the centre of the room, 58° Fahr.; and at 1 foot from the floor-level 55° Fahr.—or only a difference of 5° between the floor and ceiling levels. In another room, lighted by four of Sugg's silent "Christiania" burners, on brackets on the walls, the air entering on the north side of the room was 30° Fahr.; coming into the room, it was 42° Fahr.; over the gas-bracket, 1 foot from the ceiling, and 3 feet directly above the burners, it was 88° Fahr.; in the centre of the room, 1 foot from the ceiling, it was 65° Fahr.; at the hot-air exit, 6 inches from the ceiling, 72° Fahr.; at 4 feet from the floor in the centre of the room, 61° Fahr.; and 1 foot from the floor, 58° Fahr.—showing only a difference of 7° between the floor and ceiling levels. This, I think, proves conclusively that the ventilation of these rooms is very efficient; and that the heated and vitiated air was being quickly taken away from the rooms, and as rapidly replaced with fresh air from the outside. As all the fire-places in the rooms are fitted with Barnard, Bishop, and Barnard's (fire-tile, slow combustion, solid bottom) grates, no special means for supplying air to the fires was provided, as these grates require but a small amount of air. Especially when arranged to burn the fuel downwards, without producing smoke, the minimum of air only is required. Had the old form of grate been used, it would have been necessary to provide for a supply of air to ensure proper combustion, something after the plan suggested by Mr. Sugg, in a paper he read before the Institute a few years ago, when the air was delivered from the outside under the raised fender, through perforations made in the hearth, so as not to depend upon any haphazard supply by doors or windows, or supposed transpiration through the walls of the rooms. With the class of grates mentioned, no special air supply appears to be essential, whether burning all coal or half coal and half broken coke, as this method of slow combustion warms the rooms quite as effectually as, if not more so than when the flame of a coal fire goes roaring up the chimney, carrying half the heat with it, and taxing to the utmost limit the air supply from under doors, &c., and producing, by the rush of cold air across the floor to satisfy the blazing fire, the discomfort of cold feet.

This mode of ventilating houses is an easy matter when one has a new house to build; but the question to be considered is, How is it to be applied to gas-lighted rooms in existing houses, so as to obtain like results in the matter of

keeping down the temperature and the renewal of the air by the removal of the heated and vitiated air, and without injuring the building? There may be a little trouble; but I do not think the difficulties are insurmountable. If I had such a thing to do—and I wish some one would give me the opportunity of carrying it out—I would proceed very much on the lines I have indicated. I would arrange an iron, zinc, or thin wooden pipe—say, square in section—in the corner of a room, taking air from the outside at or near the ground-level, and delivering it six inches below the ceiling. Another similar pipe would be fitted in the opposite corner of the room, or close against the side of the projecting chimney breast, having its opening at the ceiling-level. It would run up through the room above; and would be allowed to project a foot or two through the bed-room ceiling into the space below the roof. The heated impure air would then soon find its way outside. There would be a constant pull, and no danger of down draught; and the expense could not be very great. The tubes and opening in the ceiling might have some amount of ornamentation, if thought necessary; but probably, in this æsthetical age, a square pipe might be admired, and not thought plain. However, I could not advise the pipes being let into the walls; for this would cut the walls too much, and very likely endanger their stability. As an alternative means of carrying out this idea, an angle of the room might be utilized by fitting a pine board 11 inches wide into it, enclosing an area of about 40 square inches, which could take its supply of air from the cellar, or below the floor, with an air-brick in the outside wall. For the outlet, the angle formed by the chimney and the wall of the bedroom could, without much disfigurement of the room, be made use of by being enclosed with a $\frac{1}{2}$ -inch by 11-inch pine board painted, stained, or papered, like the rest of the room. If this plan could be carried out—and I do not see where any difficulty arises—I have not the least fear but that the results obtained in the case alluded to would follow; and the difference between the temperature at 1 foot from the ceiling-level and 1 foot from the floor-level in any room so ventilated would never be more than 10°.

For those who will not, or do not see their way to adopt this arrangement, there are many improved forms of ventilating-lamps; indeed, there are so many now, that they are too numerous to mention in this paper. A few weeks ago Mr. Vivian B. Lewes, of the Royal Naval College, gave a lecture on this subject of ventilating gas-lighted rooms; and he described the way in which the Wenham lamp can be utilized for the purpose in large or small rooms. For the last three years, the large rental-office of the South Metropolitan Gas Company, Old Kent Road, has been lighted and ventilated by this means. There are ten of the large sized lamps; and the three centre ones have ventilating shafts conveying away the heated and vitiated air through slate flues above the ceiling, and into the nearest chimney. They answer very well, and give little or no trouble. Mr. Sugg has adapted his inverted burner lamp for the purposes of ventilation by applying them, in a very neat and admirable manner, to brackets on the wall, by which the products are ejected outside the buildings. He is also bringing out the Methven system of supplying a separate current of air—previously deprived of its moisture—to the purposes of ventilation, in connection with his lamp; the air being fed to the lamp under a slight pressure, and the products conveyed to the outside of the room, or to the nearest chimney. All or any of these regenerative

lamps lend themselves readily as a means of ventilation, carrying away not only their own products of combustion, but also the heated and contaminated products of respiration of crowded rooms, the air of which soon becomes poisonous, if lighted in any other manner, without some very efficient method of ventilation. As a recent writer reporting upon the lighting of rooms by means of electricity says: "Glow lamps do not modify the atmosphere and produce less heat, but also at the same time have less ventilating power; and ill-ventilated rooms, with glow lamps and persons in them, become poisonous after a time. Though the composition of anthroptoxin is not yet accurately known, there can be no doubt now as to its existence." This anthroptoxin, it appears, is a deadly poison, and kills quickly when given to animals. It is procured by collecting the condensed products of respiration from crowded rooms, which are badly ventilated, and lighted by any means which do not assist in ventilation. It is seen condensing, and can be collected from the cold glass window panes of such rooms. Whenever this moisture is seen, it is a sure sign of imperfect ventilation; and by opening the windows it disappears.

In conclusion, I trust I have succeeded in showing how ventilation may be made easy, and at little cost; always bearing in mind that the inflowing fresh air should be warmed as near as can be to within 10° or 15° of the temperature of the room. Then there will not be any discomfort to those occupying the rooms; and always a certainty that there will be a steady inflow of pure fresh air, replacing that taken out of the apartment. Our homes may thus be rendered more healthy, comfortable, and enjoyable in the long dark evenings of winter.

The PRESIDENT said he believed the ventilation of dwelling-houses was less understood in England than anywhere else; for we were a long way behind most other countries in this respect. It was a difficult matter to deal with; but Mr. Somerville had treated it in a very exhaustive way. What he recommended appeared satisfactory, if it would be successful. There was one point, however, which rather disagreed with his experience, for he understood Mr. Somerville to advocate the use of Bunsen or atmospheric burners for heating; whilst his (the President's) experience had been that such burners were far more liable to create an unpleasant smell than were ordinary gas-burners.

[It was decided to discuss this and Mr. Leeds's paper (to appear next week) together.]

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(FOR STOCK AND SHARE LIST, see p. 84.)

DURING the past week business on the Stock Exchange has been somewhat restricted; but the markets have not dropped. On the contrary, favoured by the continued promise of peace on the Continent, the tendency has been towards better prices generally; and but for some access of stringency in the Money Market, they might have gone higher. The upward movement is fairly well marked in the Gas and Water Departments, though the extent of business done has been decidedly limited. In the former category, the most noticeable feature is the continued improvement in Gaslight "A," which steadily advanced, until on Saturday it was marked at 255½. South Metropolitan "B" has been repeatedly done at 244—the top price; but the quotation is left unchanged. The "A" has not been dealt in at all. One transaction in the old stock, at 267, was all the business in Commercial. Imperial Continental has been dealt in every day, at about level figures. Continental Union and European are rather better; and the debentures of Australian and Buenos Ayres are fractionally higher, on *ex div.* changes. There has been very little doing in the Metropolitan Water Companies; and the only variations are favourable—being a rise of 2 in Lambeth 7½ per cent. and in Southwark ordinary. The daily operations were: Quiet business in Gas on Monday, at fair prices, but without any advance. Two transactions in Kent comprised the business done in Water. Tuesday's business in Gas was largely in debentures, which are still in demand. Upon reference below to the comparative table of prices now and six months ago, it will be noted how the secured issues of Gas undertakings have advanced in price. Wednesday was much quieter. Prices generally were very good; and Gaslight "A" rose 1. Water was almost neglected. Much of Thursday's Gas business was in the debentures of the two Australian Companies, which stand in good estimation. Gaslight "A" rose 1 more, and European improved ½. There was nothing done in Water. Friday was a quiet day in both Gas and Water, and quotations did not move. Saturday was more active than usual, and prices rose. Buyers of Gaslight "A" were 1 higher; and Continental Union advanced. Water was more dealt in; and Lambeth 7½ per cents. and Southwark ordinary

improved 2 each. [ERRATUM: In line 17, last week, for "bring" read "buy."]

We append a comparative table of the quotations of Gas and Water stocks as on the 1st of January last and on the 30th of June. In regard to Gas Undertakings, the most noticeable feature is that, while the open stocks have in many instances failed to maintain their position, the debenture and preferred issues have made considerable advances—a movement which was largely stimulated by the demand for first-class securities created by the conversion of the National Debt. Some considerable improvements have been achieved by the Water Companies; the recovery of New River being the most conspicuous.

NAME.	Prices on Jan. 1, 1888.	Prices on June 30, 1888.	Gain or Loss.
GAS COMPANIES.			
Alliance and Dublin Company, 10 per cent. maximum.	183-193	183-193	—
Do. 7 per cent.	123-133	133-14	+2
Australian (Sydney) 5 per cent. Debentures	107-109	111-113	+4
Bahia, Limited.	22-24	22-24	—
Bombay, Limited.	7-7½	7-7½	—
Do. New	5-5½	5-5½	—
Brentford Consolidated.	224-229	223-228	-1
Do. New	163-168	162-167	-1
Brighton and Hove, Original	43-45	43-45	—
British.	45-47	44-46	-1
Bromley, Ordinary 10 per cent.	20-22	20-22	—
Do. 7 per cent.	133-143	133-143	—
Buenos Ayres (New), Limited	13-14	133-143	+3
Do. 6 per cent. Debenture.	105-107	109-111	+4
Cagliari, Limited.	26-28	25-27	-1
Commercial, Old Stock	274-279	264-269	-10
Do. New do.	205-210	205-210	—
Do. 4½ per cent. Debenture Stock.	120-125	120-125	—
Continental Union, Limited	443-454	431-441	-12
Do. New 1869 and 1872	303-314	28-30	-2
Do. 7 per cent. Preference.	33-35	35-37	+2
Crystal Palace District	200-210	200-210	—
European, Limited	24-25	243-254	+3
Do. New	17-18	174-184	+3
Do. do.	113-124	113-124	—
Gaslight and Coke, A, ordinary	251-254	250-254	+3
Do. B, 4 per cent. maximum	95-98	97-102	+3
Do. C, D, and E, 10 per cent. Preference	257-262	259-264	+2
Do. F, 5 per cent. Preference	121-125	125-130	+4
Do. G, 7½ per cent. Preference	180-185	183-188	+3
Do. H, 7 per cent. maximum	164-168	168-178	+4
Do. J, 10 per cent. Preference	255-260	258-263	+3
Do. 4 per cent. Debenture Stock	112-114	116-119	+4
Do. 4½ per cent. Debenture Stock	120-125	125-130	+5
Do. 6 per cent. Debenture Stock	162-165	172-177	+11
Imperial Continental.	206-209	201-205	-4
Malta and Mediterranean, Limited	43-54	42-54	—
Metropolitan of Melbourne 5 per cent. Debenture Stock	112-114	114-116	+2
Monte Video, Limited	183-194	193-204	+1
Oriental, Limited	94-94	91-92	—
Ottoman, Limited	64-74	6-7	-3
People's Gas of Chicago, 1st Mtg. Bds.	101-106	104-109	+3
Do. 2nd Do.	95-100	92-97	-3
San Paulo, Limited	154-164	154-164	—
South Metropolitan, A Stock	817-823	815-820	-2
Do. B do.	244-249	240-244	-4
Do. C do.	260-270	250-260	-10
Do. 5 per cent. Deb. Stk.	132-136	135-140	+3
Tottenham and Edmonton, Original.	11-13	11-13	—

WATER COMPANIES.

Chelsea, Ordinary	235-240	248-253	+12½
East London, Ordinary	188-192	193-197	+4
Grand Junction	119-124	120-124	+3
Kent	253-258	267-273	+14
Lambeth, 10 per cent. maximum	234-239	250-255	+16
Do. 7½ per cent. maximum	183-187	197-202	+15
Do. 4 per cent. Debenture Stock	112-114	117-120	+5
New River, New Shares	330-330	347-352	+24
Do. 4 per cent. Debenture Stock	115-121	122-127	+7
Southwark and Vauxhall, 10 per cent. max.	158-162	155-160	-2
Do. 7½ per cent. maximum	150-155	151-156	+1
West Middlesex	253-258	264-269	+11

COAL FORMATION.—As a contribution to the study of the formation of coal, M. Spring (in a recent number of the *Bulletin de la Société Chimique de Paris*) deals with the proportion of carbon and hydrogen contained in coal-schists. He maintains that the formation and preservation of a coal rich in gas can only have occurred when it was sufficiently protected against atmospheric agencies. The many varieties of coal owe their origin probably rather to the unequal manner in which they have been protected against slow combustion, than to a difference in the kinds of vegetation from which they are derived. Even in our epoch the fattest coals give the most abundant escapes of "fire-damp;" and the presence of this gas under high pressure is certain evidence of the impermeability of the rocks in which this coal has been shut up.

THE ELECTRIC LIGHTING SCHEME FOR BIRMINGHAM.—The Town Clerk of Birmingham has received formal notice from the solicitors of Messrs. Chamberlain and Hookham of the intention of the latter gentlemen to apply to the Board of Trade during the present year for a Provisional Order to authorize them to supply electricity for public and private purposes within the municipal area. The present intention of the promoters is to embrace an area comprising New Street, Colmore Row, Bull Street, and High Street; the current being supplied from Messrs. Chamberlain and Hookham's works in Bartholomew Street. If applications are received for the electric light from persons outside this radius, the area will be extended. The system to be used will, it is stated, supply a continuous current of electricity; and at the central station there will always be a large storage force in reserve, so as minimize risk of a failure of the light.

ELECTRIC LIGHTING MEMORANDA.

REVIVAL OF INTEREST IN PROVISIONAL ORDERS FOR ELECTRIC LIGHTING—THE GROSVENOR GALLERY COMPANY AND THEIR STOKERS—THE MAXIMUM EFFICIENCY OF ELECTRIC LAMPS—THE AFFAIRS OF THE PILSEN-JOEL COMPANY—AN AMERICAN ADVERTISEMENT OF THE BOSTON EDISON COMPANY.

It is impossible to say whether the movement is meant seriously or not; but it is a fact that notices of intended applications for Provisional Orders under the Amended Electric Lighting Act are beginning to fly about the ears of various local authorities in different parts of the country. The Metropolitan Board of Works have received intimations of this nature from three parties, only one of whom—the South Metropolitan Electric Supply Company, Limited—is known by name to us. The two others are styled the London Electric Supply Corporation, Limited, and the Westminster Electric Supply Corporation, Limited. The similarity between the names of these two concerns is to be noted, as it is probably a sign of other relationship. The Alliance and Dublin Consumers' Gas Company have served a notice upon the Dublin Corporation of their intention to apply for a Provisional Order authorizing them to supply electricity within the municipal boundaries of the city of Dublin. A conference has been arranged for in London, at which representatives of the Corporation were to meet the representatives of the Gas Company, with a view to discussing the subject. No intelligence of the result of this meeting has yet been made public. Something has been heard also of a proposed statutory electric lighting experiment at Nottingham. It is quite possible that the passing of the Electric Lighting Act Amendment Act may give an impetus to speculation in this direction; but local authorities, having got over the violent agitations into which they were thrown by the swarms of similar notices issued by electrical speculators in 1883, are not likely to be seriously disturbed thereby. The issue of notices may mean business now, although it did not in 1883; but time will show.

The electrical press continues to notice the tempest in the Grosvenor Gallery teapot, to which we have already referred in this portion of the JOURNAL. It now appears, on the showing of the stokers, that they did not, as alleged, strike work and plunge the district into darkness because they were asked to eat cold beef when they expected hot meat. There seems to have been some unpleasantness between several of the men employed at the station and their superiors; but it was nothing more than occasionally happens in the best regulated factories, and is now declared to have had nothing to do with the hitch in the Grosvenor Company's lighting. What was the actual cause of the breakdown in question is now uncertain; but it is the opinion of the *Electrical Review* that "the stokers have been made the scapegoat of one of the little bangles, which, unfortunately are neither few nor far between at this West-End central station." It will be very funny if the conductors of electric lighting stations, whenever these become general, follow the fashion set by the Grosvenor Gallery people, of inventing comic explanations of their difficulties. The cold meat excuse can hardly be made to serve twice. Next time we may hear that the machinery had to be stopped because the man who attends the dynamos went out to get his hair cut. There is plenty of scope for the imagination in this direction.

Mr. John W. Howell read a paper on the maximum efficiency of incandescent electric lamps before the last meeting of the American Institute of Electrical Engineers, the object of which was to set forth the principles upon which these lamps can be worked to the best advantage. It is easy to perceive that, when the cost of current is high and that of lamps low—especially when in the latter case cheapness is combined with good lasting quality—it is desirable to work the lamps at a high incandescence. On the other hand, if lamps are dear and poor, and current is cheap, high incandescence is not advantageous; but economy is to be found in sparing the lamps at the expense of a little more current. There is, however, a limit at which the cost of lamps must be made to follow the cost of current; and accordingly Mr. Howell lays it down that the cost of lamps should never vary widely from 15 per cent. of the total working expenses of an electric light station. It is, therefore, comparatively easy to ascertain, when the accounts of such stations are published, if they are being worked at the maximum efficiency, since all that is necessary is to deduct from the gross expenditure on revenue account the bills for new lamps; and if these do not amount to about 15 per cent. of the whole, the station is being mismanaged somehow. Dr. J. A. Fleming allowed in 1885 that the lamp charge might be 17.4 per cent. of the whole working expense of a station; but matters appear to have altered in this respect, at least with regard to American lamps.

The Pilsen-Joel and General Electric Lighting Company held an extraordinary general meeting recently, at which the Chairman made a long statement explanatory of the position of the concern. In March last it was recognized that the condition of the Company was desperate; and the Directors accordingly proposed that a call of 5s. per share should be made for the purpose of carrying on the business, at the same time that the capital was to be reduced with a view to the possibility of declaring a dividend. The shareholders, on being appealed to, were disinclined to advance any more money; and, litigation being threatened, the Directors were compelled to make a small call, and also to take steps for disposing of the business of the Company. The course finally adopted was to arrange for the disposal of the concern to a syndicate in which Messrs. Woodhouse and Rawson appear to be interested; and it was this arrangement that was submitted to the proprietors at the recent meeting. The proposal did not satisfy the meeting; and in the end a resolution was carried which practically directed

the Board to reconsider the matter, and joined with them several prominent shareholders in a consultative capacity. It does not look as though the unfortunate Pilsen-Joel Company, any more than the Maxim-Weston concern, is destined to survive into the good time which, thanks to Parliament, is supposed to be dawning upon electricians in general.

Advertisement is tolerably rampant in the United Kingdom, but it is nothing here to what it is in the States. Read for example what the *Daily Graphic* has to say of the management of the Boston Edison Electric Lighting Company. "It takes a bright, quick, active, and pushing man to do what Samuel Insell, Superintendent of the Edison Machine-Works at Schenectady, did in Boston the other day. There was a big fire at the Hub of the Universe, and the station of the Edison Illuminating Company was swept away by the flames. Darkness hovered over the places where from 8000 to 10,000 electric lights had kept bright as day. Mr. Insell happened to be in the city, and he sat down with a telegraph operator while the wires were singing and warm between Boston and Schenectady. It needed quick work; and the work was done. From the Schenectady factory the necessary machinery and appliances were run out and sped on their way to Boston. Then Mr. Insell met them, and, with a swing and energy that made conservative old Boston burn, he put the plant in place; and next night the city lay down to rest in all the glory and radiance of the new-made light." Where be your *Daily Telegraph* writers now? If this is not "graphic" writing, where can such be found? A tame English reporter would have been contented to write that the plant of the electric lighting factory in Boston having been destroyed by fire, fresh plant was telegraphed for, and and set to work by the next night. Such is evidently not the spirit in which an American reporter understands his opportunities. One can feel the slow music with which the monologue description of the great city enveloped in darkness—for the want of a few thousand electric lamps—should be put upon the stage. Then Mr. Insell appears in the character of the Spirit of Light (clarions and drums); and the city "lies down to rest" in artificial daylight once more. Why the city wanted the glorious light to go to bed by must remain a mystery. Surely a tallow candle would have served for that purpose? However, it is a fine bit of writing, and one is tempted to ask of the subject of it whether it cost him much.

THE GLASGOW INTERNATIONAL EXHIBITION.

SIXTH ARTICLE.

IN accordance with the intimation given a fortnight ago, we now proceed to make some remarks regarding the gas cooking and heating appliances in use in and about the Glasgow Exhibition; dealing first with the "installation" in the extensive kitchen connected with the Bishop's Castle Refreshment Rooms. In this kitchen Messrs. R. and A. Main have fitted up two large "Kilburn" gas-ranges, which are together capable of roasting as much as 600 lbs. of meat at one time. Besides this, these ranges are fitted with seventeen powerful boiling-rings on the top. Near by, there is a large double griller, which is capable of grilling 40 steaks or chops at one time. It is divided into two compartments to work together or separately, as may be required. The top of the griller is fitted up as a cutting or carving table. There is also a large carving table which contains recesses underneath for joints, &c., and a hot closet for warming plates. This carving-table, which is 17 feet in length, stands in the centre of the kitchen, and is fitted complete with copper gravy dishes at the back. The hot closet is provided with four sliding-doors, and is capable of heating a great number of plates at one time. Alongside the carving-table there is a large hot-plate with hot closet, which is used for keeping and serving hot pastry, &c.

A special feature of the Bishop's Castle kitchen is Messrs. Main's new baking oven. It is 3 ft. 8 in. square, and is used for baking the fancy tea bread, light pastry, &c. We ought to remark in reference to this oven that it was specially designed and constructed by Messrs. Main for the Glasgow Exhibition. For soups there is a large stock-pot, which has a powerful gas-heater underneath. Its capacity is about fifty gallons. For cooking potatoes, Messrs. Main have made a large steamer which is heated by gas. In it there are provided six oval steaming dishes, each of which is capable of cooking two stone of potatoes at one time—the total capacity being 1½ cwt. of potatoes. For boiling large quantities of vegetables, hams, fish, &c., and for doing general work, there have been fitted up three gas-heated boilers, all containing wire cages and drainers. Then, again, for ordinary boiling work, there is a large boiling-table, having spaces underneath for drying plates, &c. The hot water required is supplied by one of Foulis's patent automatic circulating water-heaters, and is drawn from large copper tubes into the various sinks for scullery purposes. For making tea and coffee, there is a quantity of miscellaneous apparatus, all of which is heated by gas. The kitchen is very commodious; and it is probable that this is the first instance in which cooking has been done on such an extensive scale entirely by the use of gas as the heating agent. The whole of the apparatus has given the most satisfactory results, notwithstanding the severe test to which it has been put. The contractors for the refreshments in the Bishop's Castle Dining and Tea Rooms, deserve great credit for their enterprise in resolving to carry on the work of such a large kitchen by the exclusive use of a gas "installation" for cooking and heating; and Messrs. Main, to whom the work of designing and fitting up the "installation" was entrusted, also deserve a meed of praise, as they have most ably demonstrated the advantages of using gas as the heating agent

under somewhat peculiar circumstances. In view of the forthcoming annual meeting of the North British Association of Gas Managers in Glasgow, we would suggest the desirability of provision being made for the members inspecting the arrangements of this kitchen on the occasion of their visit to the exhibition. They would certainly be much interested. It may be mentioned that the cost of the gas consumed in this kitchen during the season is likely to amount to £700 or £800.

What are known as the Working-Men's Dining-Rooms, situated at the north-west corner of the Machinery Court, are also worked on the same system as the kitchen just passed under notice. The kitchen is likewise furnished with one of Messrs. Main's large "Kilburn" gas-ranges, with boilers on the top. The installation in this case likewise embraces two of the same firm's "Universal Domestic" gas-cookers, No. 5; and there is, in addition, a large double grill and carving table similar to that supplied to the Bishop's Castle kitchen. In the tea-rooms fitted up close by the Women's Industry Section of the Exhibition, and worked by the Committee of the Glasgow School of Cookery, gas is also used as the heating agent. There are two large hot-closets for infusing tea; and each of them has a baking-plate on the top. There are, in addition, two baking-plates for fancy tea bread, &c. The other appliances include a "Foulis" hot-water circulating apparatus and two boilers, which are heated by gas. This installation, like the other two just dealt with, was fitted up by Messrs. Main. The Bodega bar and luncheon department has been furnished by the same firm with one of Foulis's automatic water-heaters (to which there is attached a 50-gallon copper tank), and a double grill and hot closet, with boiling-burners on the tops. At Messrs. Gray, Dunn, and Co.'s stand, located in the Machinery Court, one of Messrs. Main's "Universal Domestic" cookers is in use to illustrate the process of biscuit-baking; and at adjacent stand, Messrs. R. and A. Scott, Limited, of Glasgow, have in constant use two large hot-plates, supplied for the same firm, for baking the famous Midlothian oat-cakes.

Throughout the exhibition there are heating appliances in use of a miscellaneous character which are nearly all employed in processes that are being illustrated to the visitors. At Messrs. Kirkland's Indian Tea-Rooms, which have now become a prominent feature of the exhibition, a number of Fletcher's boiling-rings are employed for heating water for tea-making and cleaning purposes. At the two kiosks in the grounds, boiling-rings are also in use; and at the Ceylon Tea Company's Refreshment Rooms, also in the grounds, there is in use one of Messrs. Main's hot-plates. The heating operations at the Old Dutch House, where Messrs. Van Houten and Son, dispense their cocoa, one of Fletcher's multitubular burners is employed. In the Machinery Court, there is also a stand where the manufacture of cocoa, chocolate, bon-bons, and other fancy articles is carried on; the grinding-mill being heated by gas. At two adjacent stands, gas is also used in connection with hot-plates, &c., employed in the making of confectionary goods. Messrs. R. and J. Dick's extensive stand for manufacturing gutta-percha goods affords an example of the use of gas-fires for providing the necessary heat which the workmen require in their operations. Mr. S. Wright pursues, at his stand in the Machinery Court, the process of barrel-making by machinery; and one of his important requisites is heat for bending the staves. This is obtained by the use of a group of Bunsen burners. Within the exhibition buildings, there are two stands at which hat-making and hat-dressing operations are carried on, at both of which recourse is had to gas iron-heaters. Ironing appliances and washing-machines in action are also shown, which owe their utility in great measure to the employment of gas for heating.

PRESENTATION TO MR. W. W. MONK, OF BOURNEMOUTH.—On Saturday, the 30th ult., an interesting presentation was made at the Bournemouth Gas and Water Company's works, to Mr. Walter W. Monk, who has occupied the position of Engineer of the Company for the past nine years, and is about to retire from the service, having accepted a position as representative at Melbourne of the firm of Messrs. C. and W. Walker, of Donnington. The testimonial consisted of a purse containing 32 sovereigns, and an album with views of Bournemouth; including the Company's works and a photographic group of the South-West of England District Association of Gas Managers, who assembled at the Winter Gardens, Bournemouth, a few years ago. The title-page of the album bore an illuminated address. The presentation was made by Mr. A. Newton, who said he had been asked on behalf of the *employés* of the Company and a few friends to present to Mr. Monk a small token of their esteem on the occasion of his relinquishing an appointment which he had filled for so long and with so much ability. On leaving Bournemouth, Mr. Monk could take with him their very best wishes for his future health, happiness, and prosperity. Mr. Monk, in returning thanks, said it was a great gratification to him to know that he was so highly esteemed by those among whom he had laboured for a number of years, and whose interest he had always had at heart. He hardly knew how to express his pleasure; for, in addition to the handsome present which they had made to him, they would no doubt be pleased to hear that his Directors had recognized his services in a most generous manner. Having referred to his work at Bournemouth and to his future duties in the Antipodes, he thanked his friends for the good wishes they had expressed, and assured them that he was leaving Bournemouth in no discontented spirit, but with a light heart, and with a bright prospect before him. Mr. Monk's health was then proposed, and very heartily received.

THE VENTILATION OF GAS-LIGHTED ROOMS.

A SUGGESTION.

THE subject of the ventilation of inhabited rooms, taken in conjunction with gas lighting, received merited attention at the recent meetings of both The Gas Institute and the Société Technique du Gaz en France. It formed the principal question submitted for the competitive studies of the members of the French Society, who were stimulated in the task by the offer of a substantial premium of £40 for the best paper. Notwithstanding this inducement, however, only one paper was submitted in competition, and even this was not regarded as worthy of the full prize. The author—M. Charles Pot—was accordingly solaced by an award of half the proffered amount, in order that he might be encouraged to continue his study of the subject, and as a testimony to the interest attached by the Société Technique to the general question. When M. Pot's paper is published (which will probably not be until the volume of the Transactions of the Society is issued), we shall be better enabled to form an opinion respecting its merits than can now be done from the curt synopsis of its scope which has come to hand in the report of the Committee that made the award. From the observation that "the author had not sufficiently investigated the data constituting the basis of his work," although he is credited with having "made intelligent use of well-known rules and formulæ," we are, however, inclined to expect that the paper is likely to turn out a distinctly booky performance, not qualified to advance one's knowledge of the subject to a very appreciable extent. It is only a matter of access to the text-books, and of application during a few evenings of leisure, to put together an "intelligent" paper on ventilation, in which well-known formulæ and old data shall be dressed up in a passingly acceptable fashion. The cause of ventilation will not be advanced in this way, however, but only by new triumphs of practical application in those directions where difficulties appear most insuperable.

Mr. John Somerville's paper at The Gas Institute meeting was somewhat diffuse for reading aloud; but it forms interesting matter for private perusal. Mr. Somerville said a good deal round and about ventilation; but the real purpose of the paper was to describe the dispositions whereby the author has succeeded, as he claims, in ventilating a newly-built dwelling-house. It is with reference to this point that the paper must be judged. The author's description of, and reflections upon other branches of his subject are comparatively unimportant. If, as he contends, he has ventilated a dwelling-house by natural means so perfectly that in rooms lighted by open gas-burners there is only a difference of 7° between the temperatures taken at distances of 1 foot from the floor and 1 foot from the ceiling, he has done well; and the paper describing the means whereby such a remarkable result has been obtained must be regarded as a valuable addition to the Transactions of The Gas Institute. In using the conjunction with which the last sentence begins, we do not mean to cast any doubt upon Mr. Somerville's results, but only to indicate their extreme importance. Such a record of the effect of natural ventilation is quite unprecedented, and one cannot help wishing that some independent authority in this matter of ventilation would look into them, and institute a series of check observations. The issue is quite important enough to warrant this inquiry.

It will be noticed that Mr. Somerville's plan is simplicity itself. He has a modification of the Tobin tube for the admission of air—the modification being of the essence of the design. Air, admitted at the bottom of a rising channel formed in the brick-work of an outer wall, enters the room very near the ceiling; the point of discharge being guarded by an angular flap-valve. On the other side of the room, in the chimney-breast, and also near the ceiling, is an outlet leading into an air-shaft carried up alongside the smoke-flues, and terminating like them in a chimney-pot outside. That is all. With this simple means, the temperature of the upper portion of the apartment is kept low, notwithstanding the free burning of gas for lighting, by the constant flow of fresh air from the inlet to the outlet, which carries away all the products of combustion and respiration.

One would like to be sure, with reference to this very remarkable bit of house ventilation, whether it always works equally well in winter as in summer; whether there is ever any back draught from a reversal of the current in the outlet flue; and what influence the burning of a brisk open fire in the grate has upon the ventilating currents. The latter question is partly answered by Mr. Somerville's own statement that the rooms are warmed by Barnard, Bishop, and Barnard's slow-combustion grates, which probably make a different demand upon the air supply of a room to the old-fashioned "slam-register" in general use. We incline to the opinion that in most cases, whatever the kind of grate used, a special air supply for the fire must be provided if there is not to be occasional trouble with the general ventilating arrangements through reversal of air currents. Atmospheric conditions vary so much that it is almost impossible for any system of ventilation depending upon natural draught to be preserved from occasional disturbance; but, of course, a little difficulty now and again would not weigh very heavily against a high average of success such as is witnessed to by Mr. Somerville's figures. A valuable part of the paper contains the directions of the author for the establishment of a ventilating system like his own in old houses; from which it would appear that the expense of such an improvement could not be very great if undertaken at the usual time of repainting, papering, and "spring-cleaning." We hope to hear that this good idea has been followed by other engineers bent on showing a good example in this

matter. One or two well and cheaply ventilated houses in a town cannot but have a great "missionary" influence.

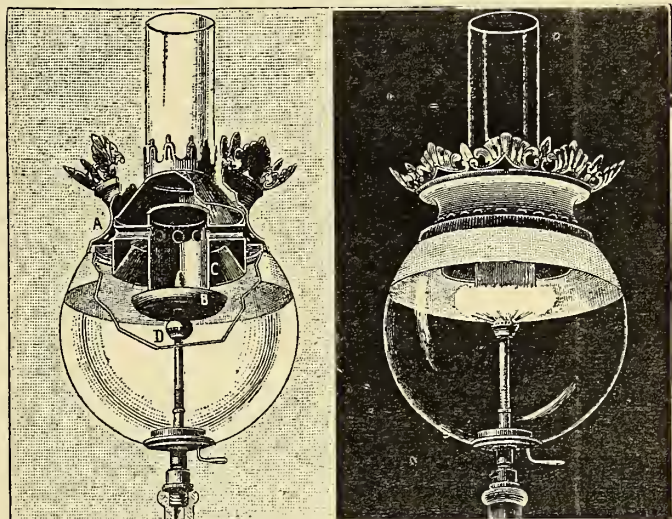
And now we have a suggestion to offer, which The Gas Institute may or may not think fit to adopt. Some years ago—and the custom may be yet in existence—it was the practice of the Sanitary Institute or the Society of Arts to offer premiums for the best examples of household sanitation, precisely as agricultural societies offer prizes for the best cultivated farms. Why should not the same course be pursued with regard to ventilated and gas-lighted apartments? If it is sometimes advisable to offer premiums for papers upon defined subject, it is certainly reasonable to award prizes for the practice of advice given in papers. What is wanted now in connection with the question of ventilation is not theorizing or the application of formulæ to supposititious examples, but examples of well-ventilated houses. We suggest, therefore, that a special fund should be formed by donations from gas companies and individuals interested in this subject, just as was done for the support of the research work of the Institute, which seems to have come to a sudden stop for the want of a programme. From this fund a prize of (say) £50 should be offered for the best example of a ventilated, gas-lighted house in any part of the kingdom, with £20 as a consolation prize for the second, and £10 for the third. It should be a condition of the competition that the designers of the competing systems should prepare illustrated descriptions of their work and its results, to be read, if so required, at the next ensuing Gas Institute meeting, and in any case to be published in the Transactions of the Institute. The source of every such design should be acknowledged, if not original; and the Committee might be empowered to make any division of the prizes that they deem equitable between the actual author of any design and the competitor who has merely carried it into effect. It should not be the object of the competition to force a misleading appearance of novelty in connection with any application of published principles; and the Committee would not divide a premium unless the indebtedness of the adaptor to the original designer was very obvious. The idea should be to recognize in the fullest degree the successfully ventilated house, without depriving the builder of his reward out of too scrupulous respect for the success of his inspiration. After taking note of what the designers or adaptors of the various systems had to say for themselves, the Prize Committee would make a provisional selection from those submitted to them, to be tested in any required way by independent examiners according to some predetermined standard. The principal elements of such a standard are not difficult to imagine. It should be required, in the first place, that the competitors' own claims and tests should be verifiable upon independent examination. Secondly, the degree to which the requirements laid down by the Committee respecting differences between ceiling and floor temperatures, absence of draughts, proportion of carbonic acid in the contained air of rooms, and so forth, might be fulfilled, should be ascertained by independent testing. Then the questions of cost and facility of application of these systems should be taken into consideration. Speaking generally, preference should be shown for systems which dispense with patented specialties of all kinds. It would not be difficult to procure a couple of practical examiners anywhere in the Kingdom who could be trusted to make a reliable test of any specimen of house ventilation submitted to them, provided that their attention was called in the first place to the points requiring investigation. An architect and a chemist would constitute a good pair of examiners into matters of this kind. A couple of years, and the expenditure, in premiums and expenses, of (say) £100, would go far to establish something like a standard of house ventilation, the observance of which could not fail to be beneficial to the community, and particularly to that portion of it which is directly interested in removing from lighting the stigma of unhealthiness, which is so recklessly thrown by its enemies upon this system of artificial lighting. The suggestion herein is, of course, crude; but perhaps sufficient has been said to prove that something more than the composition and publication of papers on ventilation is needed if that which everybody desires in connection with the subject is to be obtained. House ventilation is no promising field for patented specialties, and it will therefore be left unexploited by those whose interest in the subject is solely commercial. It is for this reason that we advocate the giving to practical efforts in regard to the ventilation of gas-lighted room of some such fillip as the premium contemplated in this article would probably impart. The thing could easily be done if one or two public-spirited engineers would take it in hand.

By the appointment of Mr. W. R. Chester, Manager of the Bradford Road Gas-Works of the Manchester Corporation, in succession to Mr. Lewis T. Wright, Assoc. M. Inst. C.E., as General Manager of the Nottingham Corporation Gas Department, a vacancy is created on the technical staff of the great Lancashire gas undertaking. Mr. Chester went to Manchester about eight years ago from the Vauxhall works of the South Metropolitan Gas Company, where he was assistant to Mr. P. J. Wates; and after being engaged at the new Rochdale Road and other works of the Corporation, he was finally appointed to superintend the Bradford Road station. Mr. Chester's antecedents therefore seem to render him specially suitable to take charge of the important works which Mr. Wright has conducted with so much ability; and there can be no reason to doubt that in his hands they will continue to furnish a very substantial amount of profit to their owners.

Notes.

THE LEBRUN REGENERATIVE GAS-LAMP.

The accompanying illustration represents the external appearance and the internal construction of a gas-lamp of the recuperative type designed by M. Lebrun, and recently described in *La Nature*. It is somewhat similar to the Danishevski lamp in general appearance, owing to the fact that the regenerative fittings are suspended over the flame, and that the necessary draught is obtained by means of a glass chimney. The gas is led into the interior of the globe through the pipe D, which is terminated by a radial burner. Over the burner hangs a closed cylinder C, the lower part of which B is perforated with a great number of small holes, while the upper portion communicates at A with the outer air, by means of a number of radial tubes. The top of the glass globe is closed by a metallic crown, between which and the glass there is a packing of asbestos to make an air-tight joint. There is



a hole in the bottom of the globe, which is opened for lighting the burner, and closed at other times. The working of the lamp is now easily understood. When the burner is lit and the globe closed, the contained air is heated, and escapes by the chimney; the draught thus produced drawing the external air through the tubes A into the cylinder, whence it escapes by the lower holes, and immediately combines with the burning gas, rendering the combustion complete and brilliant. Three patterns of these lamps are constructed, of 4, 9 and 16 Carcel power respectively; the consumption of gas per candle being given as 39, 33, and 32 litres per hour in the different sizes of lamps. The Lebrun lamp is described as burning well, with a white and steady light.

A FLAMELESS CARBON LAMP.

At a recent sitting of the Académie des Sciences, M. Hirn exhibited a flameless lamp. It is commonly known that platinum heated in a stream of hydrogen with atmospheric contact will preserve its incandescence as long as the conditions remain unaltered; and in this lamp of M. Hirn the same phenomenon is produced by carbon instead of platinum. The discovery of the principle of the new lamp was made accidentally. Requiring to extinguish a spirit lamp, and having for this purpose covered the wick with the usual glass extinguisher, M. Hirn noticed that the point of the wick remained in a state of ignition. He thereupon removed the glass cover, and the carbonized cotton remained red for nine hours. Upon this principle an incandescent carbon lamp has been constructed; and although the light emitted from the glowing wick is, of course, insignificant, the phenomenon is interesting, and may lead to renewed attempts to penetrate the mystery of luminosity at low temperatures, which has puzzled mankind ever since the glow-worm was first remarked by a half-savage field naturalist.

THE PROTECTION OF BUILDINGS FROM LIGHTNING.

In the course of a lecture on the "Protection of Buildings from Lightning," delivered by Professor Oliver J. Lodge, F.R.S., before the Society of Arts, he remarked that the complete and certain protection of buildings from this special danger is by no means so easy a matter as the older electricians thought it, especially as it appears since the rise of the modern practice of running lines of metal piping for gas and water inside houses. If any such conductor as a gas-pipe passes out of the building before being thoroughly connected with the walls, it is possible for a spark to pass from something in the interior of the edifice to this conductor whenever a flash strikes the building. In many cases it may be well to rest content with something less than absolute security, and to be satisfied with the probable safeguard of a common galvanized iron rod or rope. For tall and important buildings, isolated chimneys and steeples, and powder magazines, Professor Lodge was reluctant to advocate anything that might be taken as a nostrum, and so conceal the principles involved. He declared his preference for a number of lengths of common telegraph wire; thinking a large number of thin wires preferable to a single thick one. The capacity of such conductors must be in-

creased whenever possible by connecting up large metallic masses, such as lead roofs, &c.; the connection being thorough, and made at many points, to prevent sparks. The earth connection should be deep enough to avoid damage to surface soil, foundations, and gas and water mains. As to the roof, barbed wire should be run all round the eaves and ridges, so as to expose innumerable points; and the highest parts of the building must be specially protected. But Professor Lodge would not run any rods above the highest point of the building, so as to precipitate flashes which might not otherwise occur, in search for a delusive area of protection which has no existence.

A NEW WATERPROOFING LIQUID FOR BRICKWORK.

According to the *Mittheilungen des Bayrischen Gewerbe Museums*, walls of houses and buildings exposed to wet may be satisfactorily treated with a solution of paraffin in heavy coal tar oil. It is reported that a number of experiments on damp walls with this preparation have yielded very good results. Papered walls, which formerly in wet weather showed dampness, gave no traces of damp after the external application of this remedy. The solution is prepared by dissolving, at a moderate heat, one part of paraffin in from two to three parts of coal tar oil. Care must be taken to use sufficient oil, so as to prevent the mixture from becoming sticky after cooling; at the same time it must not be too thin. In order to keep the solution liquid during use, it must be kept in a vessel standing in hot water. A couple of glue pots, one being warmed over the fire while the other is in use, would be a good means of keeping the preparation in good condition while in course of application. If possible, the painting should be done during hot days, when the bricks or stone of the wall are very dry and absorbent. One application is sufficient; and the cost of the preparation is very moderate.

Technical Record.

SOCIÉTÉ TECHNIQUE DU GAZ EN FRANCE.

THE PAPERS AT THE BOULOGNE CONGRESS.

In the general notice of the proceedings at the recent congress of the Société Technique du Gaz en France which appeared in the *JOURNAL* for the 12th ult., a list was given of the papers presented on the occasion. We are now in a position to make our readers acquainted with the nature of the various communications, from the abstracts which have just been published in a special number of the *Journal des Usines à Gaz*.

Dealing first with the prize paper of the year—"The Ventilation of Dwelling-Houses and other Buildings Lighted by Gas"—which has already been briefly referred to, the author (M. Charles Pot) has divided his subject into two parts. In the first, he has examined the general conditions of ventilation—dwelling particularly on the use of high-power recuperative gas-burners; in the second, he has applied to the ventilation of a dwelling-house, a workshop, a school, theatres, and a tenement building, the principles laid down. Having defined the principle of ventilation, the author determines successively the quantities of air consumed and the amounts of heat generated by human beings as well as by various systems of lighting. He then enters in detail into the circumstances of the ventilation of localities illuminated by gas; explaining the action of recuperative lamps, and recapitulating propositions previously laid down by another member of the Society. He cites his own personal experience on this matter; and shows that if the light of one Carcel (say, 9.5 candles) is obtained with the consumption of 33 litres (1.15 cubic feet) of gas in a recuperative burner, as laid down by M. Coindet, it must be reckoned that at the distance of a metre the temperature of each cubic metre of ventilating air is raised, at the expiration of an hour, to the extent of 0.0077°C. per Carcel. The author next gives some results taken from the report of Dr. Renck on the ventilation of the Salle Royale of the Odéon in Munich. In a full room, by the aid of recuperative burners on Grove's system, the temperature did not increase more than from 4° to 5° C.; while the proportion of carbonic acid did not rise beyond 0.186 per cent. The author specifies the conditions under which the withdrawal of the vitiated air, the introduction of fresh air, and the hydration of the air should be effected; and closes the first portion of his paper by quoting from the report of the Commission on Hygiene of 1887 and the works of Dr. Tavignat (1858). Having stated his principles, the author, in the second part of his work, proceeds to apply them in connection with the ventilation of the various places above enumerated. Among the cases studied, the one which deals with the lighting and ventilation of a workshop 1050 square metres in superficial area and 4 metres high, occupied by 20 men, and lighted by 12 recuperative lamps (each of 16-Carcel power, and giving the light of one Carcel with a consumption of 33 litres of gas per hour), and that which has reference to the ventilation of various modern theatres, must be regarded as the most interesting. Such, in its broad outlines, is M. Pot's communication. The number of our French contemporary from which the foregoing particulars are taken contains the criticisms of the Committee of the Société Technique upon the *mémoire*; but it will, perhaps, be more convenient to deal with these in connection with a fuller notice of the paper which we hope to give when the full text has been published.

The first ordinary paper was on "The Most Practical Means of Developing the Consumption of Gas;" the author being M. Melon. He referred at the outset to the system of differential prices which is now in force in Brussels, and which is, he

maintains, making its deplorable consequences felt year by year. The author is a partizan of the system of a sliding scale of charges according to the total annual consumption of gas. He dwelt on the necessity imposed upon gas companies of looking after customers, and facilitating the use of gas by them by offering to lay on a supply on the simplest and least costly conditions. M. Melon alluded to the particulars given by Mr. T. Duxbury, in the course of his address, at the meeting of the Manchester District Institution of Gas Engineers in March last, as published in the *JOURNAL* at the time, and used them as a basis for the discussion of the various reasons adduced against the introduction of gas into apartments. He expressed the opinion that deposits should be abolished when the consumer is prepared to offer an adequate guarantee; that meters and fittings should be let on hire at the very lowest figures; and that accounts should be collected monthly, fortnightly, or even weekly in the case of small consumers. In order to counteract the influence of petroleum and electricity, it would, he thought, be advisable to lay on a supply of gas gratis, on condition that the consumer would undertake, for a certain number of years, to burn only the company's gas, with an annual minimum consumption per burner. This system has been adopted at Lille; and the author submitted to the meeting forms of the various agreements into which a consumer could enter. He closed his interesting paper by remarking that the suppliers of gas were powerless to enforce the adoption of gas in every house; but they could all offer a gratuitous installation on the conditions he had indicated. He assured his colleagues that they had in their own hands the means of rapidly doubling the consumption of gas in all the towns lighted by them.

The next paper was on a similar subject, and dealt with the distribution of gas among the consumers. The author was M. Le Roy; and he took some statistics published in the *Journal des Usines à Gaz* in March last as a model for a case of a gas-works having a *clientèle* composed of ordinary consumers as well as tradesmen and manufacturers. It was, he said, curious to notice that, even in this case, the consumers who burn from 1 to 5 cubic metres per 24 hours represent 94 per cent. of the total number, and 44 per cent. of the entire annual consumption. Suppliers of gas had, he considered, a primary interest in popularizing the use of gas, and in increasing the quantity burned by small consumers who pay the full rate, and whose accounts do not produce a sufficiently large sum to tempt the electricians. The author was of opinion that gratuitous installations, if such were possible, or, at all events, installations at cost price, with deferred payment, and the loan of gas appliances at a reduced rate in view of the possibility of purchase during the first year, were excellent measures to be adopted for increasing the number of consumers. Altogether, the paper contained some instructive statistics.

The two latter communications were discussed together. Mr. H. M'Lauchlan Backler acknowledged the excellence of the principles laid down by the authors; but he thought that in each town the temperament of the consumers ought to be taken into account in selecting the method to be pursued towards them, so as to choose the one that would be most in accordance with the habits of the population. M. Jouanne cited the cases of Lisieux and Cherbourg, where installations of gas—comprising a service-pipe, meter, cooking-stove, and two ordinary burners—at a reduced price had led to a considerable increase in the number of consumers. In one year there was an addition of 600 at Lisieux, and of 1000 at Cherbourg. M. Alavoine considered the minimum consumption indicated by M. Melon (150 cubic metres, or about 5300 cubic feet, per burner) was rather high for many of the provincial towns; and consequently this was a matter that would require study in each case. M. Melon replied that his minimum agreed with the average consumption, and was borne out by the actual price of gas at Lille. M. Cornuault explained the measures adopted by the Marseilles Gas Company. They charged, he said, rentals of 1fr. 25c. and 1fr. 50c. per month for a service-pipe, meter, and some simple gas apparatus at the choice of the consumer. The public appeared to prefer the loan of fittings, &c., without entering into any undertaking as to consumption, to a gratuitous installation with such an undertaking. M. Léon said it would be necessary to distinguish, in the case of installations, between dealing with the landlord and with the tenant of a house. In towns where the population was a floating one, or where the residents removed from one part of the place to another, it would be advisable to deal with the landlord, in order to avoid loss. M. Cornuault cited a case in point in Barcelona, where the meters are fixed by the Company at the expense of the landlords, who let their apartments with the installation of gas. The various meters are located in a cellar; and each lodger has the use of one, but only pays the Company for the gas consumed. To a certain extent this system agrees with that adopted in Paris in reference to the supply of water in houses where there is a service on each of the floors. The landlord is the only person responsible to the Municipality for payment; and he recoups himself out of the rent for the apartments supplied.

The next paper was one bearing upon manufacture; the author—M. Charles Pot—taking as his subject the heating of retorts by means of blocks of compressed breeze, by ordinary breeze, or by coke. The chief points of interest in the communication were the particulars given by M. Pot as to his arrangements for the manufacture of the fuel-blocks. These are not reproduced in the abstract from which our notes are taken.

After this came a paper by M. Jouanne on M. Largeron's system for the suppression of the dip in hydraulic mains, which was described and illustrated in the *JOURNAL* for Jan. 24 last

(p. 150). In the discussion to which this paper gave rise, M. Le Treust questioned the advisability of suppressing the dip, whatever might be the system proposed. He considered it to be dangerous to draw off the gas directly from the retort; and gas engineers would, he said, readily understand the reason, without requiring him to furnish details. M. Jouanne remarked that it was always possible to keep a sufficient water-seal by means of the cup placed between the ascension-pipe and the hydraulic main. By raising this cup, the dip was immediately re-established. M. Le Treust said he had tried to dispense with dips, but had been compelled to abandon the idea owing to the great inconvenience it entailed. The President (M. Ellisson) closed the discussion by pointing out that the Largeron system did not present very great advantages, and might interfere with the manufacturing operations in the event of unskilfulness on the part of the workmen. In gas-works, it was of the very first importance to ensure the regular working of the various portions of the plant; and the most ingeniously contrived appliances should not be employed if they were not at the same time so simple as to allow of their being entrusted to ordinary workmen.

The two succeeding papers dealt with the purification of gas. One was by M. Melon, on the working of a Kirkham washer-scrubber; and the other by M. Alavoine on purification *in situ*. M. Melon's experiments were directed to ascertaining the extent of the absorption of ammonia and carbonic acid by the above-named apparatus. During the period in which the trials were going on, the gas was made exclusively from coal from the north of France. After flowing through a long foul main 30 inches in diameter, and passing an annular condenser, the gas reached the exhausters, and finally entered the washer-scrubber, the capacity of which was 25,000 cubic metres (883,000 cubic feet) per diem, and its speed from three to four revolutions per minute. The daily make of gas ranged from 20,000 down to 8000 cubic metres. Pure water was employed in the apparatus—the quantity introduced per 24 hours naturally varying with the make of gas; and it was arranged that the water in the last chamber should not show any indication on the Beaumé hydrometer. The ammoniacal liquor as it flowed from the apparatus had a strength of from 3° to 5° Beaumé (8 oz. to 13 oz.). In the various experiments the temperature of the water ranged from 46° to 57° Fahr. The temperature of the gas on entering the washer-scrubber ranged from 50° to 68° Fahr. Under normal conditions of work, the apparatus showed the following results:—On entering, the gas contained 0·95 gramme of ammonia per cubic metre; on leaving, 0·5 gramme—showing an absorption of 0·70 gramme. The quantity of carbonic acid in the gas on entering was 2·70 grammes per cubic metre; on leaving, 2·60 grammes—absorption, 0·10 gramme. When ammoniacal liquor was introduced into the first three or four chambers, the quantity of carbonic acid taken out of the gas rose to 0·40 gramme per cubic metre. As the gas was sent out for consumption containing 2·20 grammes of carbonic acid per cubic metre, the quantity taken out by the purifiers was only 0·10 gramme, or just one-fourth of the quantity removed by the Kirkham washer. In all the trials, the importance of the degree of temperature at which the water was put into the apparatus was noticed. The colder the water, the easier the absorption. It must be noted that in this series of trials the make of gas per 24 hours did not exceed 800 cubic metres or only about one-third of the maximum quantity for which the washer was constructed. A curious fact was revealed by the daily analysis of the gas. On several occasions the quantity of carbonic acid contained in the gas as used by the consumers went up suddenly from 2·20 to 2·80 grammes per cubic metre—an increase of 0·60 gramme, or 21·43 per cent. The tests made at the inlet to the apparatus at the same time showed a rise from 2·70 to 3·30 grammes in the quantity of carbonic acid contained in each cubic metre of gas. It was subsequently found that these sudden variations corresponded exactly with the extinction of one or more of the furnaces, during which the charges of coal had been gradually lowered in order to cool the retorts. M. Alavoine's communication gave an account of some observations made in a gas-works where 461,900 cubic metres of gas were purified with about 12 or 13 cubic metres of purifying material and 3 cubic metres of powdered lime, without change. Four-fifths of the material was revived *in situ*.

The remaining papers will be noticed in a subsequent issue.

THE COST OF THE WINDSOR WATER-WORKS ARBITRATION.—The total cost of the proceedings incidental to the transfer of the Windsor and Eton Water-Works to the Windsor Corporation was £3984 15s. 5d.

EDINBURGH AND LEITH GAS COMPANY.—The annual meeting of this Company was held yesterday afternoon. The Directors reported that the net profit on the year's transactions was £26,313. The cost of manufacture had been 16s. 9d. per ton of coal carbonized, compared with 22s. per ton in 1883, before the scheme of reconstruction of the works began. The saving effected by the new works had therefore been 5s. 3d. per ton, or £10,433 on 39,744 tons of coal used during the year. The quality of the gas had been 28·13 candles—being an increase since 1883 of 1·44 candles. The unaccounted-for gas stood at 7·63 per cent. The report was adopted; and it was also agreed to declare a dividend of 10 per cent. Subsequently, the agreement entered into with the Corporations of Edinburgh and Leith, for the transfer of the Company's property, was approved. A vote of thanks was accorded to the Directors for the able manner in which they had conducted the concern.

THE CITY AND GUILDS OF LONDON INSTITUTE LECTURES ON GAS MANUFACTURE.

As already intimated in our columns, a course of four lectures on "Gas Manufacture" will be delivered at the Central Institution of the City and Guilds of London Institute, South Kensington, on the evenings of the 17th, 19th, 23rd, and 24th inst., by Mr. Lewis T. Wright, Assoc. M. Inst., C.E.. The following is a syllabus of the lectures:—

1.—The coals employed in gas manufacture; their composition, properties, and characteristics. The distillation of coal considered as a chemical and mechanical operation; the range of temperature employed. Differences in the composition and properties of the resulting distillation products—viz., gas (with its impurities), coke, tar, &c.—with different coals and distillation temperatures. Distribution of the constituent elements of the coal among the distillation products. Differences in the quality of the gas at various periods of the charge. The extent to which the composition of the distillation products can be controlled by various systems of distillation. Apparatus employed: Retorts and settings; refractory materials; chimneys and flues; retort mouth-pieces; ascension-pipes; hydraulic main and retort-house fittings.

2.—The condensation or cooling of crude coal gas. Various types of condensers. The purification of gas from tarry matter. The removal of ammonia, considered chemically and practically. Various forms of washing apparatus; how far these attain their object. Gas purification by means of ammonia.

3.—The purification of gas by means of oxide of iron and lime. Various systems of gas purification, and their respective efficiency with regard to the three principal impurities—viz., carbonic acid, sulphuretted hydrogen, carbon disulphide. The theoretical considerations that most control economical practice. Gas-purifying vessels. Valves. Gas purification without nuisance. The storage and distribution of coal gas. Governors and gas-mains. Leakage. Service-pipes. Consumers' meters. Gas-burners and gas illumination generally.

4.—The arrangement of gas-works, and the design and cost of plant. The expenses incidental to gas manufacture, and the cost of producing illuminating gas.

MR. BRAY AND THE GAS INSTITUTE.—Last Friday another step was taken in the proceedings instituted by Mr. G. Bray against the Past-President (Mr. C. Gandon), certain members of the Council, and the Secretary (Mr. W. H. Bennett) of The Gas Institute, with the view of testing the legality of the vote taken at the recent meeting of the Institute on the question of his expulsion. The matter was brought before Justice Kay; but on the application of the defendants' Counsel (Mr. Renshaw, Q.C.), it was adjourned till next Friday, to allow time for answering the plaintiff's affidavits.

MR. W. CARR AND THE NOTTINGHAM APPOINTMENT.—Referring to this matter last Saturday, the *Halifax Courier* said:—"Mr. W. Carr, Manager of the Halifax Corporation Gas-Works, was one of the candidates for the post of Manager and Engineer of the Nottingham Corporation Gas-Works. Out of the total number of applicants, Mr. Carr was one of the two who were finally selected to go before the Gas-Works Committee of that town, on Thursday; the other one being Mr. Chester, of Manchester. Mr. Chester was ultimately selected, but Mr. Carr was informed that he would have had the appointment but for the allegations which were being made against the Halifax Gas-Works Department, and which were as yet, of course, *sub judice*. The Chairman expressed great regret that the Committee were not able, because of this, to recommend Mr. Carr to the Council; he being, in their opinion, the most eligible candidate. A resolution to this effect was placed on the Committee's minutes. The salary offered is £600 a year."

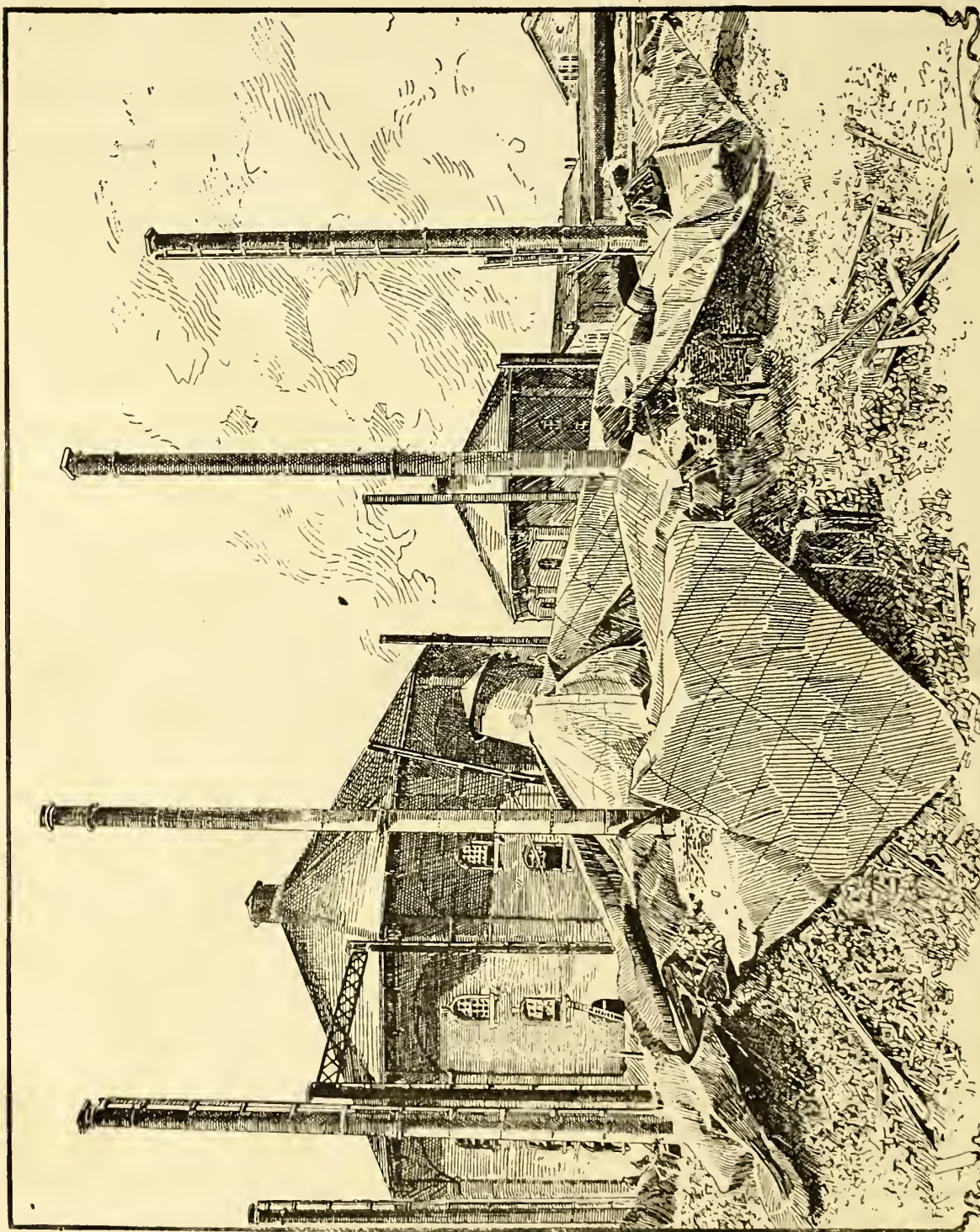
PRESENTATION TO MR. C. W. FOLKARD.—Last Thursday evening a number of the *employees* of the Brentford Gas Company assembled in the band-room attached to the works, for the purpose of taking leave of Mr. C. W. Folkard, the Assistant-Engineer (who, having been appointed Engineer and Manager of the Bournemouth Gas and Water Company, is retiring from the service of the Brentford Company), and of presenting him with a testimonial, consisting of a very handsome secretaire and purse, as a token of their respect and esteem. The Engineer and Manager of the Company (Mr. F. Morris) presided; and in a few well-chosen words, said they had met for the purpose of saying "Good-bye" to Mr. Folkard, and of wishing him success in his new home. He had also the pleasure of presenting him with the testimonial they saw before them, which had been subscribed for by his friends, brother officers, and the men employed on the works. Whilst congratulating Mr. Folkard on his appointment, he, personally, was very sorry to lose him; as the zeal and ability shown by him in the performance of his duties had relieved him (Mr. Morris) of a great deal of responsibility. Having specially referred to Mr. Folkard's work at Brentford, he concluded by saying he was sure he expressed the views of all present in most cordially wishing Mr. Folkard success in his new career, which he trusted would be as prosperous at Bournemouth as it had been at Brentford. Mr. Folkard, in reply, expressed his warmest thanks for the very handsome and useful gifts, which would, he said, be a lasting memento of his connection with the Brentford Gas Company. He assured those present that the eight years he had spent with them were among the happiest of his life; mainly due, he believed, to the uniform kindness of Mr. Morris and his brother officers. He also thanked them very much for their kind wishes for his future success. The proceedings, which were very harmonious, were brought to a close with a vote of thanks to Mr. Morris for presiding.

THE EXPLOSION AT THE MONTREAL GAS-WORKS.

In the JOURNAL for May 29 last (p. 964) we gave a brief account, obtained from press telegrams, of a serious explosion which occurred on the previous Saturday at the Hochelaga works of the Montreal Gas Company; resulting in the destruction of a large gasholder and the sacrifice of several lives. No additional particulars reached us till the arrival of the *American Gaslight Journal* for the 16th ult., which contained an article describing how the disaster occurred, and giving a summary of the proceedings at the Coroner's investigation. Through the courtesy of the Secretary and Manager of the Company (Mr. J. F. Scriver) our contemporary was able to give illustrations, taken from photographs,

of the wrecked holder; and from these the accompanying engravings have been prepared. The article was as follows:—

The engravings afford vivid pictures of the wreck of the double-lift holder, which was about to be finished by the Montreal Gas Company for the relief of their Elm Street station. The outer lift was 120 ft. 6 in.; the inner lift, 119 ft. 6 in.; each lift being 24 ft. 6 in. The entire structure was enclosed in a 16-sided brick building, covered in by an iron and steel roof. After many months of preparation, arrangements were being made on May 26 to test the holder. On this date water was turned into the tank. When the water had risen to a height of 10 feet, it was discovered that a serious leak existed somewhere in the masonry. The pumps



THE WRECKED HOLDER AT THE MONTREAL GAS-WORKS.

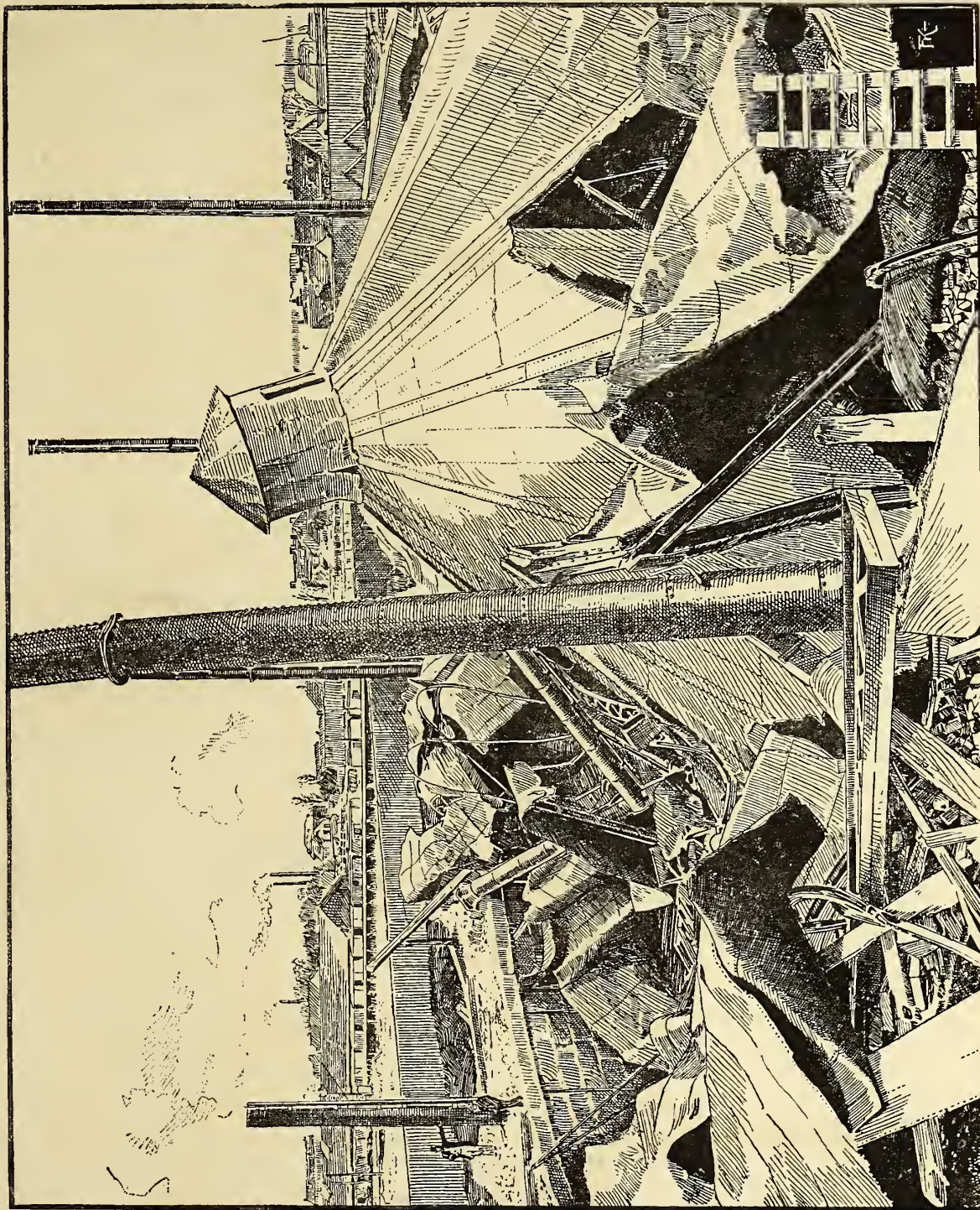
were started, and when three feet of water had been drawn off, the weak spot was located (the tank, however, was completely emptied) in one section of the wall. The puddled cone-shaped bottom was found to be perfectly tight. When the defect had been remedied, the operation of filling was again commenced, but had not proceeded to any extent before the Company's Engineer, in order to satisfy himself thoroughly as to the solidity of the bottom, ordered a stoppage of the flow, and instructed one of the fitters to remove two of the manhole covers, prior to his (the Engineer's) descent to make the desired investigation. The fitter (a known and tried hand of the Company, who had been in their service for twelve years), for reasons which will always remain undiscovered, evidently determined to make an inspection on his own account. Having removed only one of the manhole covers, he procured a ladder and an open lantern, and entered the holder. The terrible result of his fatuous course was the destruction of the inner lift of the vessel, the walls

and roof of the structure enclosing it, and the mangling to death of himself and four others, while five of his remaining fellows only escaped death to bear through their lives the scars of many wounds. No gas had as yet been turned into the holder, although all the connections had been made. The inlet valve (a 20-inch) was perfectly tight; while the outlet (a 24-inch) leaked slightly; but the pipes were said to be water sealed. Beyond a doubt the fitter and his comrades, including the Engineer, had no fear that gas had escaped into the holder; but such assurance is not to be allowed to go for anything in an attempt to extenuate the act of the unfortunate who with his life—and, worse still, that of others—paid the penalty of his rashness. We presume it is not necessary for us to here attempt to give an explanation of how the gas might have escaped into the destroyed vessel, for every engineer who reads these lines will form his own theory; and we have an idea that no great difference will exist in the nature of the opinion so formed.

The entire structure, from foundation to roof, stands the Company, in round figures, an expenditure of \$80,000; and experts who have since roughly examined the wreck say the net loss to the Company will not exceed 40 per cent. of this sum. The foundation and tank masonry, together with the outer lift, are practically intact, and a considerable portion of the inner lift and roof can be used again. In any event, we may add that, quite in keeping with the energy characteristic of the Company, they are already at work on the renewal of the destroyed structure.

The testimony taken at the coroner's inquest seems rather to add to the mystery of the affair than to take from it—that is, in respect to determining how the gas escaped into the holder. The

affirmation of R. Colquhoun, who was one of those seriously injured, and whose testimony was taken while he was writhing on his bed, is so graphic that we herewith present a summary of it. He testified that he had been in the employ of the Company for 17 years, and on the morning of the disaster was in the second gallery of the holder house, painting some of the heavy timbers in the gallery chambers. He saw Joseph Angell remove the manhole cover, being assisted in the operation by John Angell and S. M'Afee. When the cover had been removed, Angell ordered M'Afee to bring a lantern, and, this duty performed, M'Afee and John Angell lugged a ladder to, and placed it in the manhole. Angell then tied a cord on the lantern, placed himself on the top rung of the ladder



THE WRECKED HOLDER AT THE MONTREAL GAS-WORKS

and dangled the lantern down into the tank. Then, to use Colquhoun's own words: "When I saw him lowering the lantern I put both my hands to my face, for I had been long enough in a gas-works to know what to expect. The crash followed instantly; and the next thing that I remembered was finding myself on top of the tank, bricks and iron being heaped up all around me. Colquhoun's testimony would go to show that he at least of those who were on the premises at the time thought there was gas in the tank. Indeed, his action in putting both hands to his face is proof positive of his suspicion. The jury, after reviewing the evidence, returned the following verdict:—"We find that deceased came to their deaths from injuries received as the result of an explosion of a mixture of coal gas and air contained in a gasholder on the grounds and in a building the property of the Montreal New City Gas Company; and that the said explosion was caused by the introduction of a lighted lamp in the said gasholder by the late Joseph Angell, an *employé* of the said Gas Company, and one of the victims of the explosion. We further find that the said Joseph

Angell, in introducing the light into the gasholder, acted through ignorance and imprudence, and not from malice or with intent to do hurt or injury."

STEEL WATER-MAINS.—The Engineer of the Dundee Water Commissioners (Mr. J. Watson, M. Inst. C. E.) reports that since January last the supply of water to Newport has been given by gravitation, *via* the Tay Bridge. The steel main, 9 inches in diameter, laid along the new Tay Bridge a distance of two miles, was completed during the early part of the year, and was for some months subjected to hydrostatic pressure, and has been in constant work since January. Notwithstanding the constantly recurring vibration by train traffic, neither during testing nor in working has a single accident taken place in the metal or construction of the pipe; and repairs have been confined to some trifling leakages at the lead and expansion joints—principally the latter. On the whole, this work is proving very satisfactory, and for the purpose is much better than cast iron.

WESTERN (U.S.A.) GAS ASSOCIATION.

In last week's JOURNAL, we gave the first portion of our abstract of the "Official Report" (from the *American Gaslight Journal*) of the proceedings at the annual meeting of the above Association; and to-day we publish a further instalment.

Mr. B. E. CHOLLAR, of Topeka, Kansas, read a paper entitled "A Paradoxical Box." The ability of water to absorb ammonia from the gas, and thus become the medium of removing many times its own volume of other impurities, had been known for many years, he said, and was applied by the medium of "scrubbers" and of "washers." His paradoxical box was a washer; but was little more than a modification of Wilson's submerged plate, which was patented in 1817. A screen of fine wire cloth was supported about 3 inches from the bottom of a rectangular iron vessel; and the gas was conducted down below the screen by an iron hood. The paradoxical part of the affair was that the space below the screen was free from water when in action. The gas forced the fluid through the screen, and supported it there. When in use the apparatus was charged with water to a few inches above the level of the screen; and the gas passed steadily through the liquid in minute bubbles. The gas he manufactured contained $3\frac{1}{2}$ per cent. of sulphuretted hydrogen, and $3\frac{1}{2}$ per cent. of carbonic acid. The gas was well condensed in a spiral, consisting of about 700 feet of cast-iron pipe, before reaching the washer; and the condenser and washer together completely freed the gas from tar, and removed about 12 per cent. of the impurities.

In the discussion which followed, Mr. Forstall mentioned that he had tried a washer on this principle, and liked it so much that he intended to adopt it wherever he could. In reply to questions, Mr. Chollar said the gas should be well condensed before reaching the washer, or the screen would soon choke with tar. The box was made just as long in feet as the diameter of the connecting-pipes in inches; and he calculated to work at 1-inch pressure.

Mr. J. GIMPER read a paper describing the Claus process of purification in closed vessels as applied at Birmingham. At its close, the author exhibited a tracing of his "atomizing circulating scrubber." This consists of a large rectangular vessel divided into seven compartments, each of which is sub-divided into two parts; one being empty, and the other occupied by a set of shelves like a Coffey still. At the bottom of each empty compartment is a jet, with an arrangement for injecting water or liquor under pressure by means of compressed gas, and at the same time dividing it into fine spray or mist. The gas entering at the top flows downwards through the first empty compartment, meeting the spray of liquor; and then ascends through the shelves, passing in a zig-zag direction up to the top. It is thus deprived of the moisture taken up, and passes into the top of the second empty compartment, and so on alternately up and down to the outlet. The gas travels from left to right, and the liquid in a contrary direction. Pure water is supplied to the last compartment nearest the outlet. The overflow from this compartment passes off to a cistern, from which the supply for the next is taken; and so on up to the inlet end, where it flows off as strong liquor. A current of dry ammonia gas or strong liquor may be introduced near the inlet end if desired. Mr. Gimper also read a letter from Mr. J. R. Smedburg (written fifteen years ago), which set forth the importance of thoroughly condensing gas before scrubbing it, and of scrubbing with liquor rather than pure water; and it also pointed out the fact that an additional supply of ammonia to that furnished by the gas was required, in order to remove all the impurities by scrubbing. Sufficient ammonia must be present, in fact, to neutralize the whole of the acid impurities. He further explained that the atomizing arrangement used was invented by Mr. Chollar. This apparatus had existed—but on paper only—for fifteen years; and he contended that it was preferable to the Claus apparatus, as it did not require so much plant, and had not a set of pumps. A gas-compressing apparatus was the only mechanical part necessary.

Mr. C. M. KELLER, of Columbus, Ind., presented a communication entitled "The Cost of Electric Arc Lighting." He pointed out that the expense would vary in different localities, according to the prevailing rates for fuel and labour. The size of the plant, and especially the extent of approximation towards its maximum power, was also very important. For example a 50-light machine, when supplying only one arc light required $20\frac{1}{2}$ -horse power to work it; with 25 lights going, only $28\frac{1}{2}$ -horse power; and with 50 lights, $46\frac{1}{2}$ -horse power. The author had a 50-light Thomson-Houston and a 50-light American machine in operation; and he proceeded to give the details of the cost of running the former for the supply of 48 arc lights for twelve hours. This estimate was fairly complete, including repairs, taxes, and interest at the rate of 6 per cent. on a capital charge of £2000; and the total amounted to £2 10s. or 1s. 0½d. per lamp. The author, however, pointed out that the estimate did not include "depreciation of plant, burning of armatures, repairs on boilers, or accidents of any kind." The cost of a six-hour supply was, of course, much greater in proportion; being about £2, or 10d. per lamp. This was for street lamps burning continuously; but he also gave an estimate of the cost of working the American machine, for the supply of 48 commercial lights, turned off and on at different times, for six hours, which came to about £1 14s., or 8½d. per lamp. A fourth estimate represented the cost of working the two plants in combination, and amounted to £2 15s., or 8d. per lamp. In these experiments the consumption of coal per horse-power was 6½ lbs. of Indiana nut and slack, or 4½ lbs. of Pittsburgh lump coal. The two systems used showed no difference in respect to the lights—a current of 9·6

ampères being carried in each case; but the cost of maintenance was much cheaper in the case of the American plant. A fifteen months' trial of the Thomson-Houston method showed that the annual expense of repairs on 48 lamps and machinery was £25 or 10s. 6d. per lamp; and this did not include three lamps broken by accident, which caused an additional expense of nearly £4 10s. The repairs on the American system, as shown by one year's trial, on an average of 35 lamps, were £9 10s., or 5s. 8d. per lamp. He also proved that the American system required less power, and less attention. His charge per light, burning six hours each night, was 25s. per month.

In the course of the discussion, Mr. Dunbar said he was running an American plant at New Albany; and the consumption of fuel was 5 lbs. of coal per 2000-candle arc lamp per hour, in which time each lamp consumed $1\frac{1}{2}$ inches of carbon. His lamps would run ten hours without a change of carbon. Mr. Scofield remarked that Mr. Keller's estimate showed a large profit, as 2s. 1d. per night was a common charge for arc lights; but he had not included some items, which might alter the state of affairs. He wanted to know whether the electric light was more profitable than gas, and instanced a case where a gas company had lost more than £400 last year by electric lighting, and a local electric light company in the same town £1000 to £1200. In these cases the light was supplied rather cheaper than was done by Mr. Keller. He had not heard of any gas company failing; but several electric light companies had gone into the hands of receivers. He was therefore doubtful whether it was advisable to butt against the electric light, or to invest capital in an electric lighting plant. He was inclined to reduce the price of his gas to 6s. 3d. per 1000 cubic feet, and then let the electric light people come on, and see whether they could make a larger dividend than he could. His demand for gas had doubled since electricians appeared in his district. Mr. Ambrose said that for the last twelve months he had been keeping the books of a Coal Gas Company, and also of a Thomson-Houston Electric Light Company, being Secretary and Manager to both Companies. He was prepared to say that the Gas Company was doing the best of the two. The gas consumption had increased 20 per cent., although the electric light had done fairly well. On a capital stock of £32,000 for both companies, he could pay a dividend of more than 10 per cent. He therefore considered it was well for gas companies to take up the electric light. In another town he knew of the electric light was being worked by the gas company at a good profit. Mr. McMillan said that at Springfield an electric light company was started, and eventually bought out the gas company, though the two were actually being run as separate organizations; and he was Secretary and Manager to both. In each case the business was satisfactory. But they made the mistake of not supplying the incandescent light; and an opposition company had managed to establish themselves for this line of business. Mr. Chollar observed that one of the finest Edison plants in the western country had been put down at Topeka; and at one time he understood they had 5000 lights. Many of the customers who left him at first had returned; and his business had not suffered seriously, but was increasing rapidly. He doubted if it was much smaller than it would have been without the electric light company. Mr. Jenkins thought when it was decided to form an electric light company in Columbus, his Directors wanted to go into the business, but ultimately decided to let it alone. Since then the demand for gas had increased satisfactorily. Mr. Steinwedell said that at Quincy, Illinois, the Gas Company had bought up an electric plant of 310 lights; and he believed it was the best thing they ever did. He considered the estimates given by Mr. Keller were too low.

(To be continued.)

Register of Patents.

TREATING GAS AND OTHER AMMONIACAL LIQUORS.—Grahn, E., of Coblenz.

Germany. No. 10,684; Aug 3, 1887. [6d.]

This invention relates to the treatment of gas liquor and other ammoniacal liquors with a current of gas, in order to separate the ammonia or volatile ammonia compounds for the purpose of directly manufacturing nitrogenous manures.

In his specification (which is not illustrated) the patentee says that the methods hitherto in use for manufacturing ammonia compounds consist in separating the ammonia, which is in a free condition or in the form of volatile salts is contained in the liquors to be worked, by heating and vaporizing a part of the liquor; in then leading away the ammonia which is mixed with steam; and in condensing it thereupon by any suitable absorbents. According to his process, the ammoniacal salts are turned out by means of a current of air or gas; and the air charged with ammoniacal vapours is set free from its contents of ammonia by suitable absorbents. In passing a finely-divided current of gas through the ammonia containing liquor, the volatile ammonia compounds pass by diffusion into the gas; and a complete separation of the ammonia, without a partial vaporization of the solution, is thereby obtained. The current of air charged with ammonia or volatile ammoniacal salts is placed in contact (according to the ammonia compounds to be produced) with solid, liquid, or gaseous absorbents. By using a current of air or gas to conduct the ammonia from the liquor to be worked into the absorbent, not only the separation of the ammonia is facilitated and more completely than by the method heretofore in use of boiling, but it is also possible to avoid the stoppages produced by the condensation of the volatile ammoniacal salts and the separation of the condensing water, by which a part of the ammonia which has been distilled off is either conducted again into the distilling vessel or introduced into the absorbent. The air charged with ammoniacal vapours may thus be directly introduced into the absorbing apparatus; and, according to the absorbent used,

solid and dry ammonia compounds, or any other solutions and mixtures, may be directly obtained.

In order to explain the new method by an example, the patentee describes the process by which gas liquor is worked, according to his invention, into phosphate of ammonia or ammonia-phosphate of calcium or into artificial nitrogenous manure.

The gas liquor to be worked flows into the upper part of a vessel, constructed like an ordinary column apparatus used in the distillation of gas liquor, divided by a certain number of intermediate bottoms into several compartments, down which the liquid flows. Into the lowest compartment of the vessel, in which the liquid driven off is gathered, a finely-divided current of air is passed, more or less heated by steam—for instance, by means of a steam-jet blowing engine. The current of air, taking up the ammonia from the liquor, flows upwards through the several compartments of the column; and is thereby being continually distributed afresh into the liquor which flows down. In this way the current of air is cooled more and more, whilst losing thereby its water vapour; and it becomes enriched with ammoniacal vapours, owing to its contact with more and more concentrated solutions. The upper part of the column apparatus, into which the gas liquor flows in a continuous stream, acts therefore as a cooler and condenser, and the liquid freed from ammonia escapes continuously from the lower part of the apparatus; but, to free the ammonia which is bound to fixed salts, milk of lime is added to the solution before it flows out of the apparatus.

The intimate contact of the air and the liquor may also be effected by causing the latter to flow downward in vessels filled with coke or other material, while a current of air is blown upwards from below. The quantity of the air blown into the vessels, and the heating of the liquor, are so calculated that on one side the water flowing off is completely freed from ammonia; and on the other the escaping current of gas which is charged with ammoniacal vapours, has nearly the temperature of the entering gas liquor. In particular cases, the complete cooling of the current of gas may be effected by a special condenser.

To produce ammoniacal salts, the current of gas charged with ammoniacal vapours is placed in direct contact with the usual absorbents; and to directly produce artificial ammonia-manure, the current of gas containing ammonia is introduced into vessels similar to gas-works purifiers filled with superphosphate, double phosphate, or dissolved guano spread over hurdles. In passing through the acid absorbent spread in layers of moderate depth, the whole of the ammonia is separated from the current of gas, and a dry nitrogenous manure is directly obtained.

The advantages claimed for this method are, on the one hand, the easier and more complete separation of the ammonia from liquors, by means of a current of gas without partially distilling the liquor—that is to say, in the saving of combustibles; and on the other hand, the possibility of directly producing dry nitrogenous manures. The production of sulphate of ammonia is therefore avoided; and the sulphuric acid, which is prejudicial in artificial manure, is thereby prevented, and the ammonia directly obtained in the form of phosphate of ammonia, and in chemical mixture with the manure.

GAS MOTOR ENGINES.—Abel, C. D.; communicated from the Gas-motoren Fabrik Deutz, of Deutz, Germany. No. 11,503; Aug. 23, 1887. [8d.]

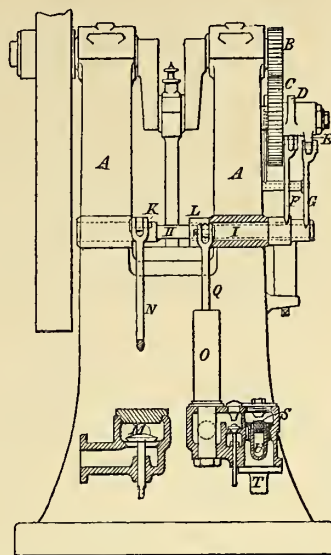
This invention relates to gas-engines in which the firing of a combustible charge takes place once in every four strokes of the piston—as in the "Otto" engine—and it has for its object "to produce a greater development of power by the formation in the cylinder of an explosive mixture rich in gas and free from products of combustion, and also to produce an increased useful effect and saving in gas consumption by the expansion of the products of combustion."

The engine is so arranged that, at the end of the expelling stroke, the portion of the gaseous products of combustion which would otherwise remain in the cylinder, are expelled more or less entirely therefrom by the introduction of atmospheric air, to which is afterwards admitted either pure combustible gas or a mixture of gas and air; the supply being cut off before the end of the suction stroke. By this means, on the following compression and working strokes, a high degree of expansion (and consequently an increased useful effect) is obtained. The front end of the engine cylinder is closed, and is provided with a suction and delivery valve, communicating with the atmosphere and with a closed reservoir; so that, at each forward stroke of the piston, a charge of air is forced thereby at a certain pressure into the reservoir. A pipe leads from this reservoir to the back end of the cylinder, where it is provided with a valve, and where it communicates with the inlet passage of the cylinder (also governed by a valve); both these valves being actuated by cams on a way-shaft, revolving at half the speed of the engine-shaft. These valves are opened when the piston arrives near the end of its expelling instroke; so that the compressed air can then pass from the reservoir into the cylinder, expelling the remaining products of combustion through the open escape-valve as the piston completes its instroke, at the end of which the air in the reservoir will have sunk to about atmospheric pressure. The escape-valve being now closed, the piston commences its suction stroke; and the valve of a gas-pipe leading into the inlet passage being more or less opened, gas (together with a greater or less proportion of air admitted by the air-reservoir valve) is drawn into the charge of air contained in the cylinder. When the piston has performed a certain part of its outstroke, the gas and air-valves are closed; so that, as the piston completes its stroke, the combustible charge in the cylinder is expanded below atmospheric pressure. Then at the commencement of the following instroke the combustible charge will first again attain atmospheric pressure, and afterwards be compressed to a greater or less degree on the completion of the stroke.

GAS-ENGINES.—Körting, E., of Hanover. No. 12,863; Sept. 22, 1887. [8d.]

These improvements consist in the means employed for operating the exhaust-valve and the igniting device, and for regulating the speed of gas-engines.

A is the frame of the engine containing the power cylinder. M is the exhaust valve, and O the igniting device; the interior construction of the latter not being shown, on account of its not forming any part of the present invention. S is the mixing-valve for gas and air, passing in



through the pipes U and T; and R, the check-valve for the gas mixture that has entered into the cylinder. On the end of the crank-shaft of the engine is keyed the spur-wheel B; and the spur-wheel C gears with it, having double the diameter of the former, and rotating on a pin fixed to the frame A. To the wheel C is secured a boss, carrying the two tappets D and E. H and F are two shafts mounted in bearings on the frame; the shaft H being passed through the shaft I, which is hollow. The shaft H is provided with the lever-arms K and G; the arm K being connected by the bar N to the stem of the exhaust-valve M, while the arm G (having a roller at its end) extends into the path of the tappet E. By means of a spring connected to the bar N, the valve M is normally kept closed, and the arm G maintained in the position in which it is acted upon by the tappet E when rotating. On the shaft I are keyed the lever-arm L, connected by the rod Q to the igniting device. P is a spring (for acting on a branch of the arm F), which keeps the arm and also the igniting device in their normal positions. For regulating the speed of the engine, the spur-wheel C has attached to it a governor, which, by acting on certain intermediate parts when the speed of the engine has become too great, causes the parts to lock the arm G upon its being pushed outward by the tappet E; the exhaust-valve being thereby maintained open, and the piston of the power cylinder prevented from drawing in new gaseous charges.

GAS-BURNERS.—Moore, D. S., of New York. No. 4245; March 20, 1888. [6d.]

This invention relates to a gas-burner which, when turned off, still admits a limited supply of gas, sufficient for a minute flame, and provided with a sliding chimney which is raised up so as to surround the small flame a short time after the main flame has been turned off.

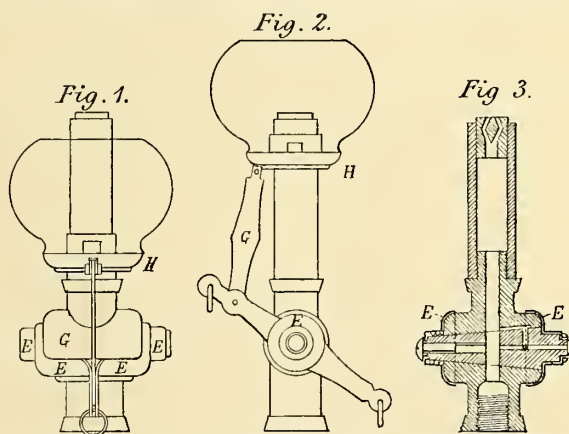
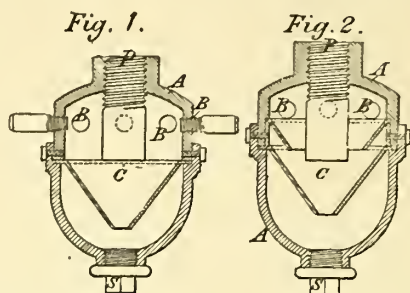


Fig. 1 is a front view of the burner with the chimney down; and fig. 2 is a side view with the chimney up. Fig. 3 is a vertical central section of the burner proper.

The tapering plug-valve of the burner projects beyond the valve-seat at both ends, which are embraced by an oscillating frame consisting of two U-shaped pieces E having laterally projecting arms, and perforated centrally to fit upon the ends of the plug-valve. G is a pivoted link, connecting the oscillating frame to the cap, carrying the chimney H. By pulling one or other end of a chain attached to G, the chimney is raised or lowered; and at the same time the plug-valve is partially revolved. The plug D is provided with a transverse slit, connecting the inlet with the discharge-pipe, though intercepted by an axial perforation. The slit is made long and narrow at its discharge end, so as to be brought rapidly past the inlet-pipe when the plug is turned. For the auxiliary flame there is a perforation smaller than the slit in D, and connecting the axial perforation with the surface. Here the perforation joins a short groove partly encircling the plug. By means of these arrangements, enough gas can be admitted to feed the main flame; and still it can be very quickly cut off. This is necessary, because the main flame should disappear before the frame E has oscillated sufficiently far to raise the chimney up to the flame; otherwise the chimney would be injured. In order to regulate the size of the auxiliary flame there is a set screw entering the axial perforation in D, and of such a length that it may close up the perforation in it to a greater or less extent. There is also a spring between the oscillating frame and the plug, for holding the latter tightly to its seat.

GAS-BURNERS.—Williams, E. P., and Thomas, W. J., of Osnaburgh Street London. No. 5102; April 6, 1888. [6d.]

This invention relates to improvements connected with gas lighting or burning apparatus where gas is led into a closed receiver containing externally the burners—as, for example, in “sun-burners” and such like lamps. Where these are used, say the patentees, the heat generated by combustion is so intense as to carbonize the gas before it arrives at the burners; and the carbonaceous deposits formed, being of a gritty or powdery nature, are apt to choke up the burner orifices and destroy the efficiency of the lamp. Moreover, by the intense heat, the burners themselves as usually constructed are rapidly destroyed. The object of the present invention being to obviate these defects, the improvements consist, first, in applying to the closed gas receiver, means for precluding the access of deposits to the burner orifices, and, secondly, in constructing a burner for use with such apparatus, adapted to withstand the action of the heat.



Figs. 1 and 2 are sectional elevations of a “sun-burner” having external burners, though it will be understood that the means described for preventing the choking of the orifices may be applied also to certain closed lamps having internal burners.

A is a closed receiver of suitable form and material; and B are the orifices. According to the usual construction, gas is led to the receiver by a pipe P, which does not extend into the receiver, but terminates at or about its interior surface. Thus carbonaceous deposits lodged in the receiver, especially under pressure, may be easily blown into and choke the burner orifices. It is proposed therefore, to extend the pipe P for a suitable distance into the receiver; and beneath its open end is disposed a set of inclined surfaces, but preferably a truncated cone or pyramid inverted as shown at C, forming a separate chamber at the lower part of the receiver A. In some cases an additional set of inclined surfaces or part of a cone or pyramid may be used, as in fig. 2. The parts C are made of thin metal or other material adapted to withstand intense heat. At the base of the receiver is a screw plug S; so that all deposits formed are blown through the opening in the lower chamber, whence they cannot return to the burner orifices, but may be removed when required by the screw plug.

APPLICATIONS FOR LETTERS PATENT.

9480.—TOLLERTON, J., “Improvements in apparatus for the speedy application of gas to wing lights, ground rows, and to the stages of theatres and public halls generally.” June 29.

9531.—CLERK, D., “Improvements in gas-engines.” June 30.

9544.—SUGG, W. T., “Improvements in the construction of gas cooking-stoves.” June 30.

9578.—DOUGILL, J., “Improvements in gas motor engines.” July 2.

9586.—THOMAS, J., “Improvements in apparatus for carburetting gas.” July 2.

9598.—BRAITHWAITE, C. L., jun., and BRAITHWAITE, I., “Improvements in or relating to heating water by gas, and obtaining a mechanical motion on change of temperature, applicable to the regulation of gas.” July 2.

9683.—ULLRICH, J. B., “Improvements in rotary slide-valves for gas-engines.” July 3.

9696.—ATKINSON, J., “Improvements in gas-making apparatus.” July 4.

9728.—DOTY, H. H., and THE DOTY LIGHTING AND HEATING CORPORATION, LIMITED, “Improvements relating to apparatus for utilizing liquid hydrocarbons for lighting and heating.” July 4.

9749.—HAACKE, A., “Improvements in the protection of pipes or other vessels containing gases, liquids, or solids at a low temperature, and for preventing the formation of ice or the condensation of moisture on the outside of such pipes or vessels.” July 4.

PATENTS WHICH HAVE BECOME VOID.

[AFTER THE FOURTH YEAR.]

5302.—JOHNS, T. H., and another., “Rotary gas-engines.”

5303.—JOHNS, T. H., and another., “Rotary gas-engines.”

5310.—THOMPSON, W. P. (Samain), “Meters for liquids.”

5357.—SPRINGMAN, H. (Hipp and another.), “Purification of lighting gas.”

5414.—GEDGE, W. E. (Berthon and another.), “Water-meter.”

5479.—BALBIRNIE, J., “Cooking by gas, &c.”

HUELVA GAS COMPANY.—The annual general meeting of this Company was held in Glasgow on Friday, the 29th ult., when it was agreed to adopt the report (the principal portions of which were given in the JOURNAL last week), and to declare a dividend of 6½ per cent.

MILL LIGHTING BY ELECTRICITY.—An installation of the electric light has just been carried out in one of the mills of Messrs. Vicary, tanners, of Newton Abbot. Hitherto the gas bill for the building in which the new illuminant has been adopted has been £36 per annum. The interest on the outlay incurred, together with the cost of maintenance and renewals, will, it is said, be only £16 a year—a saving of £20 a year being thus effected. There are 82 lights in the mill, of which about 20 are of 60-candle power and the remainder 16-candle power. The dynamo is of 100-light power, and is driven by the large engine used for the machinery generally. The average requirement for the dynamo is 1-horse power for every 10 lights. There are 110 hands employed in the mill.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

MECHANICAL V. HAND STOKING AT THE MANCHESTER CORPORATION GAS-WORKS.

SIR,—In your issue of the 3rd inst., Mr. West questions the accuracy of my figures. Those figures do not contain, as he suggests, any outlay on retorts or retort settings. They do, however, include more men than Mr. West gives as engaged on the work; notably two sub-foremen and four men opening pipes and scouring retorts. The figures I gave, moreover, are not those of a theoretic week, but the actual cost during the nine months, with the actual amount carbonized. The nine months was the latest period of Mr. West's engagement here. The accounts were on that occasion made from June to March, instead of from June to June as previously, to bring them to correspond to the financial year of the Corporation.

Manchester, July 7, 1888.

JOHN KING, jun.,
Chairman, Rochdale Road Works of
the Manchester Gas Committee.

THE STAMP DUTIES ON TRANSFER OF STOCK IN GAS COMPANIES.—“Share Ledger” asks: “Will you confer a favour on the benighted by informing us what effect, if any, the new regulations with regard to stamp duties have on the transfer of shares or stock in gas companies? For instance, what is the present duty on a common deed of transfer on £100, or its higher or lower multiples?”

THE PHOTOMETER QUESTION AT THE GAS INSTITUTE MEETING.—We have received from Mr. W. Sugg a letter dealing with the above subject, in accordance with the intimation given by him in the JOURNAL last week; but it came to hand so late that we are reluctantly compelled to hold over this communication, as well as another which has reached us on the same matter, till our next issue.

Parliamentary Intelligence.

HOUSE OF LORDS.

MONDAY, JULY 2.

The Limsfield and Oxted Water Bill was read the third time, with the amendments, passed, and sent to the Commons.

TUESDAY, JULY 3.

The Bristol Water Bill was reported, with amendments. A petition against alterations in the Nelson Local Board Bill was presented by the Brierfield Local Board.

THURSDAY, JULY 5.

The following Bills received the Royal Assent by Commission:—Henley-on-Thames Gas Bill, Hinckley Local Board Water Bill, Newport (Mon.) Corporation Water Bill, South Lincolnshire Fen Water Bill, Stockton and Middlesbrough Corporations Water Bill, Uckfield Water Bill.

The Llanelly Local Board Bill was read a second time, and committed.

FRIDAY, JULY 6.

The opposition to the Llanelly Local Board Bill has been withdrawn.

HOUSE OF COMMONS.

MONDAY, JULY 2.

The Falkirk and District Water Bill (Lords) and the Lincoln Corporation Bill (Lords) were reported.

LONDON COAL AND WINE DUTIES CONTINUANCE BILL. On the motion of Sir R. FOWLER, the order for the second reading of this Bill was read and discharged.

STATISTICS OF METROPOLITAN WATER COMPANIES. On the motion of Mr. J. F. B. FIRTH, the following Parliamentary Papers were ordered:—

Return of the accounts of the Metropolitan Water Companies for the year ending Dec. 31, 1887 (in continuation of Parliamentary Paper No. 193 of Session (2) 1880, and Parliamentary Paper No. 129 of Session 1882); and of the area in square miles and portions thereof supplied by each Company, together with an estimate of the daily waste in gallons—waste being understood to mean that portion of the water supply which is not consumed by domestic requirements, nor trade purposes, street watering, gardens, &c., but which arises from defective mains or service pipes, inefficient plumbing, &c.

Return showing, in respect of the Metropolitan Water Companies, the maximum number of houses or other buildings supplied with water by each Company in the years 1883 and 1887 respectively, and the total amount of the rates, rentals, and any other charges received for the supply of water to houses or other buildings, excluding garden supplies, during the financial year ending in September or December (according to the date to which the annual accounts of the Company were made up), in the years 1883 and 1887 respectively; showing, in respect of each of the Metropolitan Water Companies, as regards each financial half year subsequent to September or December, 1883, according to the dates to which the accounts of the Companies were made up—(1) The total amount paid by the Company by way of dividend; (2) the rate per cent. per annum of the dividend paid; (3) the amount of share capital (within the meaning of section 39 of the Metropolitan Water Act, 1871, and including loan capital converted into share capital) paid up during the half year, in respect of capital taken up during such half year or previously by corporations or persons who, when such share capital was taken up, were shareholders of the Company; (4) whether such share capital was taken up at par, and if not, at what price per £100; (5) the amount of loan capital (within the meaning of section 39 of the Metropolitan Water Act, 1871) paid up during the half year in respect of loan capital taken up during such half year or previously by corporations or persons who, when such loan capital was taken up, were shareholders of the Company; (6) the rate per cent. per annum payable on such loan capital; (7) whether such loan capital was taken up at par, and if not, at what price per £100; (8) the amount of bonuses or other payments made to shareholders, excluding dividends, but including, in the case of the New River Company, any payments in respect of the landed estate, houses, or property of that Company not directly used for or connected with their water supply. Also, showing (a) the amount of share and loan capital respectively of each Company at the end of the financial half year next after September or December, 1883 (according to the date to which the accounts of the Company were made up); (b) the amount of such share and loan capital at the end of the last financial half year to which the accounts of the Company have been

made up and audited; and (c) the value of the share and loan capital of each Company, according to the Stock Exchange List, on or about the 31st day of December in the years 1883 and 1887 respectively (in continuation of Parliamentary Paper No. 136 of Session 1885).

THURSDAY, JULY 5.

The Lincoln Corporation Bill (Lords) was read the third time, and passed, without amendment.

Requisitions to withdraw their petitions against the Edinburgh and Leith Corporations' Gas Bill (Lords) were presented from the Edinburgh and Leith Gaslight Company and the Edinburgh Gaslight Company.

FRIDAY, JULY 6.

The Staffordshire Potteries Water Bill (Lords) was reported, with amendments.

HOUSE OF COMMONS COMMITTEE.

WEDNESDAY, JUNE 20.

(Before Mr. J. W. LOWTHER, Chairman; Mr. T. A. DICKSON, Mr. PEARCE and Mr. MAPLE.)

GAS PROVISIONAL ORDERS (No 1) BILL—THE SWANSEA GAS ORDER.
The Corporation of Swansea having raised objections to the Provisional Order applied for by the Swansea Gas Company, to enable them to raise further capital, after the Order had been approved by the Board of Trade, and submitted to Parliament for their sanction, the Confirmation Bill containing the Order was referred to a Select Committee, constituted as above, in order to allow of the opponents being heard in support of their case.

Mr. LITTLER, Q.C., and Mr. PEMBROKE STEPHENS, Q.C., appeared for the Company; Mr. BALFOUR BROWNE, Q.C., and Mr. CRIPPS for the Corporation.

Mr. LITTLER, in opening the case, said the Company was incorporated in 1830 with a capital of £6000, and with power to borrow £3000. In 1861 they were authorized to raise £100,000, of which only £6000 was treated as original capital, with a 10 per cent. dividend. As the Company had spent on works £29,000 out of revenue, further capital to the extent of £12,000 was allotted to the proprietors; the rest of the £100,000 being limited to 7½ per cent. By the Act sanctioning this, it was provided that the remaining £82,000 should be offered for sale by auction, and that the premiums should be added to the capital of the Company. They were also authorized to borrow £25,000. Since that time they had issued the whole of their capital, and had reached the limit of their borrowing powers. The premiums they obtained on their issue of capital amounted to £24,301, or close upon 25 per cent. of the entire capital of the Company. In 1885 they had exhausted their borrowing powers, and issued the whole of the remaining shares; and having since to make further extensions, they had to borrow from their bankers £6775, and had, in addition, incurred other liabilities amounting to £6446. Further they had formed a contingency fund in addition to their reserve fund; and from the year when this contingency fund began to grow to its present size, the consumers had been saved no less than £975 a year by the course the Company had taken. Exclusive of the £12,000 for the contingency fund, they owed £13,121. In consequence of the shortness of capital, they had been compelled to defer necessary extensions of works and mains. They were, therefore, obliged to apply for more money. They had originally put the amount at £75,000; but the Board of Trade, at the suggestion of the Corporation, had lowered it, without any great discussion on the part of the Company, to £50,000. This they considered would have satisfied the Corporation; but as they had thought fit to oppose the Bill now, and inasmuch as the Company would want something like from £30,000 to £35,000 in the next two years, and should certainly require the whole in the course of six or seven years, he would ask the Committee to again insert £75,000 in place of the £50,000. The Company had 65 miles of pipes, on a considerable part of which there was only a very small return. They had only 3850 consumers, and only 1140 public lamps. The entire consumption of gas in the district last year was but 191 million cubic feet; so that they only sold 2,800,000 feet on each mile of main. Swansea was extremely badly situated for making a profit, because nearly all the town was undermined, which increased the leakage, besides which there were in the borough a number of works in which gas was consumed very irregularly. Comparing Swansea with the two neighbouring towns of Cardiff and Newport, the learned Counsel said that at Cardiff in 1886 they had a sale of 402,695,000 cubic feet against the Swansea Company's 190,000,000 feet; the length of mains was only 85 miles; the number of consumers, 8841; and the quantity of gas per mile of main, 4,730,000 feet. In Newport, they had a sale of 156,674,000 cubic feet spread over 35½ miles of main; averaging about 4,400,000 cubic feet per mile. The price of gas at Cardiff was 2s. 6d., and at Newport 2s. 10d. per 1000 cubic feet. The Swansea Company's Act of 1861 fixed the maximum charge at 4s. within, and 5s. 6d. beyond the borough; the actual charges being 2s. 10d. and 4s. 4d. respectively. The present Order proposed to reduce the price to 3s. 9d. per 1000 cubic feet within, and 5s. beyond the borough. The Company were dealing very liberally with their customers. In the past year, there was a deficiency of income to the extent of 1.11d. per 1000 feet below what was necessary to pay the maximum dividend; and in the previous year there was only a surplus of 1.63d. In regard to illuminating power, though they were only bound to supply gas of 11 candles, they had been sending out gas of 14 to 14½ candles; and in order to do this, they had had to import Scotch cannel to mix with the local coal, which would only produce 9000 cubic feet per ton of 12-candle gas. He should mention that the dividends on the new capital would be 7 per cent. on what was raised on ordinary capital, and 6 per cent. on the preference capital; and if the Company borrowed, it would not be at more than 5 per cent. When before the Board of Trade, the Corporation wanted to prevent the Company spending more than £20,000 in the next two years; but the Board would have nothing to do with this, as the Company already owed £13,000. The Company also proposed before the Board to supply 14-candle gas; and with the hope of getting rid of the opposition of the Corporation, they agreed to put it at 15-candles. This, however, did not make it necessary that they should be required to supply gas of this power now; and he should prove that 14-candle gas was good enough. Supposing 14½-candle gas, they could not pay the maximum dividends; and if they had to furnish 15-candle gas, it would mean an additional cost of 3d. per 1000 cubic feet to manufacture. The learned Counsel then dealt with the petition of the Corporation, in which they said that they were advised that the share and loan capital proposed to be authorized was excessive; and they applied that the dividend on the new shares should be reduced. Why, he asked, were the Swansea Company to have less dividend than any other company in the kingdom? Seeing that the gas business was a risky one just now, and they had competition from other illuminants, he considered the dividends should be rather raised than reduced. The Corporation, in their petition, also complained of the high rate of interest proposed to be sanctioned in respect to the additional loan capital; and submitted that it should be reduced, or provision made for raising loan capital subject to auction clauses similar to those applic-

able to share capital. With the sole exception of the South Metropolitan Company, there was no gas company which was under the obligation of issuing loan capital by auction; and he ventured to say that it was a useless and absurd obligation. The petitioners also complained "of the high maximum price proposed to be authorized;" and they said they were advised that "the price could be greatly reduced without prejudice to the maximum dividends, if the undertaking were more economically managed." He (Mr. Littler) was more surprised at this than he could tell, because some years ago the Corporation approached the Company with a view to purchasing the works. The Company did not desire to sell, though at that time they were certainly more disposed to do so than now. They, however, allowed Mr. G. Livesey to inspect the works on behalf of the Corporation. [The learned Counsel here read a long extract from Mr. Livesey's report, in which he stated that the concern seemed to be so well conducted that he would only say possibly some economies might be effected in the management; and further on he said: "I have made a thorough examination of the works, and must say it is very unusual to find an old-established gas-works in such substantial and excellent order."] This report was dated Aug. 26, 1885. In the face of this report, he considered it was perfectly monstrous on the part of the Corporation to put the Company to the expense of appearing there to negative such an allegation. The Corporation also submitted that the Company should adopt the sliding scale, and that a reasonable standard price (not exceeding the price now charged) should be inserted in the Order. First of all, there never was an Order which put the standard price at the figure now charged by the Company; and, secondly, there never was an Order or a Bill in which the sliding scale was imposed upon a company who did not desire to have it. The present price was notoriously not one by which the Company could earn their dividend; and the standard would have to be something between the existing price and the maximum, because they had to allow for contingencies and risks. It seemed to him that the sliding scale tempted people to false economy. What they proposed, he believed would be better both for the consumers and the Company; and he hoped Parliament would not compel them to adopt, for the first time in the case of a gas company, that which they believed would be worse for the particular Company concerned and the public. Further on in their petition, the Corporation desired that provision should be made to enable them to purchase the gas undertaking on fair terms, and that proper clauses should be inserted in the "Bill or Order" to enable them to effect such purchase. He supposed that the Corporation were ignorant of the fact that no provisions as to purchase were ever inserted in any Order, and they also ought to have remembered that no provisions for compulsory purchase had ever been inserted in a Gas Bill, and there was hardly an instance of compulsory purchase of a water company. In conclusion, he should mention that on the 16th of April, this year, the Town Clerk wrote to the Company saying that the Committee of the Town Council were willing to withdraw all further objection to the Order provided that the illuminating power of the gas was fixed at 16 candles, the maximum price within the borough put at 3s. 6d., and provision made for an additional testing-place other than at the Company's works. Although there were then only three things they thought fit to bring forward, they were now making all the allegations to which he had alluded. He would ask the Committee to disregard these allegations, to give the Company a reasonable amount of capital; and not compel them to put the illuminating power above what it was now. They did not say there had been any complaints as to illuminating power; and he questioned whether they could get a consumer to say that there was any complaint.

Mr. F. J. C. Scott, examined by Mr. PEMBROKE STEPHENS, said he had been Vice-Chairman of the Company for twelve years. Having given evidence as to the capital powers of the Company (which were given in detail by the learned Counsel in his opening statement), he stated that, but for the existence of the contingency fund, the Company would not have been able to carry on so long as they had done; and it was therefore absolutely necessary for them to come to Parliament for additional capital. In their dealings with the district the Company not only fulfilled all the obligations put upon them by Parliament, but had supplied gas of a quality considerably in excess of what they were required to give, and had charged prices much below those to which they were entitled. They had now, in fact, reached a point at which they did not earn their statutory dividend; and it was impossible for them to go lower.

Cross-examined: He did not think it would be better for the consumers to have 16-candle gas, because they would have to pay more for it. The insertion of 3s. 6d. as the maximum price in the borough might lead the Company into bankruptcy in the event of a war or anything else sending up the price of coal, more especially looking to the addition they had now to make to the illuminating power of their gas. In regard to the sliding scale, he differed from Mr. Livesey in the opinion that it ensured the practice of enterprise and economy. As to raising borrowed money by auction, he thought this would be detrimental to the Company, because the premium would not be sufficient to pay the extra interest—that was to say, if £100 fetched £120, this might not be sufficient in calculating to pay the money borrowed at 3½ per cent.

Mr. Thornton Andrews, M. Inst. C.E., said he had occupied the position of Secretary and Engineer of the Company for 32 years. When he was appointed, the works were not in a satisfactory state; and the supply of gas was insufficient for the demands of the consumers. In consequence they had to make very considerable extensions. In the 31 years from 1830 to 1861, a sum of £29,000 was expended out of profits. The shareholders during this time had not received their full statutory dividends; the average dividends amounting to only £4 11s. 4d. per annum.

The CHAIRMAN here intimated that the Committee had come to the conclusion that practically the whole question at issue between the parties resolved itself in four points—viz., the amount of capital, the maximum price to be charged, the illuminating power, and the provision of an additional testing-place. It would be convenient if the attention of the Committee were directed to these points only.

Mr. BALFOUR BROWNE said there was also the question as to whether the money borrowed should be raised in the ordinary way, or under the auction clauses; and he was going to ask that the sliding scale should be imposed on the Company, under which there would be an initial, but not a maximum price.

The Committee having consulted, The CHAIRMAN said that, of course, they could not exclude anything Mr. Balfour Browne had to say as to the auction clauses; but at the same time they did not attach any very great weight to the learned Counsel's views on these clauses as applied to borrowing powers. As to the question of the maximum price, the Committee thought they should elect to fight the Order either upon that or upon the sliding scale.

Mr. BALFOUR BROWNE replied that he should, of course, at once elect to fight on the principle of the sliding scale; but if the Committee should be against him on this, surely they would hear his evidence that the maximum price proposed was too high.

The CHAIRMAN assented.

Examination resumed: There were general conditions which made it difficult for Swansea to have a high illuminating power. First, the local

coal yielded gas of poor illuminating power—12½ candles was the average; and they had to supplement this coal by Scotch cannel. The higher they put up the illuminating power, the more of this foreign element they had to import. Any increase of the standard of 14 candles would require an addition to the initial price. If they used 10, 15, or 20 per cent. of cannel, according to the quality of gas required, they would either make the coke from the local coal useless, or would have to destroy the cannel coke manufactured. Therefore they must ascertain the loss of coke in estimating the increased price or value of a standard candle. The Swansea district was not residential, but consisted mostly of the labouring and manufacturing class, which made a high quality gas unsuitable. In the large works, the men burnt the gas out of open stand-pipes, cocks, or large taps; and therefore gas of more than 14-candle power would not only be wasteful, but a nuisance. The consumption from 25 of the works and the public lights was one-third of that consumed by private persons. With respect to the testing of the gas, it was examined daily by the Company; and an officer was appointed by the Corporation to look after their interests. The Company had not had any formal complaint from the Corporation that the gas was not of the required quality. The total share capital of the Company in 1861 was £21,300; in 1871, £67,750; in 1881, £115,360; and in 1885, £125,000. The make of gas for 1861 was 41 million cubic feet; for 1871, 94 millions; for 1881, 171 millions; for 1885, 210 millions. In 1861, the price of gas was: In the borough, 4s.; outside, 5s.; to the Urban Sanitary Authority, 3s. 10d. In 1871, it was 3s. 6d., 5s., and 3s. 3d. respectively. In 1881, it was 3s. 3d. in the borough; and 2s. 9d. to the Sanitary Authority. In 1885, 2s. 10d. to the private consumer; 3s. 4d. to Sketty; 4s. 6d. at the Mumbles; and 2s. 6d. to the Urban Sanitary Authority. While the make of gas had augmented five times, the rental had only increased from £6689 to £28,231. The increase of consumption had been 22·8 per cent. in the last seven years; and the increase of rental 11·3 per cent. This was owing to the reduction in price. If they had kept up the price they were charging in 1881 to the present time, they would have been earning £3979 more than they were doing; and this had gone to benefit the consumer. The Order prescribed a 15-candle gas, which meant 15 candles actual. He estimated the cost for every additional candle at 2½d. per 1000 cubic feet, including the loss of coke due to the use of extra cannel. They would now have to face further expenditure, and should require to erect the twelve benches, each setting containing seven through retorts—being equal to 168 mouthpieces. They required a new coal-store, an extension of the retort-houses, new washers, and would also have to lay down additional mains. They proposed erecting sulphate of ammonia apparatus; and would want some new services, consumers' meters, and gas-stoves. The total cost of all these things he estimated at £24,620. Then they wanted some working capital; and for this he had put down £5900. The liabilities over on June 30 last year—£7759—made the total amount £37,372. This would only leave a margin of £13,000 from the £50,000. Taking the actual increase during the last five years, the £50,000 plus the £12,400 borrowing powers, would only last between seven and eight years. But if they obtained the limit that was usual, of ten or twelve years, then they would require £75,000, and £18,750 borrowing powers. As to the sliding scale, he did not think it would be suitable to the circumstances of the Company. He did not think it reasonable that they should at one and the same time be asked to supply a higher quality gas and have the price cut down. In regard to the public lighting, after setting a three years' contract with the Corporation, complaints were made of the lateness of the hour at which the lamps were lighted, and the Company consented to light them an hour earlier for three months in the year; so that they were absolutely lighting the lamps for 91 hours over time.

Cross-examined: Witness was aware that 16 candles was the illuminating power of the gas in Cardiff, and the maximum price authorized was 3s. 6d. per 1000 cubic feet. Supposing the Committee desired that the standard should be 16 candles, they would have to make it higher than that, and would require to use 20 per cent. of cannel. If they supplied gas of this quality, the consumers' burners would have to be altered. They used with the Welsh coal 6·30 per cent. of cannel. The average make had of late years been 9360 cubic feet per ton. Of the one-third consumption which he attributed to "26 works and public lamps," they received from the former £5112, and £3742 for the street lamps. Of course, the public lights were supplied at a lower price. He admitted that they had had complaints from consumers; but in some cases the fittings were in a wretched state. In the two half years in 1887, they could not pay the dividends. Asked whether they had any arrears of dividends, he said they had all been paid up. The Company had made up a contingency fund of £13,900 out of surplus profits, and had expended it on works. The gas consumers had not lost this amount; they had gained by what it had produced. The reserve fund was different from the contingency fund. It was invested in Consols, and was intended to meet any deficiency in dividends. He agreed that they ought not to have reduced the price 2d. per 1000 cubic feet in October, 1886, by which proceeding they were out of pocket to the extent of £1600. He did not think that 33 per cent. of margin in manufacturing power was unusual. The 168 mouthpieces he had alluded to, would enable them to produce 1,250,000 cubic feet of gas. The 907,000 cubic feet given by Mr. Livesey in his report, as being the largest daily make, referred to three years ago. The make had increased since then. Up to the present they had not had washers; but he thought they ought to have them. The new mains were necessary to supply the new works, additional public lamps, &c. The sulphate plant had become worn out; being an old apparatus put up in 1878. Witness was about to be cross-examined on the question of the sliding scale when

The CHAIRMAN said that the opinion of the Committee was decidedly against Mr. Balfour Browne; and they considered it would be an undesirable thing to force on the Company.

THURSDAY, JUNE 21.

Mr. Thornton Andrews, re-examined, said that the maximum prices of 3s. 9d. and 5s. per 1000 cubic feet were fixed in order to meet such contingencies as a rise in the prices of coal, labour, and materials. The Company did not expect to have to pass through a worse crisis than that of 1873, when coal was at 23s. a ton. At that time they were able to sell gas at 3s. 9d. and 4s. A reduction to 2s. 10d. was brought about by the action of the Corporation and a few consumers, who thought that 3s. was too high.

Mr. BALFOUR BROWNE: In 1885, when the price of gas was 3s., the actual revenue amounted to £27,147; in 1887, with the price at 2s. 10d., the income amounted to £38,331. Therefore, with the reduced price you had £1000 extra money.

Witness: With an increased consumption.

Mr. PEMBROKE STEPHENS: An increased make, of course, means increased expense.

Mr. BALFOUR BROWNE: It shows that the increased consumption enabled you to overcome your total loss, and get £1000 besides.

By Mr. DICKSON: They had now 2000 tons of breeze produced from coal lying upon the works; their coke had been as low as 5s. per ton; and

this he attributed to the poverty of the coal, and the necessary employment of cannel.

Mr. Alfred Lass, F.C.A., gave a statement of the Company's capital and premiums received. As to expenditure, up to December, 31, 1887, after writing off £12,957 17s. 5d.—the amount taken from the contingent fund—the capital expended was exactly the amount of the share, loan, and premium capital £149,801 3s. During the last five years the increase in gas sold had been at the rate of 4·89 per cent. compound. The reserve fund became full in 1885. As to the contingent fund, if fresh capital had been called up, instead of using the £13,000 from this fund, interest would have had to be paid, which would have come out of the consumers' pockets. Assuming this £13,000 had been sold by auction, they might perhaps have reduced it to something like a 5 per cent. investment. Taking the capital at 7½ per cent., this would have sold by auction at about 30 per cent. premium; and they would have had an additional burden of £647 thrown upon the concern in the shape of dividend. They had had the maximum dividends for many years; but the dividends had been paid free of income-tax. The cost of making gas was 27·5d. per 1000 cubic feet; and they had realized by the sale of gas 35·43d.—leaving a profit of 7·92d. The dividend and interest amounted to 11·19d.; and this showed a deficiency on the sale of gas alone of 3·27d. This was reduced by the meter-rental, a small profit on fittings, and the interest on investments, by 2·16d.; so that the net deficiency for the year ending Dec. 31, 1887, amounted to 1·11d. The unaccounted-for gas was 5·68 per cent. The amount of 10 per cent. capital at Swansea was unusually small—£6000 out of £100,000. The interest-bearing capital was only £510s. 8d. per ton of coal carbonized. He thought that the Company ought to be allowed a reasonable maximum price.

Cross-examined: The deficiency of 1·11d. he had mentioned amounted to £884 11s. 9d. He admitted that the Directors' fees were increased during the years 1885-7 by £200; that there were law expenses in 1887 amounting to £495; and that the Company paid the income-tax of £279 for the year 1887. These items amounted to £974. Of course, they could have met the total dividend if these expenses had not been incurred. Coal cost in the year ending June 30, 1885, £12,439; ending June 30, 1886, £12,708; and ending June 30, 1887, £12,028, which showed that they paid less for the last year than the first-named under this head. The wages in 1885 were £4115; and in 1887, £4121.

Mr. R. P. Spice, C.E., said he thought that Mr. Andrews put the whole matter very fairly as to the extensions required at the works. In his judgment the £50,000, would not last so long as seven years. He considered the standard of illuminating power ought not to be above the ordinary one of 14 candles; and as to the price, he thought the Company had made a mistake in reducing it to 2s. 10d.

Cross-examined: The witness thought the consumers would prefer a 14 or 15 candle gas to anything higher, if the price had to be raised.

Mr. G. W. Stevenson, C.E., was also of opinion that the illuminating power and the price must go together; there must be an increase of price, because there would be an increase of cost. In regard to capital, he agreed with the evidence already given; and also as to the expenditure which would have to be incurred during the next two years. The interest of the Company was to spend as little capital as possible.

Cross-examined: He did not think the purchasers of the gas were the people to be consulted as to the illuminating power, as they did not know what was good for themselves in this respect.

This concluded the case for the promoters.

Mr. BALFOUR BROWNE said he did not think it would be necessary for him to call any evidence. As to the question of illuminating power, when the Company were before the Board of Trade they were willing to accept a higher standard than now; and this because the Corporation dared to oppose the Order. He thought he had shown that they were anxious to have an illuminating power of 15 candles. The learned Counsel next dealt with the question of capital; criticizing in detail the various requirements, as given by Mr. Andrews. He remarked that, according to Mr. Livesey's report, they had but three years ago a reserve power of 33 per cent. in the works; and he contended that only 8 per cent. of this was now exhausted. As to the contingent fund, the Company had actually been transgressing the law; for this fund had been taken out of the consumers' pockets. As to the income-tax—though it was a small matter comparatively—it should have been applied to a reduction of price. He contended that it had been improperly taken from the consumers to save income-tax to the shareholders. As to the maximum price, the learned Counsel maintained that it could not, allowing an ample margin, come to more than 3s. 4d. As to the testing place, if the testing was to be effective, it could not be done at the works.

The room was then cleared. On the parties being called in,

The CHAIRMAN said the Committee had decided to retain the amount of ordinary shares or stock at £50,000, not £75,000; the borrowing power to be £12,500. With regard to the quality of the gas, they had decided to confirm the Order of the Board of Trade, and retain the power at 15 candles. As to the price, they would vary the Order by reducing it from 3s. 9d. to 3s. 6d. Then, in regard to testing, the Committee wished a clause to be brought up in accordance with the clause in the Model Gas Bill providing for testing the pressure. They did not vary the Order in respect to the place of testing.

The clauses and preamble were then read and agreed to, with the amendments; and the Chairman was directed to report the Bill, as amended, to the House.

THE ROCHDALE CORPORATION GAS UNDERTAKING AND THE RELIEF OF THE RATES.—A Rochdale newspaper remarks that the annual statistical table of the Rochdale Gas-Works which has lately been issued gives a better view of the operations of the department than the usual accounts, and some interesting comparisons with the work of previous years. The actual quantity of gas sold last year was 267 million cubic feet, as against 264 millions in the previous year, and 252 millions in the twelve months preceding. The quantity registered at the works as being made was 331 millions last year, compared with 316 millions the year before. It is one unsatisfactory feature in last year's proceedings that the loss by leakage was so great; amounting to no less than 13·41 per cent., as compared with 10·54 per cent. in the preceding year. It is worthy of note that since 1885 it has not been found necessary to use a single ton of cannel. The writer proceeds: "The advocates of a reduction in the price will be confirmed in their opinion by the figures, which show that the net cost of gas per 1000 cubic feet, reckoned on the quantity sold, and including payments to the sinking and reserve funds, has only been 1s. 10½d., while the cost reckoned on the quantity made, and excluding payment to the two funds mentioned, has only been 1s. 6½. This being the case, one would have thought a reduction to somewhat less than 3s. might very well have been made in the selling price, and would have been good policy, seeing how fractional has been the increase in the consumption during the year. The interesting fact is stated that since the works came into the hands of the Corporation the Committee have paid over to the finances of the town, out of their profits, the vast sum of £215,865; being more than the whole amount spent on the works."

Legal Intelligence.

HIGH COURT OF JUSTICE.—CHANCERY DIVISION.

SATURDAY, JULY 7.
(Before Justice North.)

WASTE WATER-METER COMPANY, LIMITED, v. UNIVERSAL WATER-METER COMPANY, LIMITED.

This was an action for an injunction to restrain the defendants from infringing the plaintiffs' patent; the usual issues being raised by the defendants as to validity, &c. The defendants having now submitted, the matter came before the Court as a "short cause;" the terms of the order being agreed upon. An order was taken for an injunction, restraining infringement, and the delivery up of the infringing machines, and circulars, &c.

Mr. CHADWYCK HEALEY appeared for the plaintiffs.
His LORDSHIP made an order in the terms arranged.

HIGH COURT OF JUSTICE.—QUEEN'S BENCH DIVISION.

TUESDAY, JUNE 26.

(Before Justices WILLS and GRANTHAM.)

WRIGHT v. SOUTH METROPOLITAN GAS COMPANY.

A QUESTION UNDER THE EMPLOYERS' LIABILITY ACT.

This was an appeal from the decision of the Southwark County Court in an action brought by the plaintiff, a workman in the employ of the defendant Company, for compensation for injuries alleged to have been caused by their negligence. The amount claimed was £210; and the jury awarded him £200.

Mr. ADDISON, Q.C., M.P., in support of the appeal, argued that there was no evidence to go to the jury as to the alleged defective condition of the defendants' plant, or of negligence on the part of their servants. The plaintiff's injuries were caused by the falling upon him of one of the retort-lids, the fixing of which he contended was defective, owing to the negligence of the men employed at the retorts. This, the learned Counsel argued, was not made out by the evidence; and therefore he claimed that he was entitled to judgment.

Mr. MOYSES addressed their Lordships in support of the verdict; but had not finished his remarks when he received an intimation that he had said sufficient.

Justice WILLS, in giving judgment, said the case was eminently one for the decision of the jury. It seemed to him that there was abundant testimony of the existence of a defect; and it would require a very long argument and a great deal of evidence to convince him that it was not perfectly easy to devise some mechanical means which would not expose those who were employed about the Company's works to the danger caused by such defects. Therefore the application would be dismissed with costs.

Justice GRANTHAM concurred.

The appeal was accordingly dismissed.

CENTRAL CRIMINAL COURT.—FRIDAY, JULY 6.

(Before Mr. Justice Hawkins.)

THE SALFORD SCANDAL.—SENTENCE ON MR. SAMUEL HUNTER.

To-day, *Samuel Hunter*, formerly Gas Engineer of the Salford Corporation, who pleaded guilty at the March Sessions of the Court to obtaining property by false pretences, to uttering (at Common Law) a forged document, and to perjury, was brought up for sentence. The circumstances under which the prisoner stood at the bar are in the recollection of our readers; and the particulars of the indictments to which he pleaded guilty, appeared, with a full report of the proceedings at that stage, in the JOURNAL for March 27 last (p. 564).

Sir CHARLES RUSSELL, Q.C., M.P., Mr. POLAND, Mr. M'KEAND, and Mr. RICHARDS appeared on behalf of the Salford Corporation; Sir HENRY JAMES, Q.C., M.P., and Mr. FORREST FULTON, M.P., for the prisoner; and Mr. J. W. M'CARTHY for parties interested.

Justice HAWKINS, immediately on taking his seat on the Bench, said the first thing he desired to do was to hand to the Counsel in the case, if they desired to see it, a packet, without any note, but enclosed in an envelope stamped "Town Clerk of Salford." He had opened it, thinking it might be of some importance, as it looked like an important matter; but he found it contained a large sheet of paper with, more or less, cuttings from newspapers. He had not taken the smallest further notice of it; nor had he read them. It was a wrong thing to communicate to a Judge in this way; and he had not therefore even read one part of it. He could not have much doubt where it came from.

Sir C. RUSSELL, on the packet being handed to him, said that, on looking at it, one could see at once that it could not, in the slightest degree, be traced to any such unworthy or improper objects as his Lordship suggested.

Justice HAWKINS said he only wanted to know why anyone should trouble him to read it.

Sir C. RUSSELL said he had suggested to him that, on some application being made to his Lordship as to naming a day for passing sentence, it was mentioned, by the gentleman who had waited upon his Lordship from the solicitor in London, that comments had been made as to delay in passing sentence.

Justice HAWKINS said he knew nothing of such comments, and should not heed them. For the convenience of Counsel on both sides he had mentioned the matter; but whether the object in sending the packet was to influence him one way or the other or not, it was a stupid thing for anyone, knowing that a man was under conviction and awaiting sentence, to communicate with the Judge, except in open Court.

Sir C. RUSSELL said he had very little to trouble his Lordship with, but merely to remind him what the facts of the case were. The prisoner held the position of Gas Engineer of the Salford Corporation, and had been in their service from the year 1875, receiving a salary of £700 a year, with a sum of £100 for cab hire, and certain other small allowances. He was charged by Mr. Ellis Lever with having, in the discharge of his duties as Gas Engineer, improperly received certain moneys of persons who had contracts with the Corporation. The prisoner prosecuted Mr. Ellis Lever nominally for libel; and the case was tried before Mr. Justice A. L. Smith at Manchester, when the prisoner was under examination, having been previously examined at the Police Court. In the result the jury acquitted Mr. Ellis Lever. The indictment against the prisoner charged him with having committed perjury before the Justices; and to this he had pleaded guilty. It also charged him with having committed perjury in his evidence before Mr. Justice A. L. Smith. To this he also pleaded guilty. As regards the perjury, it was in both cases in furtherance of a criminal prosecution by which he had sought to fix the guilt of libel upon Mr. Ellis Lever. In a second indictment the prisoner had also pleaded guilty to receiving certain moneys by false pretences; and to a third he had pleaded guilty—admitting forgery at Common Law, such forgery being the putting forward, to the firm of Messrs. Pope and Pearson, Limited, a letter purporting to come from, and to be signed by the Chairman of the Salford Corporation Gas Committee, containing

the statement that he (Hunter) had the authority of the Salford Corporation to receive certain moneys by way of commission. The prisoner was also indicted under the statute in relation to the ordinary forgery; but, in the opinion of his learned friends who were with him—an opinion in which his Lordship had been good enough to express his concurrence—they did not think the forged authority was such an authority for the payment of money as to bring it within the statutory provisions of the criminal law. Accordingly, they did not offer any evidence on this matter; and with reference to it the prisoner had not pleaded guilty. These were all the facts of the case, so far as he had any right to go into them at that moment. In short, the prisoner had pleaded guilty to perjury before the Justices and also before Mr. Justice A. L. Smith, and to the indictments for obtaining money by false pretences and for forgery at Common Law. When the matter was previously before the Court, Sir Henry James (who appeared with Mr. Fulton for the prisoner) made an application to his Lordship to postpone sentence in order that the prisoner might pay back the commissions he had received, and that the Chancery action which was then pending might be forwarded.

Justice HAWKINS remarked that he understood it was rather a suggestion which was acquiesced in.

Sir C. RUSSELL said he certainly did not oppose it. He would content himself with suggesting (unless his learned friend Sir Henry James obliged him to say more) that in the Chancery proceedings nothing had been done beyond this: The suit was still going on; some accounts had been delivered as particulars in the action; and, so far as they could judge, it had to proceed in its regular course.

Sir H. JAMES asked permission to say a few words which he hoped would result in mitigation of the punishment which had to be passed upon the prisoner. He had no particular criticism to offer upon what Sir Charles Russell had said; but perhaps his learned friend would not object to his referring to the matter of the money restitution, as he wished to avoid the idea that the prisoner had fallen away from the undertaking he had given on the previous occasion when he was before the Court. He (Sir H. James) suggested that the money sought to be recovered by the Chancery suit ought to be paid; and that the best course to take would be as the proceedings in Chancery would, as usual, be of a somewhat lengthy character, that there should be some arbitrator appointed to determine the amount due. With this view, a letter was written on the 12th of April, dealing with the suggested appointment of an arbitrator; this having specially met with his Lordship's acquiescence. The offer had, however, been declined. He was quite sure that those who had declined it did so from a sense of right. However, this was the result. The Chancery suit had not been concluded, but no delay had taken place in consequence of any act of the prisoner. He (Sir H. James) was sorry the amount had not been ascertained; but he did not wish to say more than that no act of the prisoner had prevented it. He had now only to deal with one or two facts connected with the matter in excuse of the prisoner's conduct. His learned friend Sir Charles Russell had stated that no evidence had been offered on the indictment to which the prisoner had not pleaded guilty. The fact was the prisoner did receive commissions when acting as a servant of the Salford Corporation, and when representing the interest of the ratepayers, for he was their Manager. The prisoner had been for 25 years engaged in similar pursuits. He had managed gas companies; and he (Sir H. James) believed he had the acquiescence of every one when he stated that, with the exception of what had occurred at Salford, the prisoner's character was without attack and without taint. He would add that they might take it that, as far as the interest of the Salford Corporation was concerned, except in this one particular, the prisoner had served them faithfully; that the gas-works had, under his management, become prosperous, and a benefit to the ratepayers; and that, apart from these transactions, the prisoner's conduct had been all that could be desired. Of course, this was a very grave matter. The commissions had been received, and the prisoner had received them. In doing so, he had acted very improperly; and when the charge was made, the prisoner no doubt showed great want of moral courage (perhaps his Lordship would think it was worse than that) in endeavouring to defend his position. Under these circumstances, the prisoner had pleaded guilty to some of the charges made against him. He (the learned Counsel) would add—although he did not know whether or not it would affect his Lordship's sentence—that, of course, Mr. Hunter's ruin was complete. He had lost his position; he would be removed from the roll of Justices of the Peace; his home had been broken up; and for the future his life was brought to a close, so far as regarded his ever occupying again any honourable position. He would also mention the extreme gravity of the prisoner's position now with regard to his health, and the very serious effect which a lengthened punishment would have upon him. He had been in custody since the 3rd of February last, and his property had been subject to great depreciation. His home being broken up, of course his family and others had suffered as well as himself. These were all matters which he (Sir H. James) ought to mention, and which he hoped would be taken into consideration by his Lordship.

Sir C. RUSSELL stated that, so far as the Corporation were concerned, there was no desire to mix up the question of the prisoner's punishment with the question of money at all; and in regard to the provision for arbitration, he would point out that, of course, the prisoner was the person who best knew what amount he had received. He had had an opportunity of paying the money in the Chancery matter; but he had not done so. The amount proved was £1215 in one isolated transaction.

Sir H. JAMES said that with regard to there being any suggestion that the prisoner had declined to pay money, he would read a passage from a letter of the 12th of April from Messrs. Bowden and Walker to Mr. Graves (the Town Clerk of Salford): "We trust that the suggestion we have thus made will be accepted; but if the Corporation should decline to accept it, we feel that we ought to bear in mind the views that appear to have been in Mr. Justice Hawkins's mind, and therefore we shall be willing to agree to the nomination of an arbitrator who shall proceed at once to ascertain the exact amount received from the commissions, or to consider favourably any other course you may suggest to bring the litigation in Chancery to a speedy conclusion." He would now ask permission to call evidence with regard to the prisoner's health, and to his general character.

Dr. Raitt was then called, and, in answer to Sir H. JAMES, stated that he was a medical man practising in Manchester, and that the prisoner had consulted him on several occasions. He first saw him about two years ago, and had attended him up to the beginning of last year. He had visited him since he had been in custody, but not professionally. He was suffering from the complete destruction, from inflammation, of the left kidney, the result of calculi, or calculus, or stone in the kidney. It would never do for the prisoner to put off the warm clothing which the witness had advised him to put on. Prisoner had had, to witness's knowledge, considerable shivering attacks. Long imprisonment would tend to bring on these attacks, and would ultimately destroy him. He had, in fact, now only one kidney.

Mr. J. Makinson, Justice of the Peace for and also ex-Mayor of the Borough of Salford, and Vice-Chairman of the Gas Committee, also

deposed to having remembered when Mr. Hunter came to Salford in 1875, as the Manager for the Gas Committee. For anything he knew to the contrary, he always considered him to be a man of good character; and he believed he always served the Corporation faithfully, and the gas-works under his management had become very prosperous.

Mr. Jenkins, also an Alderman of Salford, a Justice of the Peace, and a member of the Gas Committee of the Corporation, concurred with Mr. Makinson in what he had stated with regard to the prisoner, and said the character that the prisoner had borne, apart from the transactions now before the Court, had been good, so far as he knew.

Sir C. RUSSELL said he only desired that the facts should be ascertained and put before his Lordship's mind; and he would merely remark that the prison doctor was present if his Lordship thought it desirable to hear his views upon the prisoner's health.

Justice HAWKINS then proceeded to pass sentence on the prisoner. He said: Samuel Hunter, it is a very painful thing to me to have to pass sentence upon a man whom I have no reason to doubt had, up to the period when these transactions commenced, borne a good character for honesty and integrity; and I have no reason to doubt that in all other respects than that upon which you have been found guilty, upon your own confession, you have done all in your power to advance the interests of the gas undertaking whose Manager you were. But, unhappily, somewhere about ten years ago, being a Gas Engineer, and in a position to exercise considerable influence over the contracts which the Corporation of Salford might be disposed to make, or which they were invited to make with colliery owners, you did that which every man must know to be a crime against his employer; that is to say, you entered into negotiations with colliery companies and with Messrs. Pope and Pearson, Limited, to receive from them commissions of not less than 10d. per ton upon all coals which they supplied upon contracts to the Salford Corporation—these contracts amounting altogether to 29,000 tons. It is true that the contracts extended over three years; and from time to time you received cheques for amounts of commission without saying a word to your employers, and without bringing the fact directly to the notice of Messrs. Pope and Pearson. The former Manager of the colliery company (I am not prepared to mention his name, because I know not how far he was acquainted with this matter) died, and a new Manager was appointed in his place. Towards the close of 1879 and the beginning of 1880, it is quite certain that the bargains you had made had come to the knowledge and were communicated to Mr. Pope, who, although he was only a member of a limited company, nevertheless took an active interest in the colliery affairs. He was immediately struck with (to use, I think, his own expression) the wickedness of the bargain which had been made and entered into with you; and there can be no doubt that it was a very dishonest bargain, because if a person who is employed to buy from those who are to serve his employers insists upon having a commission upon the goods supplied, it makes it absolutely certain that those who have to supply the goods sell them at a dearer rate than they would do if no commissions were paid. In truth, it is depriving those who buy of the amount of commission which is paid to their servant. I take this to be in itself a very dishonest course of dealing; and I am perfectly satisfied that you must have known, at the time you were receiving the various cheques that were paid to you, that it was so. But immediately before the last contract was completed, and before you received the last two cheques due to you for commission, it came under the notice of Mr. Pope. He called the attention of those who had the management of the colliery company to the fact; and the company passed a resolution that no further cheques for commission should be paid to you unless with the sanction of the Salford Gas Committee. This was the substance of the resolution that was passed. You were informed of this resolution, and were told that you would have no more cheques paid to you until that sanction was obtained. It was thought you would get it; and a form of letter was proposed, and ultimately you sent back a letter purporting to be signed by Mr. W. Sharp, the Chairman of the Gas Committee of the Salford Corporation, intimating that there was no objection to the bargain which had been made for your receipt of the commission, and stating that no objection would be interposed to your receiving what might become payable to you under that corrupt bargain. The letter which you so produced had this effect. It was accepted as a genuine letter; and, upon the strength of its being genuine, two different cheques were paid to you, amounting altogether to very nearly £500. That letter was a forgery—you forged the name of Mr. Sharp to it; or, if you did not write the name yourself, you uttered it, perfectly well knowing that it was forged, and therefore you were guilty upon the two indictments to which you have pleaded guilty. You were guilty of having forged an instrument, not so as to make you liable to the penalties which are the consequences of a felony, because a legal technical objection prevented that; but you were guilty of what is known as a forgery at Common Law, which would have subjected you to a long term of imprisonment. By means of this forgery—that document, being believed to be genuine by those who had it handed to them—you obtained these two sums, amounting, as I have already said, to nearly £500, by false pretences. These, stated shortly, are the matters with which you are charged, which appear on the depositions, and to which you have pleaded guilty so far as regards the indictments charging you with forgery and with obtaining money under false pretences. If the matter had stopped there, your offence would have been a very grave one, and you would have been liable to very severe penalties; for you had obtained cheques or valuable securities for money by false pretences, which is an offence which the Legislature has left in the discretion of the judge to punish with penal servitude. For your Common Law forgery you could not have been sentenced to penal servitude, but you might, as I have already told you, have been sent to prison for a very long term. But the matter does not rest there. Things went on until the end of the year 1886 or the beginning of 1887, when some inquiry was made in reference to the dishonest transactions to which I have referred; and a Mr. Ellis Lever was active in making charges against you. And it is clear from what has transpired, and from what has been set forth upon the depositions, that he published of you that which you alleged to be libellous; that is to say, he imputed dishonest conduct to you in having surreptitiously and fraudulently obtained this commission of 10d. per ton upon the goods which had been supplied to your employers. He avowed that this was so. You declared it to be false; and you took the proceedings which led to the commission of the perjury for which you are indicted, and to which you have also pleaded guilty. You caused a summons to be issued against him for having published respecting you an infamous libel which was untrue, and you summoned him before the Magistrates; and both before the Magistrates and before the Judge who tried the matter, you committed that perjury which is now alleged against you. On the trial of the indictment, a plea was put upon the record justifying the language which had been made use of towards you, and which had been written respecting you, alleging that it was not only true in substance and in fact, but also that it was for the public good that your delinquencies should be made known. This matter came on to be tried before the learned Judge who presided in the Criminal Court at Manchester at the beginning of last year. Both

when you went before the Magistrates and had Mr. Ellis Lever committed for trial, and when you went into the witness-box upon the trial and were examined before the learned Judge, you knew as well as you know now that you had been guilty of the offences which are alleged against you. You knew that his justification, as he pleaded it, was perfectly true; and yet, knowing that he was an innocent man—that is to say, that there was no pretence for criminally prosecuting him for a libel—you went into the witness-box, and you swore that you had not, directly or indirectly, at any time received commissions. The question was put to you in various forms by your own learned Counsel, by the learned Counsel who appeared for Mr. Ellis Lever, and again by the learned Judge, in order that there might be no mistake. Three or four times over that question was, in substance, put to you; and three or four times over, with the knowledge that it was untrue, you answered, in substance, as I have already stated. What was the object of that perjury? The object of it was clear. It was, by false evidence, to exculpate yourself from the charges which had been made against you, and to clear your character, which you knew could not legally and honestly be cleared, of the imputations made against it. In order to do that, you did not hesitate to endeavour to have an innocent man fixed with a crime for which he might have been sent to imprisonment for a very long period. I should have been very glad if I could have found in this case, looking through the whole of it, that your misdeeds ended and terminated with the forgery of the letter by which you obtained these two sums by false pretences. Then I could have taken, with satisfaction to myself, a course which it seems to me impossible to take having regard to your later crime, which is that of endeavouring, by false swearing and by perjured testimony, to convict of a crime a man whom you knew to be innocent of it. That, I cannot help informing you, is a very serious and grave offence. It is a painful thing to hear, in the plain and simple, but striking language of your eloquent and learned Counsel to-day, of the ruin that this misconduct has brought upon you. You have been in a good position—a Justice of the Peace, esteemed by all who did not know of your delinquencies, an able man, a man of great shrewdness and of great ability—a man able by honest endeavours to raise himself to a position which might be envied by any man who sought to engage in such avocations as you were engaged in. But this matter has brought you to ruin; it has brought upon you the sad consequences which must attend the crimes which you have committed. It is always a painful thing for a Judge to have to inflict further misery upon those whose ruin has been already effected by their own misconduct, without any penalty coming from the law itself; but what am I to do? How many men stand in the position in which you stand for far less crimes—for crimes of embezzlement, for crimes of obtaining money under false pretences, for crimes of forgery of far less real seriousness—than that of which you are found guilty. What punishment do we award to them? Day by day men are sentenced to long terms of imprisonment, and even of penal servitude, for such crimes. By false pretences—I mean false pretences under such circumstances as you have been guilty of—men have over and over again been sentenced to long terms of imprisonment; and the result has been ruin to their families, their children have been left in beggary, destitution, grief, and trouble which it is impossible to describe in language; while one has been obliged, I will not say to turn a deaf ear, for no humane man can turn a deaf ear to such appeals. What would, however, be said if I were to make a distinction between your case and that of a man who had a much less honourable position to occupy—a man without your education and without your knowledge of that which is right and that which is wrong? It would be immediately said that I was administering the law differently in the case of a rich man to the way in which I should administer it in the case of a poor one. The state of your health is again a matter which I wish I could deal with; and I wish I could myself take it into consideration in awarding the sentence which I think it right to inflict upon you. But I know full well that during the period of your sentence you will be under the watchful eye and care of those who, knowing your condition, will be anxious not to cause you to undergo one single hour's pain, by reason of your physical suffering or condition, beyond that which you are able to bear, and which it would be fairly reasonable to abate. I also know this—that if, in the course of your confinement, it shall be thought necessary that other steps should be taken with a view of your release before the termination of your sentence, there is always an appeal which you can make to the Home Secretary to advise Her Majesty to remit a portion of the sentence which I am about to inflict upon you; and you may rely upon it, if necessity should arise for the making of such an application, you will not find any obstacle in me to the remission being granted to you if the Home Secretary should think fit, with my silence, to advise Her Majesty to remit it. I say this to you as an explanation and a reason why I cannot myself, under the circumstances before me, take into consideration the ill state of your health. The sentence which I am about to pronounce upon you is one which will date from the time of your conviction, and not from to-day. I am going to pass upon you one sentence which will be concurrent with others which I may have to pass upon you upon the other indictments which have been preferred against you. The sentence that I shall pronounce upon you will be on the charges of perjury; and upon these charges I feel I should be waiting in my duty if I did not pass upon you a sentence which I know will fall heavily upon you, but still not more heavily than I think the law requires it to fall. The sentence is for the crime of perjury, of a nature which I think was committed under most serious and aggravating circumstances. It was perjury committed not for the purpose of escaping from your pecuniary debt, but with the double object of escaping the imputations cast upon your character, and fixing an innocent man with your guilt. That is perjury of a very sad description. For that I feel it my stern duty to do that which I am very reluctant to do, and that is to pronounce upon you the sentence that you be kept in penal servitude for five years. With reference to the other charges in the other indictments, I shall direct the sentence to be entered upon each of those charges upon which you have been convicted, of one year's imprisonment with hard labour. These sentences will run concurrently with the term of penal servitude; that is to say, one year's hard labour upon each of the charges for false pretences which I have had before me. Upon the Common Law forgery there will be no hard labour.

The prisoner was then removed.

THE NEATH GAS-WORKS LOAN.—At the meeting of the Neath Town Council on Monday last week, a letter was read from the Local Government Board, sanctioning the loan of £1700 for gas-works purposes, if repaid in 30 instead of 50 years. The Council agreed to this modification.

BUXTON WATER SUPPLY.—The new reservoir which Mr. J. Hague, Assoc. M. Inst., C.E., of Buxton, has been for some time constructing for the storage of water for the supply of that town, has now been completed. It will contain 20 million gallons. It is lined with concrete 10 inches thick, upon which hard-burnt bricks are laid in a 3-inch coating of cement. About 1200 tons of cement were used; and 7200 tons of stony gravel and sand were employed for the concrete and brickwork.

Miscellaneous News.

THE ALLEGATIONS AS TO THE HALIFAX GAS COAL CONTRACTS.

The Monthly Meeting of the Halifax Town Council which was held last Wednesday, under the presidency of the Mayor (Alderman J. Booth), was attended by an unusual number of ratepayers, in anticipation of a discussion on certain allegations which have been made with reference to the coal contracts of the Corporation, as contained in the correspondence published in the JOURNAL last week. On the motion for the adoption of the minutes of the Gas Committee,

Aldermen RILEY (the Chairman of the Gas Committee) said: In moving these minutes, I beg to call the attention of the Council to paragraph one, as follows:—"Letters were read by the Chairman from Mr. Ellis Lever, of Colwyn Bay, North Wales, and Mr. Thomas Fox, of the Silkestone Coal Company, Barnsley, with reference to coal contracts." Other letters have been received since this time; and the whole of them have been printed by order of the Gas Committee. All that I have to say on the subject is this—that everything that has come to the knowledge of the Committee, or any person connected with the Gas Department, has been laid before you all. This consists of the articles in the *Pall Mall Gazette* and the letters of Mr. Lever and of Mr. Fox. These articles and letters have, no doubt, been greatly talked about, and the meaning of them misconstrued, and the importance of them greatly exaggerated. I suppose we shall always have persons among us who are so dishonest and corrupt themselves that they cannot possibly believe in the honesty and integrity of anybody else. These rumours, having once started, have increased in enormity as they passed from person to person, or as Pope says:

"The flying rumours gathered as they rolled,
Scarce any tale was sooner heard than told,
And all who told it added something new,
And all who heard it made enlargements too;
—In every ear it spread, on every tongue it grew."

In this manner has the scandal grown out of the articles and letters mentioned above. But the members of the Gas Committee and persons connected with the management of the works have at present nothing whatever to do with the imaginations and vague rumours of these idle tattlers and busybodies, but must confine themselves to the rebuttal of the actual imputations which have been made relating to the gas-works and their management, particularly in relation to the coal contracts. As yet these consist merely of ambiguous insinuations of corrupt practices. The *Pall Mall Gazette* says: "We should hear shortly of disclosures in Halifax, if the parties concerned dare to court inquiry." Mr. Levers says: "In the interest of fair and honourable trading, as also of the ratepayers and gas consumers of Halifax, I must ask you for an appointment to enable me to show you how the Committee have been dealt with in the past." Mr. Fox says (and here is the kernel of the whole of this matter: "I am informed, on very good authority, that one man has an interest, directly or indirectly, in many contracts with the Gas Department of the Corporation of Halifax; and it would be well that the matter should be sifted to the bottom. Halifax cannot desire a repetition of the Salford scandal." I will not weary you with reading through the whole of the articles and letters above referred to and the replies of the Town Clerk; nor is it necessary for me to do so, as they have all been printed and freely circulated, and I have no doubt you are all fully conversant with them. Let us see what these articles and letters come to. The Editor of the *Pall Mall Gazette*, on being asked by the Town Clerk whether the allegations which appeared in his paper meant to impart a distinct charge of corruption against the Gas Committee of the Halifax Corporation, or their servants, or both, and whether the article was a challenge to them to court inquiry, replies—taking refuge under the ambiguity of the words of the article—"that he is not prepared to become responsible for the construction which other persons or papers may have placed on a note published in the *Pall Mall Gazette*." The Town Clerk then replied to the Editor, saying that his letter seemed to "repudiate the construction put upon the words in the *Pall Mall Gazette* by the public and the press, and to shirk the responsibility attaching to the words used;" and also that the Corporation accepted the challenge contained in the article, and not only dared, but courted the fullest inquiry. The Town Clerk also informed the Editor of the *Pall Mall Gazette* that the Corporation would meet on the following Friday, and that he would be glad to know whether the remarks referred to any member of the Corporation, or their officials. But on these points, and to these queries, he has not received any reply. The Town Clerk wrote to Mr. Lever on the 24th of May last, saying that he would be glad to see him any time the next week between ten and five o'clock. But to this letter this gentleman—who has the interest of fair and honourable trading so much at heart, and with the information in his possession—has not even deigned a reply. Mr. Fox, on being several times written to by the Town Clerk, refuses to say whether the man referred to in his letter as being interested in contracts with the Gas Department is a member of the Town Council or a servant of the Corporation, or neither one nor the other; and also refuses to furnish any specific information unless indemnified against all costs in the event of the charges being proved. Of the nature of these charges, whether grave or trivial, he says nothing. If Mr. Fox, or any other person, will formulate a direct charge against any member of the Gas Committee, or against anyone connected with the management of the gas-works, then I for one—and I am sure I may say the same for every member of the Gas Committee—am fully prepared to meet and disprove the same. But as yet no one has dared to make such a charge; and therefore there is nothing for us to meet or disprove. I have to move—"That the minutes of the proceedings of the Gas Works Committee of the 1st and 15th of June last be approved and confirmed; that the correspondence between the Town Clerk, Mr. Ellis Lever, Mr. Thomas Fox, and the Editor of the *Pall Mall Gazette* be referred to the Mayor, Alderman Ramsden, and the Town Clerk, with instructions to lay the same before Counsel, and take such steps as they may be advised, and report to the Council; that Mr. Fox be informed forthwith that, if the person referred to in his letter of June 2 be a member of the Council or a servant of the Corporation, his offer to prove his charges, on being indemnified against cost, be accepted—it being understood that such charges shall be proved in a Court of Law."

Mr. J. BINNS (Deputy-Chairman of the Committee) seconded the motion, and said that everything which had been done by the Committee had been done openly and above-board. The Council might rely upon it that the eyes of the Committee had not been closed; and he could truly say that nothing had come to their knowledge which could compromise either the members of the Committee or the servants of the Corporation. They would be perfectly ready to hear all that any gentleman might have to say concerning the subject. The Committee thoroughly disapproved of anything in the nature of commissions and of corruption of every kind; and they challenged anyone to make whatever statements could be made against the Committee. The position was rather an alarming one, and it must be met. The ratepayers had become somewhat excited about it.

Perhaps the members of the Gas Committee, out of their perfect innocence, had been cool by contrast. He begged the ratepayers, however, to withhold their judgment until such time as the Council could legally investigate the matter. Their friends would give them credit for the best intentions. The Committee did not know of any corruption, and were willing to hear of any that might be known outside the Committee.

Mr. J. BROOK, after describing his thorough knowledge of the affairs of the Gas Committee, said he had very great pleasure in supporting the resolution.

Alderman RAMSDEN remarked that, while he was not disposed to shirk any duty that might be put upon him by the Council, he rather doubted the wisdom of the second clause of the resolution, referring to Mr. Fox. Whatever happened, someone would have to pay, while Mr. Fox would not be under any pecuniary responsibility whatever. He doubted whether they had the power to spend public money in finding an indemnity for Mr. Fox under these circumstances. He took it that the duty of himself and his colleagues who were mentioned in the resolution was as to the first part only, and not the second.

The MAYOR: That is understood. The Town Clerk will answer the point as to our being able to take action.

The TOWN CLERK said he should not have drawn the resolution if he had not thoroughly made up his mind that the Council had power one way or the other. If Mr. Fox's charges were proved in a Court of Law, the resolution would indemnify him from all costs. But if he failed to prove his charges, he would have to pay his own costs and those of the Council as well; and he would also be subject to other inconveniences which need not at present be mentioned.

Mr. JESSOP said the question was causing a great deal of excitement among the ratepayers—excitement which had assumed such proportions that he questioned whether the resolution would satisfy them. He therefore wished to move an amendment—not from any disrespect to the gentlemen named, and not doubting that they would investigate the matter without bias, but desiring that the public mind should be relieved from any doubt. If the question was to be relegated to a Committee of Inquiry—

The MAYOR said it was not a Committee of Inquiry. It was simply sought to take Counsel's opinion, and to report to the Town Council.

Mr. JESSOP: Then, is not the Committee to receive evidence?

The MAYOR: Certainly not.

Mr. MINGLEY urged that it was due to the members of the Gas Committee that they should be regarded as perfectly innocent in this matter; and every honest-minded man would, he said, have this feeling towards them.

Mr. BROADBENT said every one had the fullest confidence in the Committee; but it was clearly the duty of the Council to adopt the resolution. These rumours were not new; and it must be painful to members of any Committee to hear such remarks. Therefore it was high time that the rumours should be silenced once and for all. If Mr. Lever and Mr. Fox were not prepared to come forward, they were unworthy of notice. If, on the other hand, they had anything to say, let them have every facility for saying it.

Mr. OAKES was of opinion that the scandal had arisen out of the dis-appointment of some person who did not get a share of the contracts. He said the Council had the utmost confidence in the Committee; and it was scandalous that such rumours should be set afloat.

Mr. JESSOP asked if it was true that the Committee had given Mr. Ellis Lever 9d. per ton more for cannel coal than the figure for which the Crosland Moor Company had offered to supply it.

Alderman RILEY said the Crosland Moor Company's tender was exactly 9d. per ton less than Mr. Lever's for the same kind of coal.

Mr. BIRSTOW: Mr. Lever never had the contract at all.

Mr. BINNS: And never has had.

Alderman D. SMITH thought it was folly to go to law over the subject. He would not spend 6d. on it.

Alderman POLLARD differed, and was of opinion that the Council ought to court the fullest inquiry.

The MAYOR said people were too ready to spread rumours of the kind in question. There was no other course left for the Corporation to take than to prosecute the inquiry to the bottom. Though the charges were so indefinite and intangible that it was difficult to say what they meant, there were charges; and it was their duty to meet them. If there had been a regular system of speculation, or if a large amount of money had been abstracted, could the Halifax Corporation have produced gas at a price lower than that charged in any other town in the country, or show so much profit? On the face of it, the rumour was a vile slander. Whatever the Council might do, he would take good care that the matter was investigated; and if there was a possibility of "warming" the perpetrators, he would warm them, either through their jackets or their purses. These things should not be allowed to go on with impunity.

The resolution was then carried unanimously.

The following letter, dated the 5th inst., addressed by Mr. Ellis Lever to the Town Clerk of Halifax, was received by the latter last Friday:—"Dear Sir,—My attention has been called to the fact that the letter which I wrote to you on the 22nd of May last has been published in the newspapers without any notice of such publication being given to me. The letter was of a confidential character, although not marked private; and I am very much surprised to find that it has been handed to the press. It was not my intention to make any imputation against the Gas Committee or the officials of the Corporation, all of whom are unknown to me. A sudden death in my family and absence from home have prevented my seeing you, as I had intended."

NEW JOINT-STOCK COMPANIES.—The following joint-stock companies have lately been registered:—The Long Melford Gas and Coal Company, Limited, with a capital of £4000, in £1 shares, to purchase or otherwise acquire the whole, or part of the business properties, consisting of the gas-works and coal-yards, situate at Long Melford, in Suffolk, as a going concern, from the present owner (Mr. A. Stuart).—The Buckingham Electric Light and Power Supply Company, Limited, with a capital of £5000, in £1 shares, to carry on at Buckingham and elsewhere in the county of Buckingham, the business of an electric light and power supply company in all its branches.—The Electrical Purification Association, Limited, with a capital of £15,000, in £1 shares, to acquire certain patents relating to "improved means of oxidizing and decomposing by electrical action organic matter and inorganic salts in sewage water and other liquids, and the production of certain products therefrom, and improvements in the means or appliances for treating sewage by electrolytic action, and for the disposing of the deposits thereof." Among the first subscribers are Mr. W. Webster, electrician, who agrees to take 200 shares, and Mr. T. Slater, who is down for 1000 shares.—The Tenbury Union Gas Company, Limited, with a capital of £3000, in £5 shares, to light with gas or other lighting power the town of Tenbury, in the county of Worcester. The Company is registered without Articles of Association.

BIRMINGHAM CORPORATION GAS SUPPLY.

THE LIGHTING OF COURTS.

At the Meeting of the Birmingham Town Council last Tuesday—the Mayor (Alderman Pollack) in the chair—the report of the Gas Committee, the principal portions of which were given in the JOURNAL last week, was to have been discussed; but, owing to the length of the proceedings on other matters on the paper of business, it had to stand over till the next meeting. The subject of the lighting of courts, however, came under consideration, on the presentation of the report of the General Purposes Committee containing the following remarks thereon:—“In reference to the instruction given to the Committee ‘to take into consideration the question of the compulsory lighting of courts, terraces, common stairs, and other private ways in the borough, and to take such steps as they might deem expedient to obtain powers to enforce such lighting, and to report,’ the Town Clerk cites a recent decision as to what constitutes a street within the meaning of the Public Health Act, and quotes a clause from the Burgh Police and Health (Scotland) Bill now before Parliament, proposing to compel owners of court property to place lamps in courts and alleys. The Town Clerk sums up the case: ‘Starting with the proposition that courts in towns are objectionable on sanitary grounds, that their extension is discouraged by the Local Government Board, that the houses in them are rated (*inter alia*) for public lighting, and that the surface of the courts can be treated as a private street at the will of the Local Authority, it does not appear to me that such a clause as that contained in the Scotch Bill would be consistent with the general law of this country.’”

The Mayor, in moving the adoption of the report, said no one would deny that the time had now arrived when this matter should be settled. It had been previously stated in a report by the Town Clerk that the Council had power to declare courts and terraces private streets; and this was confirmed by a recent legal decision. If this power were exercised, it would entail upon the Corporation the necessity of lighting the courts and terraces at the public expense; but it would at the same time entail upon the owners of the property very considerable expense in carrying out the necessary works, and would deprive them of all interest in so much of the land as should be declared to be a highway. The Town Clerk did not think that any special legislation in the nature of the Scotch Bill now before Parliament with a view to making it compulsory upon owners to light their courts could be obtained in England; the law already being sufficient to deal with the matter. But the Public Works Committee had offered the owners every facility for undertaking the work in the shape of reduced rates for the gas supply and other concessions, which would be far cheaper to the owners than if they drove the Council to exercise their powers to the full. It only remained to be seen whether the landlords of the courts would show so much common sense as to consult their own interests by undertaking to light their courts. In the event of the Corporation being driven to enforce their powers, the burden of the expenditure would fall upon the ratepayers.

Sir T. MARTINEAU seconded the motion; and it was declared to be carried.

Mr. GRANGER complained that the vote had been taken without an opportunity being afforded him of speaking.

The Mayor explained that, after the motion had been seconded, he looked round the Chamber, but did not observe anyone desirous of speaking. He should, however, give Mr. Granger an opportunity of doing so.

Mr. GRANGER said he thought it was to the interests of the social and moral condition of the people that the courts and terraces should be properly lighted. There were upwards of 6000 courts in Birmingham; and yet not more than 150 of them were lighted. It was evident that moral suasion would not have the desired effect upon the property owners; and he considered that other means would have to be tried.

Mr. BRINSLEY thought there were two sides to the question, and that some of the small property owners were not in a position to undertake the lighting of the courts.

Upon a vote being taken, the report was adopted.

PARA GAS COMPANY, LIMITED.

In view of the general meeting of this Company to be held next Thursday, the report of the Directors, with the accounts for the half year ending March 31 last has been issued. It states that the revenue for the six months is slightly in excess of that earned during the previous half year, but somewhat less than that of the corresponding period of 1886-7. The expenditure has been considerably reduced in some of the most important items; and the result is a profit of £8427 on the half-year's working. The Directors have deducted from the gas-fitting plant account £2000 of the amount standing in the gas-fitting rental reserve account, and have written off a further amount of £1000 for depreciation. Mr. R. Hall (formerly Assistant Manager), who took full charge as Manager on the 2nd of August last, retired from his appointment at the expiration of his agreement, having been three years resident in Pará in the service of the Company; and Mr. John Gibson Newbigging has been appointed Manager and Engineer in his place. The petition to the Imperial authorities in Rio, alluded to in the last report, was referred to the Provincial Government “for information;” and this and other formalities caused such delay, that no definite reply had been received up to the date of Mr. Hall's departure. The repayment of duties had, however, received the attention of the Imperial Government; and a speedy settlement of this question is anticipated. The late Manager reports the works and property of the Company in good condition. The Directors regret to have again to draw the attention of the shareholders to the treatment they are receiving at the hands of the Provincial Government. Fines on the public lighting amounting to £600 for the half year have been inflicted, notwithstanding the efficient discharge of its obligations by the Company. The Directors recommend the payment of dividends for the half year at the rate of 4 per cent. per annum upon the ordinary stock of the Company, free of income-tax; and 7 per cent. per annum upon the preference shares, less income-tax.

LINCOLN CORPORATION GAS SUPPLY.

THE CHARGES FOR THE HIRE OF SMALL METERS.

At the Meeting of the Lincoln Town Council last Tuesday, Alderman Maltby moved, pursuant to notice—“That it be an instruction to the Gas Committee of the Corporation that they take into consideration the desirability of reducing the charge for meters rented by consumers having three lights and under.” He said when the question of the purchase of the gas undertaking was broached, an inducement was held out that it was hoped one of the first reductions that would be made would be in the charge for the hire of small meters. He had been at the trouble to obtain some information on the subject; and he found that if they did not take into consideration the inspecting and watering, in 16 years, at 4s. per year, a meter was paid for twice over. This was not the case with the larger meters. If the charge on the 3-light meters was reduced to 6d. per quarter, there would be an annual loss of £380; but he was fully satisfied that this sum would be made up in the increased consumption of gas. He was informed that there had been a large number of meters returned of late;

the greater proportion of which were 3-light meters. This fact spoke of there being some dissatisfaction with the charges. In many cases, where little gas was consumed during the summer months, the charge for the meters was out of proportion to the charges for the gas consumed. He felt assured that the reduction he advocated would result in additional meters being required and more gas consumed. Mr. Ward, in seconding the motion, said that probably in the whole history of the gas undertaking they had never attained such a degree of prosperity as at the present time. The consumers therefore ought to have some advantage, and to his mind the poorer classes should have it. At present in many cases the rental of meters amounted to more than the charge for the gas consumed. Mr. Cannon had no objection to the proposition; but he maintained that it was, on the whole, an unnecessary one. It was understood that some change would probably be made when the accounts of the gas undertaking were before them, and those accounts were now being handed round. He hoped the reduction would refer to all the gas-meters. This was the proposition he was prepared to put before the Gas Committee; and it would only make a further difference of £120. Mr. Wyatt was in favour of sweeping away the rents of the meters altogether; and if it was found necessary, to “make both ends meet,” they could charge more for the gas. The Mayor (Mr. T. Martin) reminded the Council that when the payments were made to the sinking fund last year, they were £8 short; and until now they had not had any money in hand. Supposing the price of coal went up during the next twelve months, they might be in an awkward position if they relieved the gas consumers of this meter-rent. The motion was then put and carried.

WIDNES LOCAL BOARD GAS AND WATER SUPPLY.

ANNUAL INSPECTION OF THE GAS AND WATER WORKS.

The annual inspection of the Widnes Gas and Water Works by the members of the Local Board took place on Tuesday, the 26th ult. It commenced at the gas-works, where the party were met by the Gas and Water Engineer (Mr. Isaac Carr), who conducted them through the works, and explained the method of making gas. Special interest was manifested in the Dinsmore process of gas manufacture from coal tar, which had been adopted at these works; the apparatus being now in course of erection. After making a thorough inspection of the gas-works, the party drove to the covered water reservoirs of the Board. The large reservoir, which was opened ten years ago, was illuminated, by the direction of Mr. Carr, with 600 candles; and the effect was most charming. The water had been previously drawn off, in order that the members might inspect the structure, to ascertain how the masonry had stood. It was found to be in excellent preservation. This is the first time the reservoir (which at the time of its construction, was the largest in the world) has been emptied; the layer of sand, after so long a period of pumping, was in no part more than three-quarters of an inch in depth—a fact which goes to prove the excellence of the water received from the source and supplied to the town. The reservoir is 330 feet long, 240 feet wide, and 23 feet high, and its storage capacity is 11½ million gallons, which is just sufficient to provide Widnes with six days' supply. The roof of the reservoir is supported by 360 massive stone pillars. The reservoir has been cut out of the solid rock, and was constructed at a cost of £30,000. During the past year the Board were able to pump a larger quantity of water than previously, owing to the improved engines which have been put up. There is now sufficient water for all purposes, and to spare; and an extra million gallons per day could be pumped, should necessity arise. The party next visited the pumping station at Stocks Well, where they inspected the new engines, which, it was stated, were pumping out of the well 1½ million gallons of water per diem. The members then drove to the Netherly pumping station, where, however, there is nothing new since the last visit, twelve months ago. Here 1,400,000 gallons of water are daily pumped. The party then returned to Widnes; expressing great satisfaction at the way both the gas and the water works are managed by Mr. Carr.

THE POTTERIES UNDERTAKING OF THE BRITISH GASLIGHT COMPANY.

THE ALTERATIONS IN THE COMPANY'S ACCOUNTS.

At the last Meeting of the Hauley Town Council—the Mayor (Mr. H. Palmer) presiding—the minutes presented by the Gas Sub-Committee contained the following resolution which had been passed:—“The Sub-Committee having considered the letter from the Board of Trade as to the British Gaslight Company's form of accounts, and the other correspondence, reports that it sees no reason to withdraw from its contention that the amounts previously charged for depreciation and insurance by the Company should be brought into account, and refunded in that manner to the consumers, and that the accounts should be altered in accordance with the letter sent to the Board of Trade by the Town Clerk on Dec. 21, 1887; and also that this Sub-Committee feels that, but for the untimely publication of certain correspondence relative to the matter, no change would have taken place in the views of the Directors of the Gas Company, as explained in their letter of the 1st of December last.”

Mr. BEBBINGTON referred to the fact that the resolution of the Gas Sub-Committee contained a minute to the effect that, but for the untimely publication of certain correspondence, “no change would have taken place in the views of the Directors of the Gas Company.” This could not be true. He asked how could the disclosures in the letters referred to possibly affect the Company? The latter were in possession of the information. He did not feel any regret for the publication of the letters; and he must contend that the Sub-Committee of the Corporation, in keeping it in its possession, away from the knowledge of the Council, over two Council meetings an important letter, had done an improper and an irregular thing. He then proceeded to discuss the question of charging for depreciation, and said the Company had never stated that they had the power to charge for depreciation, but the people of Hanley had forced it on the Company. He contended that a more thorough and searching investigation was required than the Council had at present made; and he was of opinion that it would be wise and right that the clause referred to in the report of the Gas Sub-Committee should go back for further consideration. He concluded by moving an amendment to this effect.

Mr. BRADFORD seconded the amendment.

Mr. HAMMERSLEY, in an exhaustive speech, proceeded to defend the action of the Corporation in their recent litigation against the Gas Company, and also the resolution passed by the Gas Sub-Committee. After an able criticism of the Gas Company's accounts, he said the thanks of the community were due to those members who had done so much for the benefit of the inhabitants of the town. According to the Company's own statement of accounts, one-seventh of the revenue would be kept in the pockets of the tradesmen and others in the town, owing to the action of the Sub-Committee, instead of going to swell the Company's dividend.

Alderman POWELL also offered some remarks in justification of what the Gas Sub-Committee had done. It would be in the memory of the Council how rejoiced they were on the receipt of the letter of the 1st of December, and how delighted that they had obtained the one thing they had been fighting for. He suggested that the Directors of the Company, in consequence of what had recently taken place, had arrived at the

conclusion that there was not now the same disposition in the Council Chamber that there was in times past, and that therefore they were not going to do the thing they said they were going to do on the 1st of December last. The Council had not received any indication until the present month that the Directors had changed their minds. On the contrary, they were all clearly under the assurance that the Directors had ordered to be written what they intended should be done. His own conviction was that if certain correspondence had not been published, the position taken up by the Directors would never have changed.

Alderman POWELL contended that not a single act of the Gas Sub-Committee had been done in a hole-and-corner manner. Indeed, every act of that Committee had been reported to the General Purposes Committee, and afterwards submitted to, and approved by the Council; and now Mr. Bebbington wished to censure the Council.

Mr. BRADFORD submitted that the same result which had been obtained might have been secured by the adoption of more pleasant means, and without litigation.

On a vote being taken, the amendment was lost, and the minutes of the General Purposes Committee, including those of the Gas Sub-Committee, were approved.

Two notices of motion which Mr. Bebbington had placed upon the agenda paper were not proceeded with; the members rising in a body on the completion of the ordinary business. These motions were as follows:—“(1) That this Council hereby declares its approval of the proposal of the British Gaslight Company, Limited, to the effect that they are prepared to discontinue the charges on account of insurance and depreciation. (2) That in the opinion of this Council it is desirable and necessary for the good government of the borough that all such proposals as would involve the borough in obligations, or would directly entail an expenditure exceeding £20 be submitted to and receive the sanction of the Council before action be taken upon them.”

Mr. BEBBINGTON intimated that he should place the notices on the agenda for consideration at the next meeting.

BANGOR CORPORATION GAS SUPPLY.

THE PAST YEAR'S WORKING.

According to the report of the Gas Engineer of the Bangor Corporation (Mr. J. Smith) on the working of the gas undertaking in the year ending March 25, 1888, which he has lately presented to the Gas and Water Committee, there was a falling off to the extent of 629,000 cubic feet in the quantity of gas used, as compared with the previous financial year. Only 200,000 cubic feet of this were, however, in respect of the private consumption; the remainder being due to the public lamps being lighted for a fewer number of hours. The unaccounted-for gas was less by 179,900 cubic feet, and the make per ton of coal more by 427 cubic feet than in 1886-7. There was an increase in the item of repairs to plant; 15 retorts having been renewed, and a number of meters altered to M. Wybauw's arrangement. The former cost £78, and the latter £50, against which there was £66 additional income on residuals, rent of stoves, &c. Sulphate of ammonia produced £99 net, as against £63 in the previous year. The total revenue from gas was £3886, or £258 less than before; £107 4s. 6d. being due to the curtailment in the public lighting. But the gross profit, by reason of the increased income from residuals, &c., was only £219 less than in the year 1886-7. The quantity of gas used for purposes other than lighting increased considerably; being during the three last quarters 590,600 cubic feet more than last year, in consequence of the reduction in price made in June, 1887, to 2s. 6d. for day gas and 5s. for night gas. Although there was a loss of £34 10s. 9d. on the gas used in the daytime, the profit on the increased consumption amounted to £34 2s.; leaving the net loss on the experiment only 8s. 9d. There were fixed during the year 19 cooking-ranges; also gas-fires and other apparatus for using gas. Mr. Smith says it appears by the quantity of gas sent out up to the present time, that the consumption of gas this year will be considerably more than in any previous year. In the 12 weeks preceding June 22 last (the date of the report) he sent out 249,800 cubic feet more than last year, and 157,800 cubic feet more than in any previous year; and if the illuminating power is kept up without increasing the expenditure too much, the present will, he says, be a prosperous year for the undertaking. The following are the general results of the year's working:—

Coal carbonized—	
Common, 1056½ tons	1794 tons.
Cannel, 187½ „	7 6
Percentage of cannel used	17,599,500 cubic feet.
Gas made	9,810 „
Do. per ton of coal	15,950,200 „
Gas sold	90 62 per cent.
Do. per cent. on make	866,900 cubic feet.
Gas used in cookers, engines, &c., at 2s. 6d. per 1000 feet.	165,700 „
Gas used on works	0 94 per cent.
Do. per cent. on make	16,115,900 cubic feet.
Gas accounted for	91 57 per cent.
Do. per cent. on make	1,483,600 cubic feet.
Gas unaccounted for	8 43 per cent.
Do. per cent. on make	112½ tons.
Coke made	12½ cwt.
Do. per ton of coal	5½ „
Do. used per ton of coal	7½ „
Do. sold	57 7 per cent.
Do. sold, per cent. on make	s. d.
Cost of coal per ton, less residuals	8 5½
Cost of gas in holder, less residuals	1 7 per 1000.
Amount of capital employed	£ s. d.
Do. per ton of coal carbonized	27,660 10 3
Do. per 1000 feet of gas made	15 8 3
Do. per 1000 feet of gas sold	1 11 5
Do. per 1000 feet of gas sold	1 14 8
Illuminating power of gas required by Act	14 candles.
Illuminating power supplied	17 „
Average price of coke sold	s. d.
	9 10 per ton.

The capital expended on the works amounts to £27,660 10s. 3d.; but there is also a sum £16,614 6s. 6d. premium to be paid on redemption of annuities—making the total amount to be provided by the sinking fund on account of gas-works, £44,274 16s. 9d.

THE NORTHERN COAL TRADE.—There is a better demand for steam coals in the North; and prices are so firm that in one or two instances there is now asked the rate of 8s. 6d. per ton, free on board in the Tyne, for best qualities. It is not known to have been paid, however; and generally from 7s. 6d. to 7s. 9d. net is the rate for this quality, whilst second-class coals may be put at about 7s. In gas coals there is already a rather improved demand; but the price is no better. Some discussion has taken place in local coal trade circles as to the wisdom or otherwise of collieries which have accepted the great London gas coal contracts for three years to come, during which many experienced in the trade believe that a sharp increase in prices is probable. The demand for gas coal for export continues good. Household coal is extremely dull just now; the demand being about at the minimum, and the price very weak, whilst the competition is great. In the coke trade there is an active demand generally.

WARRINGTON CORPORATION GAS SUPPLY.

THE MANAGEMENT OF THE GAS-WORKS.

On Monday last week a largely-attended meeting of ratepayers was held at Warrington to protest against the proposals of the Gas Committee relative to the appointments and salaries of officials, to which reference has been made in our columns. Mr. H. Thornton moved a resolution disapproving the proposals, and calling for an investigation into the management of the works, for a reduction in the price of gas to the consumers, and for quarterly instead of half-yearly accounts. Mr. Knean seconded the resolution. Mr. Barlow moved, and Mr. Woods seconded, an amendment, expressing confidence in the Committee. Both gentlemen met with constant interruption; and the resolution was carried by an overwhelming majority.

At the meeting of the Town Council on the following day, an animated discussion took place on the report of the Gas Committee embodying the above-mentioned proposals as to the appointments. Alderman Holmes, as Chairman of the Committee, referred to the resignation, through failing health, of Mr. J. Paterson, and the proposal to retain his services as Consulting Engineer at a salary of £100 per annum. He would report at least once a month on the condition of the works. They proposed to appoint Mr. William Spence Haddock (who had served his articles under Mr. Paterson), and pay him a salary of £300 per annum. Mr. Platt proposed that Mr. Paterson be not appointed Consulting Engineer. Mr. Pierpoint seconded the amendment. Ald. Webster seconded the motion for the confirmation of the minutes. He said that not a single farthing was contributed to the gas-works by the borough, but, on the contrary, the works had contributed largely to the reduction of the rates. The expenses of the Gas Department, as to salaries, had been £1248; but the proposed rearrangement would result in a saving of £200 a year to the Committee. As to the price of gas, since the works came into the possession of the Corporation there had been two reductions. Mr. Roberts denied that the rates had been reduced out of the profits of the gas-works; and he strongly condemned the principle of dual control. Mr. Monks supported the proposals; and denied that there would be any dual control. If the Gas Department did not contribute to the reduction of the rates out of the profits, the debt on the works was reduced from that source. Alderman Davies appealed to the Committee to modify the proposals by appointing Mr. Paterson as Consulting Engineer at £100 for one year only. Alderman Harrison approved this suggestion. The Committee had, he said, taken credit for saving £200 a year by the reorganization of the Gas Department; and he urged them to save £300 by abandoning one of their recommendations. On the amendment being put, it was lost; 14 votes being for, and 17 against it. Alderman Davies moved that the minutes be confirmed, with the exception of that relating to the appointment of Mr. Paterson as Consulting Engineer, and that he be appointed for one year only. The Mayor (Alderman Sutton) said the amendment as it stood could not be legally carried. Alderman Davies amended the resolution; retaining the first part, and concluding “that the Committee be recommended to submit an amended report to restrict the engagement for one year.” The amendment was carried.

GALASHIELS GAS COMPANY.

The Fifty-fourth Annual Meeting of this Company was held last Tuesday—Mr. J. Aird, Chairman of the Company, presiding. The report of the Directors for the past year stated that the quantity of gas manufactured was 52,968,300 cubic feet, and that the loss by leakage was 1,916,834 cubic feet; being equal to 3 61 per cent.—certainly a very low rate. In the works and offices the amount used was 500,000 cubic feet; so that the quantity of gas passing through the consumers' meters for the year was 50,551,466 cubic feet, as against 49,259,390 cubic feet in the year 1886-7; thus showing an increase for the year of 1,292,676 cubic feet. The report stated that the illuminating power of the gas had been maintained during that year at the usual high standard; and also (as mentioned in last week's JOURNAL) that the price of gas for the year 1888-9 had been reduced to 2s. 11d. per 1000 cubic feet. All the works were reported to be in good repair. The Directors regretted to have to report the death during the year of Mr. W. Haldane, who had ably and efficiently discharged the duties of Secretary and Treasurer for upwards of 30 years. In his place they had appointed Mr. J. Pike. The balance-sheet showed that the assets, after making allowance of 2½ per cent. for depreciation, rated the value of the works at £23,539 2s. 4d.; in addition to which there was the June collection, now due with recoverable arrears which together amounted to £1950. There was also in the bank the sum of £2293 2s. 10d.; and the stocks of various kinds brought up the total amount to £28,324 12s. 11d. In the shape of liabilities, there was the share capital (2100 shares at £10 each), amounting to £21,000; there was also the dividend of 10 per cent. recommended by the Directors; and, lastly, a balance of £5244 12s. 11d. to be carried to next account. The year's profits amounted to £2415 13s. 3d.; and the balance from last year's account was £4908 19s. 8d. The total income for the past year was set down at £8915 7s. 7d., and the expenditure amounted to £6499 14s. 4d.; the year's profits, as already mentioned, being £2415 13s. 3d. The report having been placed before the meeting, Mr. Fairgrieve moved its adoption. Provost Hall seconded the motion, and it was carried. Provost Hall and Messrs. Fairgrieve, Sanderson, and James Dickson were appointed Directors, in room of those who were retiring and were ineligible for re-election, to whom the thanks of the shareholders were accorded. The thanks of the meeting were also given to Mr. A. Scott, the Manager, for the way in which he had conducted the affairs of the Company.

THE WATER SUPPLY OF STAINLAND.—A Company is in course of formation to supply water to Stainland and the district from the Dean Head reservoir. The reservoir, which was originally constructed for the supply of water to mills in the locality has a capacity of 78 million gallons. The Oldham Corporation made overtures for the purchase of it some time ago; but the local opposition proved too strong for them before the Parliamentary Committee.

THE SALFORD CORPORATION GAS UNDERTAKING.—At the meeting of the Salford Town Council last Wednesday, the minutes presented by the Gas Committee stated that the profits on the gas undertaking for the year ended the 25th of March last amounted to £20,894. In reply to Alderman C. Makinson and other members, Mr. H. Lord, Chairman of the Gas Committee, said a number of men had been recently discharged from the gas-works; but it was not true, as asserted, that other men had been engaged to take their places. The men had been discharged because their services were not required. If the price of gas was to be reduced, a beginning must be made somewhere with the work of economizing. Mr. F. W. Roe-Rycroft asked whether the former Gas Manager had made any restitution; and if so, to what amount. The Mayor (Alderman Dickens) replied that the question was one that could not be rightly put to the Council at that moment; and therefore he declined to say anything on the matter. Mr. Rycroft proceeded to put other questions on the subject; but without effect.

PLYMOUTH GAS COMPANY.

THE SECRET OF THE COMPANY'S SUCCESS.

At the Annual General Meeting of this Company—briefly noticed last week—the Chairman (Mr. G. Henderson), when moving the adoption of the report, said he had no doubt the shareholders would consider the working results of the past year satisfactory; leaving as they did a balance of £10,426, compared with £10,471 the previous year—showing a difference of only about £50. In accordance with the hope he expressed at the previous meeting, the price of gas was reduced at Michaelmas last to 1s. 9d. per 1000 feet; and he believed that he was justified in saying that this was the lowest price charged by any gas company in the United Kingdom. It was possible that some gentleman present might be disposed to ask how it was that they were able to do this, especially when their long distance from the coal-pits was taken into account; for they had to obtain coals from Newcastle or Glasgow, and the cost of freight during the last year amounted to no less than £10,000. The reason they were able to do it was that in the early history of the Company for many years, instead of paying the maximum dividends of 10 per cent., the shareholders received 6 per cent., and the surplus profits were laid out in extending and enlarging the works; while subsequently, from time to time, they had appropriated large sums out of profits for depreciation and the renewal of plant. They now only required about 4½d. per 1000 cubic feet to pay their dividends. They had no borrowed capital; and consequently had an advantage over most other companies, which required from 1s. to 1s. 3d. per 1000 feet to do the same thing. This showed very plainly how it was that they were able to supply gas at such a low price; and, in fact, their capital was the lowest of any gas company in the United Kingdom. Their company was started as a consumers' company; and from the formation up to the present time, the Directors had always adhered to the policy of supplying gas at the lowest possible rates consistent with being able to pay their dividends. The reduction in the price of gas by 1d. per 1000 feet was a benefit of £1236 to the consumers; while the additional quarter per cent., which the shareholders were entitled to receive in consequence of the reduction, only amounted to £118. The revenue account however, in spite of the reduction in price, showed that the total amount received from the sale of gas was £43,623, as compared with £42,606 in the preceding year, or an increase of about £1000. Meter-rental advanced about £100. As to residual products, the sale of coke showed an increase of £600 or £700; while there was a rise of about £600 in the sale of sulphate of ammonia. The entire receipts for residual products were £13,239, against £17,909 in 1886-7. The total receipts of the year amounted to £60,666, or an advance of about £2500, notwithstanding the reduction in price. With increased revenue more coals and more labour were required in various ways in the manufacture of gas; and the total cost for coals, salaries, wages, and machinery was £40,553, against £38,953 before. During last year they laid down three miles of mains, extended mains into the suburbs, and took up some old pipes, which they replaced by larger ones; and all this had been paid out of revenue. The total expenditure was £50,239—an increase of about £2000. The quantity of coal carbonized during the year was nearly 47,000 tons—an average of something like 900 tons a week. The gas produced was 507 million cubic feet, against 484 millions in 1886-7. They were about to erect a new retort-house and some additional coal-stores; and contracts having been entered into, they hoped to get the buildings up before the end of the year, and have everything complete for the manufacture of gas during next year. It was well that they should anticipate the requirements of an increasing supply without being too closely driven; for the Directors intended to continue the policy which had guided them from the commencement of the undertaking—viz., to keep down the expenditure, and carefully watch the cost of production, so as to be able to continue to supply gas at the exceedingly low price of 1s. 9d. per 1000 cubic feet. Perhaps it was rather premature, but they might hope at some distant period to make a further reduction. As already announced, the report was adopted; and dividends at the rates of 12½ and 9½ per cent. per annum were declared.

SEWAGE POLLUTION OF THE THAMES.—The Chertsey Rural Sanitary Authority were last Wednesday, at the Chertsey Petty Sessions, fined £50 and £10 10s. costs for suffering polluted matter to flow into a tributary of the Thames at Chertsey, and £5 in respect of a similar offence committed at Addlestone.

ANOTHER WAY TO DISPOSE OF GAS PROFITS.—At the last meeting of the Belfast Town Council, on Alderman Sir John Preston moving the adoption of the report of the Gas Committee (consisting chiefly of accounts), Mr. Finuigan asked the Town Clerk whether a portion of the funds of the Committee could be allocated to the furtherance of a public duty. They were sorry that when the Channel Fleet were in the lough no entertainment was given by the Corporation, while another body entertained the officers. He thought the Corporation should have power to allocate certain portions of the surplus gas funds for the entertainment of distinguished visitors. The Town Clerk replied that there was no power to do this. The Act enabled the surplus to be applied for public purposes; but this meant purposes on which the Corporation were expressly authorized by other Acts of Parliament to spend money. Mr. Finuigan asked whether it would do if the Council passed a resolution declaring any particular thing a public purpose. The Town Clerk said it would not. The Mayor (Sir J. W. Haslett, J.P.) remarked that it was a desperate thing to bring up such a matter as this on a report of the Gas Committee.

THE GAS SUPPLY OF LEEDS.—In the course of the first of a series of articles in the *Leeds Mercury*, entitled "How Leeds is Lighted," the following particulars are given:—"Leeds was first lighted with gas in 1819. Oil gas was used in 1824; but this experiment proved a financial failure. Right on through the years the production of gas in the borough grew apace until, in 1870, the quantity made for the year amounted to 850 million cubic feet. For the year ending June, 1879, gas manufacture rose to a total of 1250 million cubic feet, which shows an enormous advance on the production achieved in previous years. The price charged for gas in the borough from 1870 to 1874 was 3s. 6d. per 1000 cubic feet; in 1875-6 a charge of 3s. 9d. per 1000 feet was made; in 1877 there was a decline in the price amounting to 3d. per 1000 feet; in 1880, 2s. 2d. per 1000 feet was the price, but a discount of 2½ per cent. was allowed, and at the present time the price is 1s. 10d. At the date last mentioned there were three gas-works in operation within the borough, and 1552 retorts in use. During this year 350 retorts have been added to the Nov Wortley works; making a total for Wortley alone of 780 retorts. The maximum daily production in 1880 was reached on Jan. 7 of that year, when 6,200,000 cubic feet were produced; and on the same day 7,564,000 cubic feet were sent out. During the comparatively short space of seven years, the production has been nearly doubled. In 1880 the length of mains in the district served by the system was upwards of 500 miles; the district embracing an area of 35 square miles. To-day there are calculated to be within the municipal and parliamentary boundaries 687 miles of piping in an area of 47 square miles."

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

The settlement of the main questions connected with the Edinburgh and Leith gas transfer has given the utmost satisfaction to the citizens—a circumstance which there is the more pleasure in recording because of the fear in some minds that the opposition would seize upon the moment of the completion of the agreement to try and inflame the public mind. The fear was all along groundless, unless upon the assumption that a ridiculously bad bargain was to be made, which was not to be expected, and which, it is almost needless to say, has not resulted, but the very opposite. The measure came before the House of Commons Committee last Thursday, and was passed on by them to the Committee on Unopposed Bills. All parties may now be congratulated on the happy termination of a most delicate piece of work.

The agitation in Aberdeen over the alleged increase of charges for gas in the face of reduced rates came to a head on Monday, when a deputation representing the dissatisfied consumers, attended the meeting of the Town Council, and laid their grievances before that body. They acted with great discretion; avoiding the wild and random statements which have been rife of late, and eschewing the desire to lay any blame whatever on the Gas Committee. They asked for an inquiry by experts into the matter complained of, with a view to re-establishing public confidence in the management of gas-works. Several instances were given by speakers of increases of gas bills. Mr. Collie, the Convener of the Gas Committee, put several questions to the deputation, with reference to the number of consumers who had complained, out of about 26,000 in the city; but his questions were ruled by the Lord Provost as impossible to answer. Mr. Collie pointed out that of 16 gentlemen who were appointed a Committee to select the deputation, nine had had their bills reduced. Mr. Cook requested the deputation to furnish them with data upon which to proceed in making their inquiry, because, he said, the position of the deputation was not borne out by the books in the gas office. The Lord Provost suggested several reasons for the increased consumption, among which were enlarged mains, badly regulated meters, and inferior burners. The subject was sent to the Gas Committee, who met yesterday to consider it. A statement was submitted, showing that the income derived from the consumption of gas during last year exceeded by £600 the amount received the previous year; being about 6d. per head increase on 24,500 consumers. It was also stated that during the year 470 new meters and 70 street lamps had been added to the number already in use. The question of employing an expert was considered; and, after discussion, it was resolved to engage Dr. W. Wallace, of Glasgow. Dr. Wallace will have submitted to him a statement of the quantities and the qualities of the coal purchased during the last two years, together with a table showing the quantity of gas produced from the coal. Mr. Crau, the City Chamberlain, and Mr. A. Smith, the Gas Manager, were instructed to examine the books, and to prepare a statement setting forth the amount of the gas accounts for the last and the preceding two half years. The table will be prepared as applicable to the householders in three streets in different parts of the city. It is to be hoped that these measures will succeed in allaying the present agitation.

An abstract of the accounts of the Arbroath Gas Corporation for the year ending May 31 has been prepared, and will be submitted to an early meeting of the Board. It appears from it that the revenue from gas during the year was £8341 15s. 2d.; from gas-meters, £231 5s. 10d.; tar, £362 2s. 9d.; cinders, £49 9s. 3d.—making together £9034. Except on meters there was an increase on all these items. On the year's working there is a balance or surplus of £180 2s. 2d., as against a surplus of £41 18s. 6d. last year. The estimated surplus was £127. The price of gas during the year was at the rate of 4s. 3d. per 1000 feet; and as there was no rebate, this was practically an increase of 1½d. per 1000 cubic feet as compared with the previous year.

The Anstruther Gas Company have declared a dividend at the rate of 8 per cent. (which is ½ per cent. higher than the dividend of last year), and have been able to reduce the price of gas from 4s. 7d. to 4s. 2d. per 1000 feet. A year ago the Company reduced the price from 5s. to 4s. 2d.

At the annual meeting of the Alyth Gas Company on Monday, the Directors reported that the concern had been more prosperous than during the preceding year. A dividend at the rate of 7 per cent. was declared; and the price of gas was reduced from 6s. 3d. to 5s. 10d. per 1000 cubic feet.

The Brechin Gas Company have this year declared the usual dividend of £1 15s. per £10 share—equal to 17½ per cent. The Crieff Gas Company has paid a dividend at the rate of 5 per cent., and a bonus of 2½ per cent. The Wemyss Gas Company has declared a dividend at the rate of 6 per cent.; and the Pittenweem Gas Company has paid a dividend at the rate of 8 per cent.

The Dundee Water Commissioners, at their meeting on Thursday, adopted the annual accounts (which I briefly noticed in my "Notes" in the *Journal* for the 19th ult.), and resolved to reduce the domestic water-rate from 1s. 3d. to 1s. 2d. in the pound. The public rate was fixed at 1d. in the pound.

At a special meeting of the Edinburgh and District Water Trust on Monday, Mr. W. Boyd, W.S., was elected Clerk to the Trust, in room of the Hon. J. W. Moncrieff, who resigned a short time since. Mr. Boyd is the son of the City Treasurer, who is also a Trustee.

There was great rejoicing at Falkirk on Monday afternoon, when it was known that the Falkirk and Larbert Water Bill had passed the House of Commons Committee. The chief opposition to the measure was from the Carron Iron Company. The Committee, without calling upon Counsel for the promoters to reply to the arguments on behalf of the Carron Company, rejected their claim. The maximum rate for trade purposes was fixed at 4½d. per 1000 gallons. Owing to the heavy costs of promoting the Bill, the water-rate is likely to be pretty high.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

At the ordinary monthly meeting of the Glasgow Corporation Gas Commissioners on Thursday, the question of using mineral oil as the source of gas was again introduced by Mr. McKellar, who suggested that, in connection with the extension of the Tradeston Gas-Works, provision might be made for testing oil gas, and trying what could be done with it. It was to be seen burning, he said, in the Exhibition; and the contrast between it and the gas manufactured from coal was so striking that everyone must be satisfied that there was a difference which was very much in favour of the oil gas. The Lord Provost remarked that when the matter was last before the Council, Mr. Ure, the Convener of the Gas Committee, stated that he was quite willing to receive any further information in regard to the question. Mr. Ure observed that since the time alluded to by his Lordship, he had had a visit from the gentleman who had been promoting the oil question; but, so far as he could learn, he did not appear to have arrived at a practical point on the subject. Hitherto all their experiments were with refined oil, which they found too dear, but he had been informed

that petroleum, or unrefined oil, might be used. The gentleman he had referred to was asked, about six weeks ago, to bring the question before Mr. Foulis; but, he had not done so. They were quite willing to test this unrefined oil, as their minds were perfectly open on the question. The Gas Committee was to a very large extent guided, and properly so, by the advice of their Engineer, Mr. Foulis, who was willing to make any experiments.

The annual meeting of the Ayr Gas Company was held on Wednesday. In the report submitted by the Directors, it was stated that during the past year there had been a slight rise in the price of coal, and that the average illuminating power of the gas supplied to the consumers had been 27.1 candles. A dividend at the rate of 5 per cent. was declared.

The annual meeting of the Saltcoats Gas Company was held on Wednesday. The revenue amounted during the past year to £1553; and the expenditure to £1152. It was agreed to reduce the price of gas from 4s. 2d. to 3s. 11½d. per 1000 cubic feet.

The Kilwinning Gaslight Company held their annual meeting on Tuesday. The accounts submitted showed that profits had been made during the past year to warrant a dividend of 8s. per share. In submitting the Directors' report, the Chairman made an interesting statement. The occasion, he said, was the last meeting of the shareholders of the Company, which was formed in the year 1836—52 years ago. All honour was due to those men who had the courage to undertake the work of supplying the town with the new light. Some persons invested freely, though with some doubts as to the scheme ever being likely to pay. The gas was distributed in the autumn of 1837, and was sold at 10s. per 1000 cubic feet. Of the original shareholders, there were only two now holding stock. By the year 1862, the number of shareholders had diminished from 81 to 58; and the dividend paid about that time was 10s. per share of £5, although transfers occasionally took place at £6 10s. per share. The price was reduced to 6s. 3d. per 1000 cubic feet in 1875, and the consumption of gas increased. In 1882 the price was reduced to 3s. 4d. per 1000 cubic feet; and the demand increased so much that in 1885 it was necessary to lay larger pipes in part of the town, and erect another holder. Owing to these and other circumstances, it was found to be necessary to raise the price of gas to 4s. 2d. per 1000 cubic feet, but the consumption continued to increase. He hoped that the new shares would be mostly taken up by the consumers, and thus keep them in the hands of those who were interested in supplying themselves with cheap gas. On the motion of Mr. Macrorie it was agreed to record a vote of thanks to Mr. Hugh King who had acted as Secretary of the Company since its foundation in 1836 until his recent retirement from active life, and for his energy and devotion to the Company's interests. A vote of thanks was also passed to Mr. Fulton for the able and intelligent manner in which he had fulfilled the duties of Chairman during the last eight years.

It is likely that the price of gas in Kilmarnock for the year 1888-9 will be reduced from 3s. 11½d. to 3s. 6½d. per 1000 cubic feet.

On Thursday, the annual meeting of the Blantyre Gas Company was held, when a dividend of 7½ per cent. was declared, and the price of gas was reduced from 4s. to 3s. 9d. per 1000 cubic feet. The Partick, Hillhead, and Maryhill Gas Company's shares were disposed of last Tuesday at 78s., 78s. 6d., and 80s. per share. It may here be mentioned that, during the year ending June 30, this Company's make of gas was increased to the extent of about 27,000,000 cubic feet.

The Glasgow pig iron market has been quiet but steady during the week; and Scotch warrants have fluctuated between 88s. 1½d. per ton cash, paid on Monday, and 87s. 9½d. yesterday. There is still a great absence of animation in the various centres of the iron trade. The stock of Scotch pig iron in the public warrant stores has now considerably exceeded a million tons.

Business is still good in the coal trade, more particularly as regards shipping sorts. There are somewhat active inquiries with firm quotations for main coal at 5s. 6d. per ton f.o.b. at Glasgow Harbour. Steam coal is in active demand.

The market for sulphate of ammonia was reported quiet yesterday at £11 5s. to £11 7s. 6d. per ton.

PROPOSED ELECTRIC LIGHTING OF SOUTHAMPTON.—"There is considerable prospect," says the *Hampshire Independent*, "that in the very near future the electric light will be permanently introduced into Southampton, and adopted by many of the large tradesmen. Negotiations are in progress for fitting up installations; and the project has been taken up with considerable favour in certain quarters. We do not, however, anticipate that shareholders in the Gas Company need trouble much over the possibility of the value of their property being depreciated. The battle between electricity and gas is one of long standing, and the gas companies hitherto have been well able to hold their own, as electric light shareholders have found out to their cost. Whatever demand there may be in Southampton for what some persons term the 'new light,' gas will be required as much as or more than ever; but as competition will be induced, the public will be sure to derive some sort of benefit."

GAS v. OIL FOR PUBLIC LIGHTING AT BROMLEY.—At the meeting of the Bromley Local Board last Tuesday, the Chairman said it would be remembered that when they negotiated with the Bromley Gas Company, they acceded to the proposal to continue the lighting, but at the same time agreed to inquire into the system of oil lighting. It seemed to him that he had only obtained a fictitious advantage from the Company, for while they were paying a lower price, they were receiving less benefit, as the Company extinguished the lamps at an earlier hour than before. He proposed that they should select a part of their district, at present not lighted, and put up as many oil-lamps as could be efficiently attended to by one man. They could then form a judgment whether oil lighting was suitable or not. The motion was carried unanimously. The Clerk stated that the Chairman of the Company had assured him that neither he nor the Directors had ordered the lights to be extinguished before daybreak.

A DRAINAGE SCHEME FOR CORK.—The Corporation of Cork have just had under consideration an important proposal for the efficient main drainage of the city. An elaborate report has been laid before the members of the Town Council by their Engineer (Mr. M. J. M'Mullen), who proposes to entirely change the drainage of the city at a cost of £94,708. He intends to remedy the defects of the water-carriage system of sewerage at present existing by making through the city 17 sewers, the dimensions varying from 12 inches to 2 ft. 6 in. in diameter; two reservoirs 300 feet in length and 60 feet in breadth; and pumping works adjacent to the reservoirs, consisting of two engines of 60-horse power each, so as to pump the sewage through the mains to a sewage farm of 300 acres. It is anticipated that the annual expense of the new scheme would be about £800; while the average cost of cleansing and maintaining the existing sewers is something like £2700. This saving of nearly £2000 per annum would represent a capitalized sum of about £40,000. The profits derivable from the sewage farm would be £600 per annum, or a capitalized sum of £12,000. Therefore, in order to gain a proper idea of the actual cost of the scheme, these sums of £40,000 and £12,000 should be deducted from the estimate.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, July 7,

Sulphate of Ammonia.—The continued absence of Continental orders, the reduction in Beckton quotations, and the operations of speculators, are beginning to tell upon the market; and although there is not a single circumstance apparent to warrant a lasting depression, it must be expected that values will suffer whilst these conditions supervene. The question of the hour seems to be, "Can consumers postpone their purchases much longer?" and it appears very doubtful whether they can. German buyers scan our markets eagerly, and they will have to disclose their position before the end of the month; while France is likely to be a much larger consumer than last year, judging from the requirements of the various "Syndicates," through whom the French farmers are supplied. One of the largest invites tenders for 185 tons of sulphate, but only 30 tons of nitrate; and it has evidently once more been found that for manuring late in the year, sulphate far surpasses nitrate in results. There is only a moderate quantity offering; and the probable consequences of any large orders can therefore easily be conceived. The market closes steadily at £11 10s. to £11 7s. 6d., f.o.b. Hull; £11 8s. 9d. f.o.b. Leith and Liverpool.

LONDON, July 7.

Tar Products.—Pitch continues buoyant. Whether this arises from the impossibility of shipping it during the warm weather, and the shortness of stocks at the fuel works abroad, or else to an increased demand for the article, it will be impossible to decide before the shipping season again commences. Distillers are remarkably short of all kinds of stocks, and are almost indifferent to the market values of any of the articles which, with the exception of pitch and anthracene, continue prostrate. It is stated that some of the buyers of high-priced tar are beginning to rue their bargain; as well they may, if present prices of products continue. Prices: Tar, 15s. to 20s. Benzol, 90 per cent., 2s. 5d. per gallon; 50 per cent., 2s. per gallon. Toluol, 1s. 4d. per gallon. Solvent naphtha, 1s. 1½d. per gallon. Crude naphtha, 30 per cent., 11d. per gallon. Light oil, 3½d. per gallon. Creosote, 1½d. per gallon. Pitch, 13s. to 16s. per ton. Carbolic acid (crude), 3s. 5d. per gallon. Cresylic acid, 10d. per gallon. Tar salts, 15s. per ton. Anthracene, 30 per cent., "A" quality, 1s. 4d. per unit; "B" quality, 1s.

Ammonia Products.—A good deal is being made of the reduced quantities of sulphate shipped to France this season, which it is stated only amount to one-half of last year's shipments to that country. If the report which comes from a good authority is correct, that nitrate of soda (which has been used in lieu of sulphate of ammonia) is giving unsatisfactory results so far, next year should bring a large demand for sulphate for France. Makers have no anxiety at the moment, as stocks are low, and new outlets are continually opening up. Prices: Sulphate of ammonia, £11 12s. 6d. to £11 15s. per ton, less discount. Gas liquor (5° Twaddell), 8s. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 2d. per lb. Carbonate of ammonia, 3½d. per lb. Muriate of ammonia, brown, £18 per ton; white, £28. Sal ammoniac, £30 per ton.

[From the *Chemical Trade Journal*, July 7.]

Sulphate of Ammonia.—The market is very dull; there being no inquiries from the Continent, so that it would be folly to name a price as representing the market value. No one would sell under the present circumstances unless forced to do so, as every parcel bought by the speculators at the present moment means so much weakness added to a future market. The present price is £11 10s. to £11 12s. 6d. at all ports. Fortunately there is not much offering, and stocks are small all over the country.

Tar Products.—The market for all tar products still remains quiet. Benzol remains much the same as in our last report, in spite of those who endeavour to depress it in order to cover sales on aniline already sold, and those who wish us to call it 2s. 7d. for 90's and 2s. 3d. for 50/90's. We think, however, it is a little firmer, though why it should be so we cannot tell, as Continental consumers are not buying. Solvent naphtha is in good demand at 1s. 0½d. to 1s. 1½d.; and a new quality is being offered, made from coke-oven oil, at 10d. Anthracene still remains at 1s. 1d. for "B" quality and 1s. 4½d. for "A"; while pitch is said to be firmer. We cannot see any very bright future for the pitch market, as heavy stocks are in the users' hands, and the patent-fuel market is not over brisk. The Salford tar has just been let to Mr. Hamor Lockwood, of Bradford and Miles Platting, and amounts to over 6000 tons annually.

REDUCTIONS IN PRICE.—The *Bury Corporation* have decided to reduce the price of gas to all consumers in the borough to 2s. per 1000 cubic feet net. At the meeting of the *Hereford Town Council*, last Tuesday, it was decided, on the recommendation of the Gas Committee, to reduce the price of gas 3d. per 1000 cubic feet; making the present charge 3s. 6d., with a discount of 3d. per 1000 feet.

GAS EXHIBITION AT HORNCastle.—An exhibition of gas cooking and heating apparatus was held at Horncastle in the last week in June; closing on the 29th. The cookery lectures by Miss Young were very well attended. The Chairman of the Local Board, in moving a vote of thanks to the lady, said the exhibition had been a decided success. The Board had received several orders for stoves, &c.; and he hoped the consumption of gas would be so much increased as to enable them to reduce the price of gas next year. The price was now only 3s. 2d. per 1000 cubic feet; and he hoped it might be less.

THE ROTHERHAM CORPORATION GAS UNDERTAKING.—At the meeting of the Rotherham Town Council last Wednesday, the recommendations of the Gas Committee to accept tenders for the coal supply for the ensuing year led to a long and acrimonious discussion, which ended in the adoption of a motion that the 1000 tons recommended to be purchased from Earl Fitzwilliam should be obtained from Messrs. John Brown and Co., and that the 1000 tons recommended to be purchased from the Greasbro' Coal Company, and the 1000 tons from Messrs. Newton, Chambers, and Co.; should not be purchased until after the same Committee had tested the gas-producing powers thereof. In the discussion, Mr. A. P. Hirst accused Alderman Gummer of insinuating that the members of the council had a little commission out of the contracts. Alderman Gummer said there was no doubt about it. Later on in the discussion, Alderman Newsum protested against the power which had been exercised by the Chairman and Vice-Chairman of the Gas Committee in testing the coal from Earl Fitzwilliam's colliery, and purchasing coal for this purpose without first obtaining the consent of the Committee. With reference to a proposal to call in the services of Mr. George Livesey to give the Gas Committee his opinion as to having increased purifying power at the gas-works, Mr. Cox opposed, and moved that the recommendation be rejected. He said he regarded it as the thin end of the wedge for engaging the services of a Consulting Engineer permanently. Mr. Cox's motion was seconded, but only three voted for it; and it was negatived by a large majority.

THE WATER SUPPLY OF BILSTON.—Last Thursday, a Committee of the House of Commons were engaged in considering an application by the Wolverhampton Corporation for a Provisional Order to alter the Wolverhampton Improvement Act, 1869, by allowing the Corporation to create a reserve fund of £10,000 in regard to the water undertaking, and to carry any balance of such revenue remaining in any year, and exceeding £500, to the improvement fund, or to use such balance in reducing the price of water to the consumers. The Bilston Commissioners, who are supplied with water by the Corporation at the rate of 5d. per 1000 gallons, petitioned against the Order, on the ground that they, as consumers of water supplied by the Corporation, ought not to be placed in the position of consumers in the case of a company trading for profit, but that in any event surplus revenue should be applied for the benefit of all the consumers alike, including Bilston. It was argued for the Corporation that Bilston could not complain of the Order, because they were bound by an agreement to a price fixed by an Arbitrator for 21 years. The Counsel for the Commissioners (Mr. Littler, Q.C.) attempted to raise the whole question of the water supply of Bilston; but this was objected to by the Corporation's representative (Mr. Balfour Browne, Q.C.). The Committee decided that they could not disturb the existing agreement; whereupon the Commissioners withdrew, and the Committee agreed to confirm the Order.

THE ADDITIONAL WATER SUPPLY FOR SKIPTON.—At a recent meeting of the Skipton Local Board, a report was read from Mr. Hill, C.E., who had been engaged by the Board to investigate the various sources of water supply in the neighbourhood. It deals with three alternative schemes—viz., Cawder, Potter's Gill, and High Skibeden. The one which would bring the water from Cawder into the existing reservoir by a pipe-line is estimated to cost about £5700; and the Potter's Gill scheme, which would also bring the water from this source to the present reservoir in a similar manner, is estimated to cost about £5000; whilst the additional supply of water from either of these schemes has been calculated, at the recent rate of increase, to serve the needs of Skipton until it has a population of about 15,000, some ten years hence. It is pointed out, however, that not one of these schemes would give an increased pressure to the existing water service, of the town which is so much needed at the highest points to which the pipes are laid. The Skibeden scheme is the one most highly recommended, because it is said to be capable of meeting all the needs of the town for the next 25 years. The scheme includes the construction of a reservoir at Higher Skibeden, which would cost about £12,000. This scheme would not only furnish a good supply of water, but there would be (in the opinion of the most competent authorities) sufficient pressure to meet all the requirements of the town for many years.

SALES OF SHARES.—Some miscellaneous shares in various Companies were sold by auction, by Mr. Alfred Richards, at the Mart, Tokenhouse Yard, last Tuesday. In all cases, the purchasers took the dividends accruing as from Jan. 1 last. The first five lots sold comprised in all 44 original £10 fully-paid shares in the *Brentwood Gas Company*, earning dividends of 10 per cent.; the price realized being £20 10s. per share. Four £25 additional shares (fully paid) in the *Chelmsford Gas Company*, producing dividends of 7 per cent., fetched £38 per share. An average price of £11 per share was paid for 30 £5 fully-paid "A" shares, paying a dividend of 10 per cent., in the *Romford Gas Company*. A parcel of 10 £10 fully-paid ordinary shares in the *Harrow District Gas Company* (the last dividend on which was at the rate of 7½ per cent.) sold for £15 15s. per share. 27 £10 original fully-paid shares in the *Carshalton Gas Company* (on which a dividend of 8 per cent. was last paid) produced £18 5s. per share; and 27 similar shares, on which £2 only have been paid, sold at £6 per share. Three lots consisting each of 10 £10 "A" fully-paid shares in the *Grays Gas Company*, bearing dividends of 7 per cent., sold at £16 10s. per share; and the same number of £10 "B" shares in the Company, earning dividends of £4 18s. per cent., sold at £12 a share. £9 per share was paid for 97 £5 fully-paid original shares (on which a dividend of 9 per cent. was last paid) in the *Harwich Gas Company*. Ten second issue £5 shares in the same Company (£3 per share paid), paying dividends at the rate of 6½ per cent., realized £5 17s. 6d. per share; and 10 similar shares, £5 15s.—Ten £5 "B" shares in the *Ossett Gas Company*, with the dividends shortly accruing, were sold by auction in that town last Thursday, at £10 5s. per share.—Ten original and fully-paid £10 shares in the *Pontefract Gas Company* were recently sold for £25 7s. 6d. per share; and 20 new £10 ordinary shares in the same Company for £11 2s. 6d. per share.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 64.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.					£ s. d.
GAS COMPANIES.								
590,000	10	12 Apr.	10½	Alliance & Dublin 10 p. c.	10	184-193	..	5 7 8
100,000	10	"	7½	Do. 7 p. c.	10	184-14	..	5 7 2
800,000	100	2 July	5	Australian (Sydney) 5½ p. c. Deb.	100	109-111	+½	4 10 1
100,000	20	30 May	10	Bahia, Limited.	20	22-24	..	8 6 8
200,000	5	11 May	7	Bombay, Limited.	5	7-7½	..	5 0 0
40,000	5	"	7½	Do. New.	4	7-7½	..	5 9 1
380,000	Stock.	15 Feb.	11	Brentford Consolidated.	100	222-228	..	4 13 8
110,000	"	"	8	Do. New.	100	162-167	..	4 18 9
220,000	20	14 Mar.	10	Brighton & Hove, Original.	20	43-45	..	4 13 4
320,000	20	12 Apr.	11	British.	20	44-46	..	4 17 10
50,000	10	14 Mar.	11	Bromley, Ordinary 10 p. c.	10	20-22	..	5 0 0
39,000	10	"	8	Do. 7 p. c.	10	134-141	..	5 10 4
328,750	100	30 May	8	Buenos Ayres (New) Limited.	100	106-109	+½	5 10 1
200,000	100	2 July	6	Do. 6 p. c. Deb.	100	25-27	..	5 8 2
150,000	20	29 Feb.	7	Cagliari, Limited.	20	25-27	..	5 8 2
550,000	Stock.	12 Apr.	13½	Commercial, Old Stock.	100	264-269	..	5 0 4
130,000	"	"	10½	Do. New do.	100	205-210	..	5 0 0
121,234	"	28 June	4	Do. 4½ p. c. Deb. do.	100	120-125	..	3 12 0
557,320	20	14 June	12	Continental Union, Limited.	20	41-45	+1	5 6 8
212,680	20	"	12	Do. New 69 & 72	14	29-30	+½	5 13 0
200,000	20	"	9	Do. 7 p. c. Pref.	20	33-37	..	4 17 3
75,000	Stock.	28 Mar.	10	Crystal Palace District.	100	200-210	..	4 15 8
234,060	10	27 Jan.	12	European, Limited.	10	25-26	+½	4 13 4
120,000	10	"	12	Do. New.	7½	171-181	+½	4 17 7
354,060	10	"	12	Do. do.	5	111-124	..	4 16 0
5,468,350	Stock.	15 Feb.	12½	Gaslight & Coke, A, Ordinary	100	253-256	+½	4 15 8
100,000	"	"	4	Do. B, 4 p. c. max.	100	97-102	..	3 18 5
665,000	"	"	10	Do. C, D, & E, 10 p. c. Pf.	100	259-264	..	3 15 9
30,000	"	"	5	Do. F, 5 p. c. Pf.	100	125-130	..	3 16 11
60,000	"	"	7½	Do. G, 7½ p. c. Pf.	100	183-188	..	3 19 9
1,300,000	"	"	7	Do. H, 7 p. c. max.	100	169-173	..	4 0 11
463,000	"	"	10	Do. J, 10 p. c. Pf.	100	258-263	..	3 16 1
1,081,150	"	14 June	4	Do. 4 p. c. Deb. Stk.	100	116-119	..	3 7 3
294,850	"	"	4½	Do. 4 p. c. do.	100	125-130	..	3 9 3
650,000	"	"	6	Do. 6 p. c. do.	100	172-177	..	3 7 10
3,600,000	Stock.	11 May.	10	Imperial Continental.	100	201-205	..	4 17 7
75,000	5	14 June	6	Malta & Mediterranean, Ltd	5	43-52	..	5 14 3
560,000	100	3 Apr.	5	Met. of Melbourne, 5 p. c. Deb.	100	114-116	..	4 6 2
541,920	20	14 June	6	Monte Video, Limited.	20	194-204	..	5 17 1
150,000	5	30 May	10	Oriental, Limited.	5	94-93	..	5 2 7
60,000	5	28 Mar.	7	Ottoman, Limited.	5	6-7	..	5 0 0
People's Gas of Chicago—								
420,000	100	2 May	6	1st Mtg. Bds.	100	104-109	..	5 10 1
500,000	100	1 June	6	2nd Do.	100	92-97	..	6 3 9
100,000	10	26 Apr.	10	San Paulo, Limited.	10	154-163	..	6 1 2
500,000	Stock.	29 Feb.	15½	South Metropolitan, A Stock	100	315-320	..	4 16 10
1,350,000	"	"	12	Do. B do.	100	240-244	..	4 18 4
141,500	"	"	13	Do. C do.	100	250-260	..	5 0 0
550,000	"	28 June	5	Do. 5 p. c. Deb. Stk.	100	135-140	..	3 11 5
60,000	5	29 Feb.	11	Tottenham & Edm'ton, Orig.	5	11-13	..	4 4 0
WATER COMPANIES.								
717,467	Stock.	28 June	9	Chelsea, Ordinary.	100	248-252*	..	3 11 5
1,720,560	Stock.	12 Apr.	7	East London, Ordinary.	100	192-197	..	3 11 1
700,000	50	14 June	9	Grand Junction.	50	120-124	..	3 12 7
708,000	Stock.	29 Feb.	10½	Kent.	100	267-272	..	3 17 2
1,043,800	100	28 June	9	Lambeth, 10 p. c. max.	100	250-255*	..	3 10 7
406,200	100	"	7½	Do. 7½ p. c. max.	100	193-204*	+2	3 13 11
200,000	Stock.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	117-120	..	3 6 8
500,000	100	27 Jan.	12½	New River, New Shares.	100	347-352	..	3 8 10
1,000,000	Stock.	"	4	Do. 4 p. c. Deb. Stk.	100	122-127	..	3 8 0
902,300	Stock.	14 June	6	S'tbwk & V'xhall, 10 p. c. max.	100	157-162	+2	3 14 1
126,500	100	"	6	Do. 7½ p. c. do.	100	151-156	..	3 16 11
1,155,066	Stock.	14 June	10	West Middlesex.	100	264-269	..	3 14 4

*Ex div.

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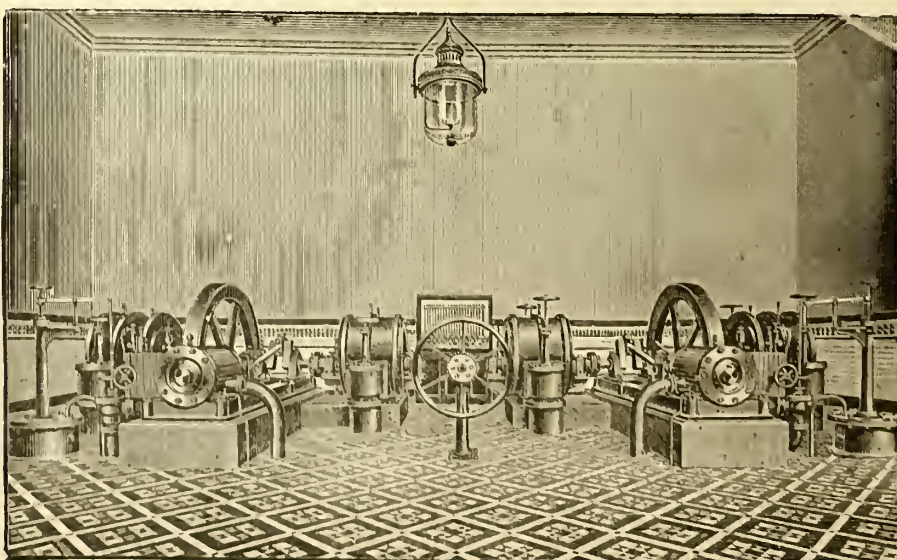
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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JULY 17, 1888.

MR. BRAY WINS.

On Friday last, Mr. Justice Kay, of the Chancery Division of the High Court of Justice, had before him Mr. George Bray's motion for an injunction to restrain the Council of The Gas Institute from giving effect to the vote for his expulsion which was passed at the last meeting of the Institute. When the case came on, it was announced on behalf of the defendants that, acting upon the advice of their Counsel, they would not dispute the plaintiff's contention, but would reinstate his name in the list of members upon payment of the regular

subscription; they bearing all costs of the action. A circular letter explanatory of the matter was sent to all the members of the Institute by the Secretary by the same day's post, so that they would be in possession of the facts from Saturday morning. The point of law upon which the event turned is very simple. The rule under which the proceedings for Mr. Bray's expulsion were taken is imperfectly drafted. It enacts that a member who shall have been guilty, in the opinion of the Council, of such conduct as shall have rendered him unfit to continue to belong to the Institute, may, after certain formalities, be expelled therefrom by a vote of "two-thirds of the members present." It is well known that the vote expelling Mr. Bray was carried at the meeting by 126 to 62; making a total poll of 188. It was obvious that this number did not represent all the members present. The President and the Secretary did not vote, neither did Mr. Bray; and several other members made no secret of their abstention from voting. It is manifest that if the words of the rule are to be construed with strict literalness, a margin of three non-voting members would have prevented this vote of 126 from being returnable by the President as the vote of two-thirds of the members "present." Mr. Bray quickly detected this flaw in the proceedings, and gave formal notice next day that, in his opinion, the vote was invalid; following up his protest by the legal action now under notice. The point having been submitted for Counsel's opinion, Messrs. Walter C. Renshaw, Q.C., and S. B. L. Druce declared that, in view of the decision of the Master of the Rolls in the celebrated case of *Labouchere v. the Earl of Wharncliffe* (the attempted expulsion of Mr. Labouchere from the Beefsteak Club), the words "two-thirds of the members present," in the 25th rule, mean two-thirds of the members present and entitled to vote, whether actually voting or not; and that, on the facts as stated, there was not a requisite majority in favour of expelling Mr. Bray. Consequently the Council had no case; and Mr. Bray triumphs.

It is, of course, easy to be wise after the event, and to see where the case for the Institute has broken down. It has been the practice recently, in drafting rules relating to the voting of members of clubs, &c., to insert, after such words as those in the 25th rule of The Gas Institute which confer the power of expulsion upon "two-thirds of the members present," the qualifying words "and voting"—which would have put Mr. Bray out of Court. This practice has been adopted with the object of getting over the difficulty created by the ruling of the late Master of the Rolls in the once notorious *Labouchere* case already cited. But The Gas Institute rules were not settled by Counsel, more's the pity. There is another consideration which affects the issue. The 35th rule says that no member whose subscription is in arrear shall be entitled to vote; and as there is a custom of paying subscriptions at any time during the meeting, it is practically impossible to tell at any given moment who is or is not duly qualified to vote. When the ballot in Mr. Bray's case was taken, it therefore now appears that every member presenting himself before the tellers should have been asked to prove that he was duly qualified to vote, and also to declare whether he wished to vote. He should then have recorded his vote; and when all the members had passed the ballot-box, their number should have been compared with the numbers of the balls in the divisions of the box. If this course had been followed, and only 188 members had passed into the hall, and constituted the meeting, the vote 126 to 62 would have been the legal two-thirds majority; but because this was not done, the whole proceedings for Mr. Bray's expulsion are invalid, and his name is to be restored to the roll of membership. It is the old story. Rules of societies are like Acts of Parliament and patents—very symmetrical and imposing until they are tested under the strain of a legal action, when they are apt to give way like wet paper. When one remembers what a fuss was made about the introduction of this supposed power of expulsion into the Code of Rules of the Institute, it is not without a smile that one can remark how little good it has been to the organization. The very first time it has been put in operation, it has landed the Institute in a very awkward predicament, entailing much irritating trouble and wasteful expense. Verily, in the matter of printed rules and regulations of all sorts, it is impossible to pronounce respecting their efficiency until they are tried. This notorious 25th rule of The Gas Institute has been like many other pieces of ordinance constructed at great trouble and expense—more dangerous in action to friends than to foes.

We congratulate Mr. Bray upon his victory, such as it is. It might be said that a man of any pretensions to sensibility would not avail himself of a legal quibble to escape the

consequences of an unmistakeable expression of public opinion; but, so far as we understand him, Mr. Bray indulges in no such pretensions. He is, indeed, quite justified in making the most of his legal triumph. The Council that recommended his expulsion were content with the narrow margin over the necessary two-thirds vote which they obtained at the meeting. They did not retire in dudgeon because the vote was not one of three-fourths, or nine-tenths, or any other fancy majority of the members present, with which they might naturally have been better pleased. Now it is Mr. Bray's turn; and he cannot be blamed for taking the fullest advantage of the relief which the law affords him. He has reaped the reward of single-minded devotion to his object, facilitated by a breach, not of his making, in the defences of his opponents. The merits of the case, of course, remain as they were. A man who escapes the gallows by virtue of that "flaw in the indictment" so dear to the typical Old Bailey practitioner, walks out of the dock a free man; but it needs something more to regain the esteem of his fellows. Mr. Bray has escaped the consequences of his misconduct in a way that does credit to his cunning; but nobody ever denied him the possession of this quality. Will anybody shake hands with him now who would not have done so last week? Certainly not. He remains what he was in the eyes alike of his admirers and those who despise him. It is unnecessary to discuss this part of the subject further. It is impossible, however, to resist the temptation to point out the remarkable contrast between the celerity with which Mr. Bray has sought his legal remedy in the present instance, and the repugnance which he has shown to taking a similar course for the enforcement of his monstrous claims against the Institute and sundry of its leading members. In 1886 he presented an account against the Institute for the considerable sum of £1194; and, though challenged to do so, he has never attempted to recover this amount by legal process. This debt probably yet stands against the Institute in the books of Mr. Bray's firm; but he has forgotten to demand payment. Does he treat all his debtors in this way, and forgive them if they do not pay on demand? If so, it is a curious way of doing business.

The natural question that will be asked upon the reception of the intelligence of last Friday's doings is, What is to happen next? We understand, from the circular to members already referred to, that the Council will find it necessary to "consider their position"—whatever this somewhat oracular pronouncement may mean. It probably signifies in the first place that a special meeting of the Council will be held forthwith to decide upon what shall be done. They owe this to the members, who will also wait with natural interest to learn the decision of their representatives in authority. It cannot be denied that the question is of the gravest importance in connection with the future of the Institute. A great muddle was made in the drafting and application of the rules, which competent legal advice, if taken in time, should have been able to prevent. It is idle to cry over spilt milk, however; and the mess having been made, the first duty is to wipe it up as neatly as possible. We do not propose to speculate upon what the Council may or may not do when they meet; but it may be at least permitted to us to predict that they will have plenty of matter to cogitate upon, over and beyond the immediate topic of Mr. Bray's enforced reinstatement. It would not be surprising if the Council should find themselves in face of a state of affairs to call for an extraordinary meeting of the Institute some time before the close of the current year.

A CONDEMNATION OF THE AVERAGE METER SYSTEM.

IN another part of the present issue of the JOURNAL will be found an interesting and important paper on the "Average Meter System," read by Mr. George R. Strachan, the Surveyor to the Chelsea Vestry, at the annual meeting of the Association of Municipal and Sanitary Engineers and Surveyors last week. It is not necessary to summarize the matter of Mr. Strachan's paper here; suffice it to say that it is a remarkable indictment of that system, to which such extravagant virtue in economizing gas has been ascribed by some municipal officers since it was first put into operation some twenty years ago. Mr. Strachan details a series of experiments by which he was led to perceive the fallacy of the name "regulator" as commonly applied to cheap gas-burners. It also appears that he detected a considerable amount of carelessness in the manufacture of real street-lamp regulators. But it is possible to accuse him of showing a little hypercriticism in his remarks upon this class of appliances; for, on the whole, the regulators tested seem

to have come out of the ordeal very well, considering that they were ordinary gas-fittings, and not philosophical apparatus. Indeed, Mr. Strachan is forced to admit after all that "regulator gas-burners can be made"—that is to say, are made, for he had some of them in his own possession—"which will not vary in their consumption of gas, at pressures varying from 1 inch to 4 inches, more than 1·15 per cent. fast and 2·3 per cent. slow of their average consumption." The conclusion drawn from this observation is that "regulator gas-burners can be made as correct as gas-meters." Hence the natural inference follows that the use of street-lamp meters is unnecessary. This opinion is fortified by a proof, drawn from experience, that the average meter system costs 9·9d. per annum, and the utmost that it can be credited with saving is 1·5d. per lamp per annum. This is a striking exemplification of municipal economy. Naturally, Mr. Strachan's revelations were criticized by some of his hearers—municipal officers who had advised their employers to adopt the average meter system. But they are clearly credible in the main; and it would scarcely be too much to say that the paper has dealt a severe blow to the superstition that meters are always a necessary or desirable appendage to public street lamps.

THE MONTHLY COLLECTION OF GAS ACCOUNTS.

IN another column we publish an intelligently-written communication from "A Manager Abroad" upon the subject of the monthly collection of gas accounts. It is notoriously difficult for an exile to keep himself acquainted with the current of contemporary thought in his native land; and when our friend across the seas expresses the opinion that the question of weekly, monthly, or quarterly collection of gas-rental is "at present agitating the minds" of his home-keeping brethren, this observation is forcibly recalled to memory. The fact of the matter is that, though the subject has undoubtedly been talked of in England of late, there is not half enough interest, to say nothing of agitation of mind, about it. The debates upon the topic have been of a particularly mild and academical character; and one can tell upon the fingers of a hand the gas managers whose interest in it has been sufficient to impel them to make an experimental departure from established usage. Our contributor settles the question, from his own point of view, in favour of monthly collections. It is certain that the system of monthly payments is successful in most foreign countries; and there is no real reason why it should not be adopted generally in the United Kingdom, except the unreasonable, but doubtless powerful argument of use and custom. As our contributor points out, there need be no compulsion about such a change, as those consumers who preferred to pay quarterly could still do so; and there is something in what he says about the ability of a large class of consumers to pay monthly accounts to the collector on demand, instead of asking him to "call again," as they now very generally do. We should like to hear from other gas managers who have tried both systems, as to which they really prefer, taking everything into consideration.

MORE OF THE CIRCULAR-OF-INQUIRY NUISANCE.

IN continuation of the notice of the circular-of-inquiry nuisance which appeared in the JOURNAL a fortnight ago, we may state that during the past few days we have received copies of letters, of the same character as that then commented upon, which we believe emanated from a member of the Board of the same Gas Company to which the inquiring Secretary belonged, addressed to gas engineers, with the object of obtaining gratis information upon matters connected with gas making. It is gratifying to learn that in at least one instance the honourable Director encountered the rebuff he deserved. He did not take it kindly, however, but replied with a tirade against the "discourtesy" of the Engineer who had refused to reply to his unwarranted inquiries. One is disposed to ask how much farther this sort of thing may be expected to go on. If a Gas Company's Secretary is to be charged with the duty of obtaining answers to one set of questions relating to gas management, while individual members of the Board undertake the task of getting information upon other points, out of any engineers with whose names they may happen to be acquainted, it is time indeed for the victims of these attentions to "strike." Let secretaries address themselves to secretaries, and directors to their kind; but it is necessary to inform these gentlemen that it is no part of the duty of engineers who may happen to be employed by Boards that know how to administer the property committed to their charge, to supply professional and technical information to

anybody but their own employers. We counsel all engineers and managers so approached either to consign these "fishing" inquiries to the waste-paper basket, or to briefly refer the inquirers to their own professional advisers. If they have not any qualified advisers, let them make good the deficiency as speedily as possible; for it is very certain that not all the secretaries and directors of all the gas companies in the United Kingdom, though they gave their minds to sending out and receiving replies to inquiry circulars every day of the week, could manage their gas-works as well as capable engineers. We are very loth to advise engineers to take a course which may be twisted into looking like reserve or incivility. But the evil to be combated has become a grievous one; and as it aims at nothing less than the destruction of the profession of gas engineering, and the working of gas undertakings "on the cheap," it is necessary to take strong measures for checking it. With reference to the protest from our clerical correspondent which will be found elsewhere, it should surely be unnecessary to point out that we have no desire to depreciate the value of a "clerical head" to a gas undertaking, so long as he keeps to his proper work. Secretaries as well as engineers have their place and part in the gas industry, which we should be the last to desire to take away from them. What we do condemn, however, is that subordination of the executive to the clerical element which seems to be in progress in some places. We hold with the preservation of a fitting balance between the two branches of administration; but if circumstances entail the supremacy of the one over the other in any case, we cannot agree that the engineering branch should be the one to succumb, for the reason that gas engineering is a speciality, while the work of a secretary and accountant is not. Any educated accountant, with a knowledge of finance and some acquaintance with company law and practice, can discharge the duties of secretary of a gas company, as of a railway, mining, or steamship company. A mining engineer could not properly manage a gas-works, however; nor could a gas engineer take charge of an ocean steamship. And as gas engineers cannot exist unless they are properly supported, we object to seeing them belittled and ignored by self-sufficient committeemen and directors or ambitious secretaries.

A CONTINENTAL VIEW OF SACCHARINE.

THE coal-tar sugar, saccharine, is greatly exercising the customs authorities of those Continental countries in which common sugar is heavily taxed. The use of saccharine as an adulterant does not affect us much in the United Kingdom, because of the cheapness of refined sugar; but it is a very different thing in places where, what with customs and *octroi* and other impositions, sugar generally sells at from 6d. per pound upwards. Under these circumstances, the confectioners have, of course, found out the advantages of saccharine. A trade recipe shows that 10 grammes of saccharine mixed with 5 grammes of bicarbonate of soda and dissolved in a litre of warm distilled water will replace about 3 kilogrammes of sugar. No sooner had this statement seen the light in a German publication, than the sugar refiners were all up in arms against the intruder. What was the use of encouraging the sugar trade by the bounty system if this chemical preparation was to be allowed to undermine the business of the refiners? It began to look as though the ruin of Jamaica and Demerara would be avenged by Newcastle coal tar, when a chemist came to the rescue and showed how by a "simple" test the presence of the intruding sweet may always be detected. All one has to do is to treat the suspected article of diet with a few drops of sulphuric acid, and then to add water, if the substance requires dilution. Equal parts of petroleum and ethylic ethers are then to be added, and the whole shaken up. After the reagents are evaporated, the residue is to be dissolved in hot water. The solution is to be finally divided into two portions—one to be kept for testing for salicylic acid, and the other to be tasted for saccharine, which will be revealed by its energetic sweetness. That is all; but well may the writer in the *Revue Industrielle*, from whom we obtain these particulars, declare that if this sort of thing is to go on, it will be necessary to retain chemists to be responsible for the bills of fare at restaurants.

THE CHARGE OF LIBELLING MR. W. J. WARNER.—At the Durham Assizes yesterday, Richard Cunliffe, who was committed for trial at the South Shields Police Court on the 25th of April last (as reported in the JOURNAL for May 1), on a charge of having made certain libellous statements concerning Mr. W. J. Warner, Manager of the South Shields Gas Company, surrendered to his bail, and publicly withdrew the charges; apologizing for having made them.

Water and Sanitary Affairs.

THE investigations conducted during the last quarter of a century into the presence of micro-organisms in air and water are brought under review in an interesting article contributed to a recent number of *Nature* by Dr. Percy F. Frankland. The multiplication of microbes in natural waters, practically devoid of organic matter, is one of the puzzles of bacteriology. Water obtained from deep wells in the chalk is cited as an example of effective filtration through the action of the intervening strata; for while river water contains some thousands of microbes in a cubic centimetre, the chalk wells yield water containing as an equivalent only eighteen microbes, on an average, for the year. But this same water, if kept for several days, although thoroughly protected from atmospheric contamination, is found to contain an enormous number of micro-organisms. Dr. Percy Frankland says: "From what source such organisms obtain 'their necessary nourishment under these circumstances, 'has not yet been determined.' Some of the water organisms are even capable of this abundant multiplication in water which has been several times distilled, and which is, therefore, almost absolutely pure. The extent to which this process goes on, is shown by a sample of water from one of the deep chalk wells belonging to the Kent Company. On the day of collection, there were seven micro-organisms per cubic centimetre. The next day there were 21 of these; and in three days the number was nearly half a million. Minute as these creatures are, such teeming life, with seemingly nothing to support it, is little short of marvellous. The practical conclusion arrived at is that the examination of water for the number of micro-organisms present can have no value if this kind of multiplication has previously taken place. Accordingly, if the number of these organisms present in a water is to throw light on the 'natural purification' it has undergone, the sample for examination, Dr. Percy Frankland says, 'must be taken as near as possible to 'the point where it issues from the water-bearing stratum.' So also in the case of 'artificially purified' water, we are told that the sample should be taken 'as soon as 'possible after the water has left the purifying apparatus.' It was for this principle we contended some time ago, when comparisons were made between water as pumped from a Kent well, and as drawn from the main of a Thames Company. Vicinity to 'the purifying apparatus' would suggest, for example, that the sample of the Chelsea Company's water should be taken somewhere near the exit from the filter-beds, or where the supply quits the service reservoir, instead of being drawn from a stand-pipe on the cab-rank at the Horse Guards. As the monthly samples are taken at spots selected by the several Companies, it might be judicious for the Directors in each case to consider whether they are doing themselves justice. What may take place in the mains, is indicated by the experience of the Kent Company. In May last, while the micro-organisms in samples taken from the three deep wells at Deptford were less in number than in any part of the Thames and Lea supply, the case was reversed in respect to the sample taken from the Kent Company's main in Mill Lane, situated at a short distance from the wells. In this latter instance, the microbes were numerous enough to exceed the proportion in all the remaining Metropolitan supplies, except that of the East London Company. Judged by the microbes at Mill Lane, the Kent supply stood second on the list of excellence, although the samples from the wells placed it at the head. Dr. Percy Frankland's article in *Nature* confirms this record; seven microbes in the Kent water becoming 495,000 after being kept three days. The sooner the water gets through the mains, therefore, the better. On the great reduction in the microbes which results from the storage and filtration practised by the River Companies. Dr. Percy Frankland is perfectly explicit. The results are admitted to be 'striking;' and we are told 'there is no 'doubt that, with the introduction of fresh improvements and 'increased care, an even greater reduction will be effected.' Concerning the actual detection of harmful or pathogenic forms of bacterial life, Dr. Percy Frankland argues that the point is of very little importance, the removal of micro-organisms in general being a sufficient guarantee for the removal of those that are hurtful. It is also proved, by experiment (for which we think Messrs. Crookes, Odling, and Meymott Tidy may be cited), that ordinary drinking water does not afford a suitable medium for the development of pathogenic forms.

The Gas Institute.

PROCEEDINGS AT TWENTY-FIFTH ANNUAL MEETING.

CHARLES GANDON, Esq., M. Inst. C.E., PRESIDENT.
PAPERS AND DISCUSSIONS.

(Concluded from p. 64.)

ON THE LATEST IMPROVEMENTS OF THE GAS-BALANCE.

By FREDERICK LUX, of London.

At the meeting of the Institute in Glasgow last year, I had the pleasure of giving you a detailed description of my apparatus for the determination of the specific gravity of gases—the “gas-balance.” Having since then modified and perfected the apparatus in several respects, I once more venture to trespass upon your indulgence by laying before you a few new facts connected with this matter.

You will perhaps remember that the receiving vessel for the gas in my former apparatus—models A and B—consisted of a glass globe, holding 1-15th of a cubic foot. [See JOURNAL, Vol. L., pp. 177-78] I have now replaced the glass globe by a brass sphere to contain only 1-30th of a cubic foot, or of one-half the capacity of the former; thereby securing two advantages—viz., a decreased liability to fracture; and the possibility of exchanging the gases in one-half the time which this operation previously required. The bores, moreover, in these new models C and D (figs. 1 and 2), have been made wider; so that by this arrangement the outflow of the gas is both easier and quicker—the result being that, with these new models, only from three to five minutes are required to replace the total contents of the globe by fresh gas, which operation, in models A and B, took fully from ten to twelve minutes to accomplish.

In order to give facilities for testing at any time the temperature and pressure of the gas in question, I have added, in convenient places, thermometers and manometers; and as the apparatus is intended to be used in all parts of the manufacture of gas, I have enclosed it in an oak case, which is glazed over, and capable of being put under lock and key. It is thus perfectly safe from dust, from being tampered with, &c. The case is supplied with a spirit-level and regulating screws, so that the balance can at any time be examined as to its horizontal position. A thermometer and barometer fixed inside the case serve for the determination of the temperature and the pressure of the air. In model C (with gas supply and outflow), only the front side of the casing can be opened; but in model D (with gas supply and burner-pipe), the lid is also arranged for opening. As the case in apparatus D must be opened while the apparatus is at work, and in model C it may remain shut, the latter deserves the preference. The four models mentioned give the specific gravity exactly to within $\cdot 01$; and are, therefore, sufficiently accurate for ordinary everyday use.

For calculations requiring greater accuracy, I have constructed model E (fig. 3), which, in several respects, differs from the other apparatus. The balance rests, not on points, but on an edge, and is so arranged that, while the apparatus is not in use, the edge is lifted off the bearing, and in whatever position the balance may happen to be, it can be retained there. For the purpose of avoiding the large angular movements experienced in the case of the other apparatus, I have furnished the balance with a weight, which can be shifted to and fro on the beam; the division marked upon the beam giving the first two decimal places, while the pointer of the balance, moving in a graduated arc, which is fitted somewhere below, indicates the third decimal place. We may, with the aid of this balance, determine the specific gravity of any gas to within $\cdot 001$. In every other respect, the balance is fitted up exactly like the other apparatus.

Model F (fig. 4) is intended for determining the constituents

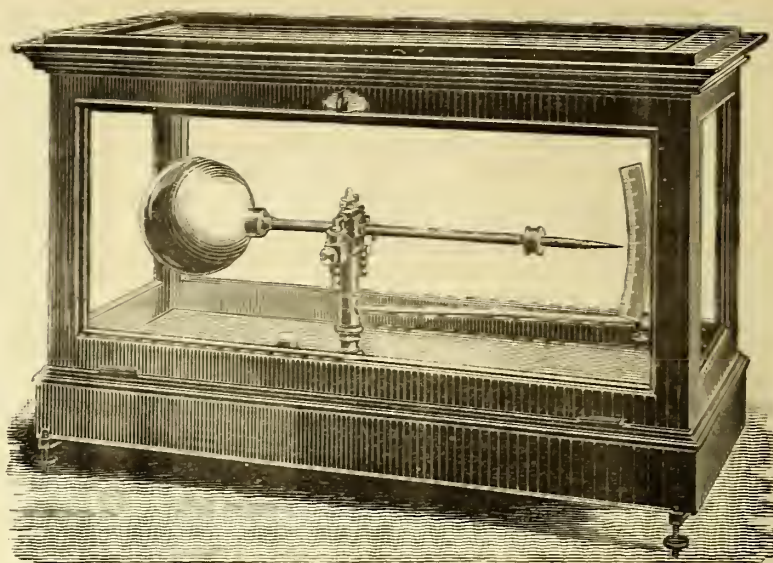


FIG. 1.

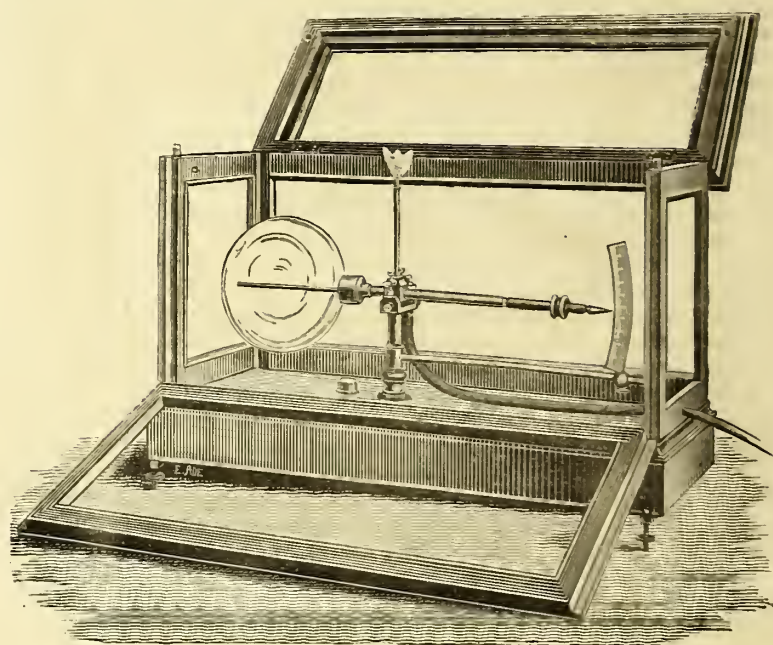


FIG. 2.

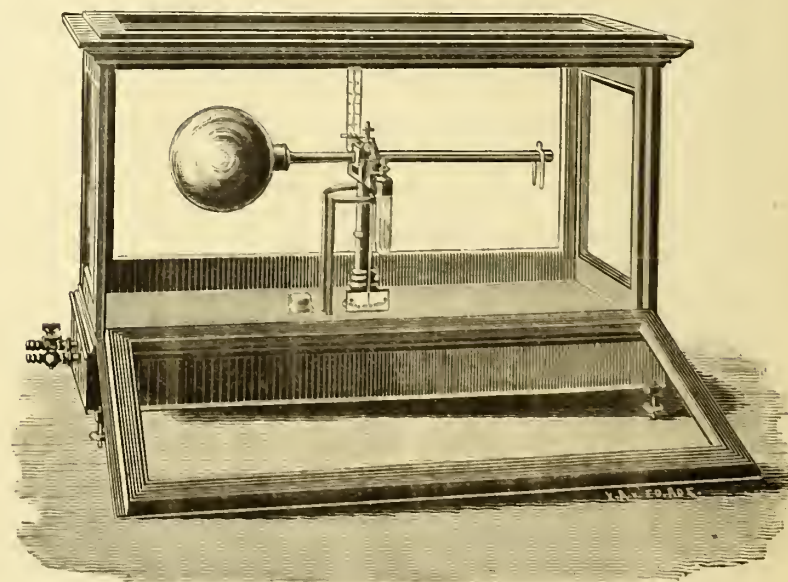


FIG. 3.

of gaseous mixtures—as, for instance, the quantities of carbonic acid and sulphuretted hydrogen present in illuminating gas. The beam carries on each side a brass globe, which serves as a receiving vessel. The gas to be examined flows first through one globe; then through an absorbing or purifying vessel, in which, to mention one example, the carbonic acid may be retained; and, further, through the second globe. The change in the specific gravity, made by the elimination of one constituent, is commensurate to its quantity. As with gases of an average specific gravity of $\cdot 5$, one per cent.

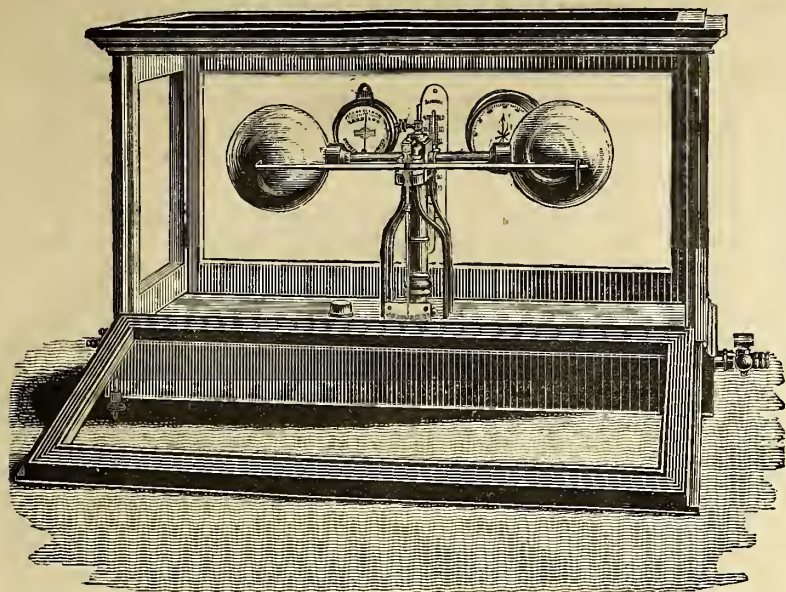


FIG. 4.

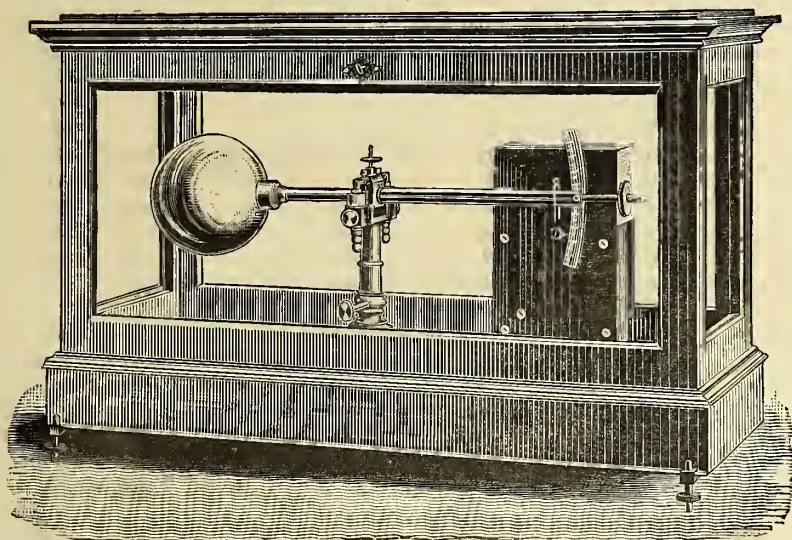


FIG. 5.

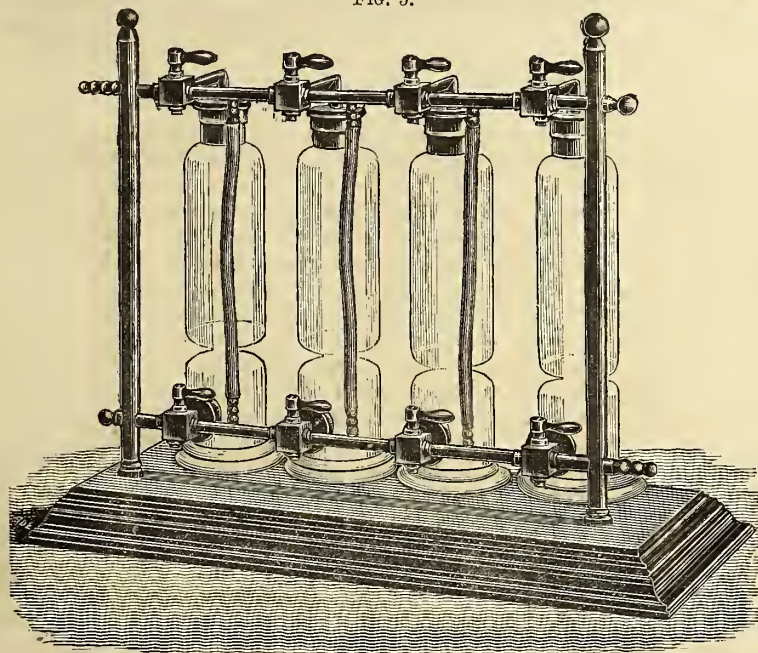


FIG. 6.

of sulphuretted hydrogen causes a difference in specific gravity of $\cdot 006$, and one of carbonic acid a difference of $\cdot 01$, and as, moreover, the balance is capable of accurately indicating a difference of $\cdot 001$, the sulphuretted hydrogen in ordinary illuminating gas can be determined to within 1-6th per cent., and carbonic acid to within 1-10th per cent.

In conclusion, I wish briefly to refer to model G (fig. 5), which is capable of automatically registering the specific gravity of gases during their passage. In this self-registering apparatus, we cannot, of course, expect a connection with any

writing arrangement; for the simple reason that a difference of $\cdot 01$ in the specific gravity of gases corresponds to a difference of only about 1-5th of a grain in weight. The marking, on the contrary, is done by photographic means; the higher or deeper position of the beam being registered by a ray of light (which passes through a bore of the beam) upon a strip of sensitive paper. This paper, by means of clockwork, is moved along in a dark casing, and is slowly drawn across a narrow slit. By means of an apparatus of this kind, I have succeeded in marking the specific gravity of gas in gas-works; and the registrations obtained (see next page) actually indicate the variations which result from the operation of filling the retorts. We may, therefore, anticipate that this apparatus will show its usefulness in controlling the working of furnaces, &c.

Of additional apparatus, specially constructed for use with the gas-balance, I may mention the gas-filter, which can be utilized for the retention of water and tar in crude gas, of particles of dust, &c., in generator and fire-gases. There is also an apparatus (fig. 6) for absorbing moisture, carbonic acid, sulphuretted hydrogen, &c.; and, lastly, an appliance for the cooling of hot gases.

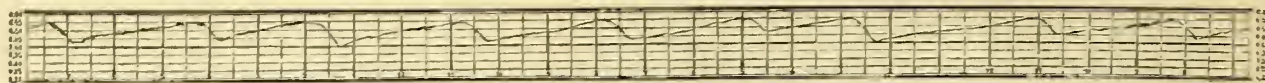
Allow me to add that the gas-balance, in ordinary working, has proved a very useful apparatus; and Mr. W. A. Valon, of Ramsgate, among others, has given a very favourable account of its practical value.

Discussion.

The PRESIDENT said in these days of demand for improvements in gas manufacture, anything which would enable them to test and analyze gas in an easy manner must be welcomed by everybody. He was much struck last year by the simplicity of Mr. Lux's gas-balance; and no doubt the improvements now described would add to its utility. The paper did not admit of much discussion; for without a careful examination of the apparatus, it would be difficult to express an opinion upon it. He would merely ask the members to record a vote of thanks to Mr. Lux for his paper.

Mr. J. SOMERVILLE (London) said that this was a matter of rather more importance than was generally attached to it. Some 14 or 15 years ago, he had considerable experience in testing for carbonic acid in furnace gases, and had had a great deal of difficulty in doing so. He used Wright's balloons and glass globes, and Dr. Bunsen's and Schilling's apparatus for effusion tests. But he could never get a satisfactory and straightforward determination; so that, after considerable difficulty, he had an arrangement made very similar to Mr. Lux's, consisting of a glass globe at the end of a beam. Mr. Lux, however, had very much improved the instrument. He described his own arrangement in the *JOURNAL OF GAS LIGHTING* in 1875,* when he proposed that it should be connected (as Mr. Lux had now made it) with an automatic photometer. His experience was that when all the moisture and carbonic acid was taken out of the gas, the balance acted accurately as a photometer. He found, from a number of experiments extending over several months, and working with gas from 14 to 24 candles, that 14-candle gas had a specific gravity of about $\cdot 440$; 15-candle gas, $\cdot 450$; and so on, up to 19-candle gas, which had a specific gravity of $\cdot 490$. But when it came up to 20 candles, there was a difference in the constitution of the gases; and he found that from 20 to 24 candle gas, the numbers went at the ratio of $\cdot 15$ for every candle; so that, although 20-candle gas gave $\cdot 500$, 24 gave $\cdot 560$. He could depend more upon this than he could on the photometer, although he had too much friction in his balance; but he believed Mr. Lux had succeeded very well with a jet of light on sensitized paper. If he could depend on doing this, and they could set up a machine which would be independent of gas examiners or managers, it would be a very great advantage. It was always an anxious time for a gas manager each morning before he saw the examiner's report as to the previous night's test; and an apparatus of this kind would be hailed with great satisfaction.

* See Vol. XXVI., p. 793.



THE SPECIFIC GRAVITY OF LIGHTING GAS RECORDED BY PHOTOGRAPHY IN LUX'S SELF-REGISTERING GAS-BALANCE.
Duration of the Experiment, 24 hours; Gas taken off after passing the Station Meter.

Mr. NORTON H. HUMPHRYS (Salisbury) believed it was usually the custom to have a vessel containing chloride of calcium or sulphuric acid in the glass case for the purpose of absorbing moisture; but he did not see any arrangement here shown for that purpose. He was in the habit of using a glass globe, about 7 inches in diameter, which contained $\frac{1}{4}$ foot of gas, with a delicate pair of scales; and he found that, by taking care of the moisture, and, of course, with accurate thermometers, he obtained very good results. It was necessary to keep a perfectly dry atmosphere inside the glass case, in which the balance was contained.

Mr. W. A. VALON (Rainsgate) said he had not had one of the latest balances; but he had tried one of the others, and found it exceedingly useful. He thought, however, to make them accurate, a little square box was wanted, through which to pass the gas to extricate the moisture; and it then became a very good check on the quality of the gas. The foreman could tell immediately if anything was going wrong. Hitherto, by knowing nearly what the specific gravity of the gas should be, they could tell what was going on, and had been able sometimes to regulate the charges of new benches, so as to get the makes fairly regular. In furnace gases once the specific gravity of the constituents were known, it was easy to make a very rapid estimate, which would tell whether or not the furnace was doing its duty.

Mr. Lux, in reply, said, if he understood aright, Mr. Humphrys objected that there were no absorbing materials in the interior of the case to dry the air. He had made some experiments with a hydrometer in the interior, and determined the moisture of the air; and he found that it varied only very little—from about 40 to 60 per cent. Without the absorbing materials, he obtained a percentage of only about 35 to 45; so that, for ordinary purposes, it would not be at all necessary to adopt this precaution.

SANITARY INFLUENCE OF HEATING BY GAS.

By LEWIS W. LEEDS, of London.

In saying that I believe thousands of lives and many millions of money would be saved by the general adoption of gas for warming our houses, I do not want to be understood as asserting that the heat from a gas-stove is more wholesome than that from the ordinary open fire; quite the contrary, I wish it to be understood at the start that I consider the heat from the open fire the most wholesome artificial warmth known. It is the nearest imitation of that magnificent heating power that the ancient heathen so devoutly and sensibly worshiped—the sun. It is not the quality that we want improved; but it is the quantity. Every one is satisfied with gold to fill his pockets with. But sometimes we cannot get all the gold we want; and then we are willing to take silver, or even accept copper. So with the heat from the open fire, it is very good what there is of it. There are, however, many parts of houses where we cannot easily get from the open fire the necessary amount of pure radiant heat needed to maintain good health; and in such cases, we require the best possible substitute. Gas appears to me to offer an excellent means of securing this substitute; but it is of the utmost importance to know that we make the proper application of the gas to secure the best results.

Heating by gas is much more liable to abuse than heating by the ordinary open fire. The deadly products of combustion from the open fire are so disagreeable that one of the first steps towards civilization taken by any members of the human family was to get clear of the smoke from their dwellings. The products of combustion from gas are almost as deleterious to health as those from the ordinary fire; but, unfortunately, they are less conspicuous, and consequently we have, as yet, sadly neglected using the necessary precaution to have these unwholesome products of combustion scrupulously removed from occupied apartments. We cannot get the fire to burn readily without a good draught, which ensures the carrying away of the products of combustion. This guarantees us, in a certain measure, against the abuse of allowing these to remain in the room. But with gas it is different, as that will burn in a room without any flue or exit for the escape of the products of combustion; and hence its greater danger. But

with a little study and thoughtfulness, this can be easily remedied.

One of the most important points in connection with artificial heating is the fact that the air is not warmed by the rays of heat which pass through it. This we may say is the fundamental principle of all heating, either natural or artificial. Many suppose that, for the persons to feel warm in a room, it is necessary for the air in that room to be heated. This is a great mistake. The air ought not to be warm, but should be cold, because it is necessary for health and vigorous strength that we should inhale cold air. The colder the air we breathe, the more rapid the circulation of the blood. The whole action of the system is twice as great when inhaling air nearer zero, than when inhaling air nearer the temperature of the body.

Now the important question arises, How shall we keep the blood warm, while being surrounded with, and inhaling this cold and invigorating air? for we know, if the blood is allowed to cool only a very few degrees, it is certain death. The extra warmth may be maintained by additional clothing, which is often debilitating, or by exercise, which exhausts the animal strength. But now comes to our relief that beautiful and very wise provision of the radiation of heat. We can have our bodies warmed by the direct rays of heat from an open fire or any other hot substance, without having the air warmed. This is a grand arrangement. Now, we want to familiarize ourselves with this one great and important fact, because our health and comfort is affected more or less by clearly understanding and knowing how to readily apply this principle of keeping ourselves warm while being surrounded with, and inhaling cold, invigorating air.

One of the greatest difficulties connected with this subject is to prove, by actual demonstration to the sight, the passage of the rays of heat through the air, and to prove also that these rays of heat do not warm the air as they pass through it. Of course, we have the familiar illustration of the heat received by radiation from the sun. We know that in winter, when the air is so cold that it is freezing on the shady side of the street, a thermometer hung in the sun, and protected from the air, would rise to 150° or 200°. We are surrounded constantly with many illustrations of this important principle; and we should make ourselves intimate with the best means of applying it for maintaining health and comfort. Professor Tyndall has given much study to this subject, and has tried a great variety of experiments. He has purified the air; removing from it the obstructing substances mechanically suspended in it—such as moisture, dust, and in London a great amount of smoke, which had to be taken out before he could tell what the effect would be with pure air. He succeeded in getting the air to a condition in which it arrested such a small fraction of the rays of heat, that he came to the conclusion if it was absolutely pure, it would not obstruct a particle of the radiation; or, in other words, pure air formed an exception to all ordinary substances, in the fact that it would not obstruct or absorb radiant heat.

I fear we cannot do much towards illustrating this beautiful principle by any crude experiments we can perform here. We

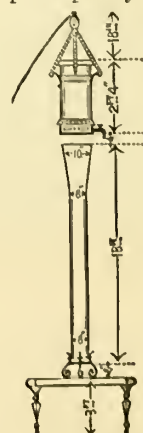


FIG. 1.

have, however, a very rough affair, which may give some idea. We have simply taken one of our ordinary circular gas-stoves, and suspended it about 15 feet high; and by removing the bottom, we get the radiation directly toward the floor. We have placed below it an 8-inch tube, about 12 feet long. This tube is open at both ends; and there is a rapid circulation of air passing up it, as you may see by the smoke from this paper. But directly in opposition to this ascending current of cold air, there is a strong descending current of radiant heat. We will place a thermometer directly below the tube and see how rapidly it rises. We will also see if it will light this candle. There you see it is lighted in 50 seconds. We have placed a thermometer on top of the stove; and will look at them both again in 10 minutes, and see what effect the heat has had upon them. Here you see how these rays of heat descend through this long tube in direct opposition to

the strong ascending current of cold air. I cannot show you how little the air is warmed by the rays of heat; but very careful scientific experiments have demonstrated that the air is not warmed in any degree. The thermometer below the pipe has, you see, risen to 120° in 10 minutes; and the one on top has risen 5° . You thus see how totally independent are the movements of the air and the movements of heat—radiant heat, I mean.

Having thus got this great fundamental principle of radiation clearly in our minds, we can proceed to apply it to the various arrangements for artificial warming. I call it "artificial," because this principle is most beautifully applied in the natural heating by the sun, in which the rays of heat are not absorbed by passing through the many miles of air surrounding the earth, but are first obstructed by the solid substances at the earth's surface—at the very bottom of this ocean of air; and then the air is warmed by each individual particle coming in actual contact with these warmed substances. This heated air rises; and the colder air from above falls down to take its place. This is Nature's great method of warming and ventilating. How can we most nearly imitate it? We must notice distinctly that Nature's main principle is to warm the floors; and we may almost say this is the only warming she does. With the solid floors of the earth warmed, and colder air above, excellent ventilation is at once secured, because this creates a perfect agitation and circulation over the entire heated surface. Now what we have to do is to imitate this as nearly as possible. The great difficulty we are hampered with is that we have a roof just above our heads, and walls on all sides of us, which confine and obstruct the circulation of the air. This cannot be helped; and so we must put our ingenuity to work to overcome these difficulties the best we can.

If we could get an even temperature of 98° over the whole floor, which would be the normal temperature of our bodies, and would consequently feel neither warm or cold, and if we could have a constant supply of pure air in the room at a temperature of 52° , we should have a splendid arrangement—almost equal to the sunshine. There are various ways of warming floors; and our most thoughtful architects and engineers are giving much attention to devising practicable methods for accomplishing this very desirable object. The luxurious old Romans took great pains to warm the floors of their palaces. Steam and hot-water pipes are now frequently employed in large buildings for this purpose; but it is a slow and elaborate process to get the necessary warmth by these methods. If similarly good results can be obtained by using gas, with the great additional convenience of being able to get the heat instantly whenever required, and to be dispensed with when not needed, it will be a most valuable point gained.

It is with the view of securing these advantages that we have devoted much time and thought to devising and completing a system of warming by gas-stoves, which might secure these important conditions. I have here a specimen of these stoves, in which you will see that we use a row of ordinary gas-burners. Over these burners we place an arch of asbestos, from which are suspended fine filaments of asbestos. You will notice, as I light the gas, this asbestos floss is instantly made red-hot; it scarcely requires a quarter of a minute to become heated to a bright red. I have placed six candles on the front of the stove, which you will please notice carefully. The first one lights in 27 seconds; Nos. 2, 3, 4, 5, and 6 are all lighted in less than 55 seconds. This shows the instantaneous effect of the downward radiation of the heat. You will also observe what a pure white flame the gas gives; and from this and the perfect whiteness of the asbestos, you will see we secure excellent combustion. This is the first necessity—the securing of perfect combustion, so as to create the greatest amount of heat possible from the consumption of a given amount of gas. The location of the burners in a chamber closed at the top, making a reservoir of hot air, from which the burners are supplied, undoubtedly assists in perfecting the combustion. The absence of the ordinary disagreeable odour given off when burning gas in the open room, is due to this complete combustion.

The second point to be considered is, How to get the heat where we require it? The tendency of heat is to rise immediately to the ceiling. But it is of no use there. We must therefore endeavour to prevent it ascending; and direct it to the floor, which is the only place where it is required. Many eminent engineers have wasted much time and thought in trying to keep a stratum of warmed air on the floor, without heating the ceiling of the room excessively; and many millions of money have been thrown away upon these

vain efforts. It may be considered practically an impossibility to make a thin stratum of warmed air lie on a cold floor with cold air above. I have spent a large part of my life in endeavouring to make what may be called the American system agreeable—that is, the method of attempting to warm our houses by over-heating the fresh air supply. This plan, however, is radically wrong. It is unnatural, because in Nature we find the solid substances hotter than the air. But now that we have discovered the valuable property of radiant heat, and find that these rays do not warm the air in passing through them, we have the key to the whole subject. You will see, by these thermometers lying on the floor, that the heat from the underside of this red-hot arch has been radiated to the floor, so that the thermometer indicates 150° . I have another thermometer nearer the fire surrounded by a double tin tube (which shields it from the radiant heat) open at both ends, which allows a free circulation of the air; and this only indicates 76° . This gives the temperature of the air close to the fire, so that you see the air is not heated. We also have a thermometer hanging immediately above the stove, which indicates only 81° . In addition to the heat radiated to the floor, there is a second important process. The products of combustion are confined in this enclosed chamber over the burners long enough to impart to the sides the remaining heat not radiated to the floor. A secondary radiation takes place from the warmed sides of this chamber; thus utilizing most effectually all the available heat.

For further illustrating the effect of warming the floor by downward radiation, we have, in the accompanying tables [see next page], the results of experiments tried by The Gaslight and Coke Company. In those tests a circular stove (Fig. 2), 13 inches diameter and 54 inches high, was used. There were four ordinary burners, consuming, on an average, $13\frac{1}{2}$ cubic feet per hour. You will notice that the thermometers Nos. 1 and 1A were placed on the floor, about 18 inches from the burners. They were put back to back; No. 1 being turned towards the burners, and consequently receiving the full force of the radiation from the heated asbestos arch. No. 1A was screened from the radiation; but, as it was within 2 or 3 inches of the other, and there was a free flow of air round them, both thermometers must necessarily have been in air of precisely the same temperature. It is scarcely possible that there could have been a variation of $\frac{1}{4}^{\circ}$ in the temperature of the air surrounding the two thermometers. The difference indicated by the thermometers is about 115° ; and this therefore shows the amount of heat radiated on the floor at that point. By comparing No. 2 (which was on the floor, under the window, and from 3 to 4 feet from the stove) with No. 6 (which was near the ceiling), we see there was some 23° more heat radiated on to the floor at that point than there was near the ceiling. Again, by noticing the record of No. 7, which was hung directly over the stove, we see there was some 15° more heat on the floor under the window than there was immediately above the stove. The figures given in these tables are not the outcome of mere guess work; but are the results of experiments carefully and accurately made. They prove, in the most conclusive and comprehensive manner, how floors may be warmed by downward radiation, while at the same time there may be a free and rapid circulation of the air through the room, which will be but slightly warmed. These results are of the greatest practical value in artificial warming.

The second table gives the figures derived from experiments with a stove of similar external appearance (Fig. 3), and which I supposed would show results much nearer the first than it did. You will see that the thermometer No. 1, which was placed in a similar position directly in front of the stove, only rose 5° the first hour, instead of 125° —certainly a very remarkable difference. This stove had the corrugated copper back, and reflected the light very similarly to the one invented by me; but although they look alike, the results as you observe, are very different. But if you will look at No. 7, you will readily imagine what becomes of the heat— 148° in one hour according to the table with the door open, or 159° when the door was shut. This, of course, is the very common result of artificial heating. Hot heads and cold feet—a most unnatural and distressing condition of things. With this latter system of heating, it is absolutely necessary to close up all the ventilators at the ceiling, in order to prevent the heat from escaping there, and leaving the floors cold.

Therefore, by the method of floor warming by direct radiation, we have a principle quite similar to that

TABLE I.—Experiments made with Gas-Stove supplied to The Gaslight and Coke Company by Mr. Leeds (Fig. 2).

DOOR CLOSED.									
Monday, June 21, 1886. Time.	INDICATIONS OF THERMOMETERS, IN DEGREES.								Index of Meter. Cubic Feet.
	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8.	Zero.
12.30 p.m. (Start).	60	61	61	61	61	61	61	61	—
1.0 "	165	84	64	65	64	63	68	67	—
1.30 "	166	90	67	67	66	65	74	69	13
2.0 "	190	90	69	68	67	67	75	70	—
2.30 "	190	92	70	69	68	68	76	72	27
3.0 "	189	90	71	70	70	69	78	72	—
3.30 "	189	91	72	70	71	70	78	72	39
4.0 "	189	91	73	71	71	70	78	74	—
4.30 "	189	90	73	72	71	70	79	74	—
5.0 "	189	90	74	72	72	71	80	74	59

Remarks.—Average consumption per hour 13·3 cubic feet.
DOOR OPEN.

Tuesday, June 22, 1886. Time.	INDICATIONS OF THERMOMETERS, IN DEGREES.													Index of Meter. Cubic Feet.
	No. 1.	No. 1A.	No. 2.	No. 2A.	No. 3.	No. 3A.	No. 4.	No. 4A.	No. 5.	No. 5A.	No. 6.	No. 7.	No. 8.	
11.0 a.m. (Start).	65	65	65	65	65	65	65	65	65	65	65	65	65	59
12 noon	190	69	88	71	68	64	68	64	66	63	66	72	66	—
12.30 p.m.	192	71	92	75	70	66	70	64	66	64	67	74	67	—
1.0 "	190	73	92	81	71	68	71	64	67	66	68	76	68	—
1.30 "	191	74	93	82	72	68	72	65	68	67	70	78	69	—
2.0 "	191	75	94	83	73	69	74	65	69	68	70	78	70	—
2.30 "	192	75	94	83	73	70	74	65	70	69	71	79	70	—
3.0 "	193	76	95	84	74	70	74	65	70	69	72	80	71	—
3.30 "	193	77	96	85	74	71	74	66	71	70	73	82	72	—
4.0 "	204	77	103	87	76	73	75	68	72	71	74	82	73	126

Remarks.—The thermometers indicated by "A" were placed at the back of the others. Average consumption per hour 13·3 per cubic foot.

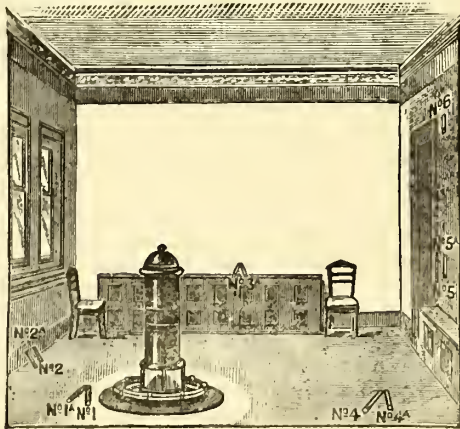


FIG. 2.

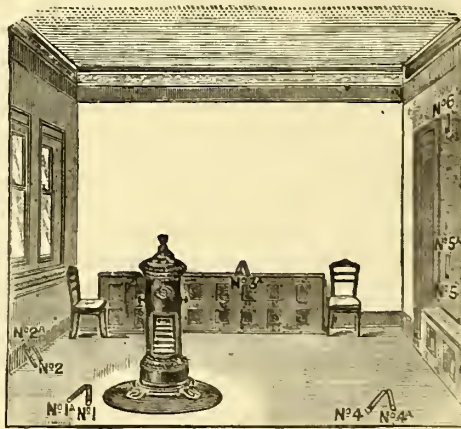


FIG. 3.

TABLE II.—Experiments made with the Company's Stove (Fig. 3).
DOOR OPEN.

Wednesday, June 23, 1886. Time.	INDICATIONS OF THERMOMETERS, IN DEGREES.													Index of Meter. Cubic Feet.
	No. 1.	No. 1A.	No. 2.	No. 2A.	No. 3.	No. 3A.	No. 4.	No. 4A.	No. 5.	No. 5A.	No. 6.	No. 7.	No. 8.	
11.30 a.m. (Start.)	65	65	65	65	65	65	65	65	65	65	65	65	65	126
12.0 noon	67	65	67	65	66	66	67	65	65	65	67	131	67	—
12.30 p.m.	70	66	69	67	68	68	68	65	67	66	69	148	69	136
1.0 "	73	67	70	68	69	68	68	65	68	67	71	151	70	—
1.30 "	78	67	72	68	70	68	69	66	70	69	72	151	73	147
2.0 "	78	68	72	69	71	69	69	66	70	62	73	150	73	—
2.30 "	79	68	72	69	71	70	70	66	70	70	74	149	74	156
3.0 "	80	69	73	69	73	71	71	66	71	71	76	149	76	—
3.30 "	80	69	73	69	73	71	71	67	72	72	76	149	77	164
4.0 "	80	69	74	70	74	71	72	68	72	72	76	149	77	—
4.30 "	80	69	74	70	74	71	72	68	72	72	78	145	78	176

Remarks.—No. 1. thermometer was removed to front of stove. Average consumption per hour 10 cubic feet.
DOOR CLOSED.

Thursday, June 24, 1886. Time.	INDICATIONS OF THERMOMETERS, IN DEGREES.								Index of Meter. Cubic feet.
	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8.	
11.0 a.m. (Start).	65	65	65	65	65	65	65	65	176
11.30 "	72	68	66	66	65	68	150	69	—
12.0 noon	75	70	68	68	67	70	159	71	188
12.30 p.m.	77	72	69	68	69	72	170	73	—
1.0 "	78	72	71	69	70	73	170	74	199
1.30 "	79	73	72	70	71	75	169	76	—
2.0 "	80	74	75	71	74	77	169	77	211
2.30 "	81	75	76	71	75	79	169	79	—
3.0 "	83	76	78	71	79	82	170	83	—
3.30 "	83	76	78	71	79	82	170	83	—
4.0 "	83	76	79	74	81	83	170	85	234

Remarks.—The thermometers indicated by "A" were placed at the back of the others. Average consumption per hour 11·6 cubic feet.

of heating by the sun, but with one very important difference. In heating by the sun there is no trouble with products of combustion; and how to get rid of these products from gas stoves is an important problem. All artificial sources of heat—either gas, lamps, chandeliers, or coal fires—should have, if possible, a separate flue for removing the products of combustion immediately from the room. This matter has been much neglected heretofore in all arrangements for lighting by gas. There is now a disposition amongst our more thoughtful architects and engineers to give this special subject much more attention. There should always be in the ceiling of a room a good exit for the vitiated air. With such an exit the products of combustion from the gas-stove would also escape. You will see by the smoke from the taper I have here that, notwithstanding the heat is much the greatest on the floor, the products of combustion, as they escape from the under side of the front canopy, are still warm enough to rise through the colder air of the room. We must remember that this ascending air does not carry with it the rays of heat; therefore there may be a rapid escape of the air from the ceiling of the room with a very small proportion of loss of heat. This explanation applies to rooms or places where no flue is available, such as shops, the front entrance, halls in dwellings, many offices, and a large number of places where there is no heat at present owing to the want of a flue. This principle of radiant floor-warming is a great boon to such places; because it is possible in nearly all such positions to obtain proper circulation of air by lowering a window or by an open stairway, or by providing some similar means of escape.

You must bear in mind that the most important part of the condition of heating the floors by direct radiation is that you can have a free circulation of air for ventilation without creating unpleasant draught on the feet. Of course, where there is a flue or an open fireplace available, it is the simplest thing possible to set the stove in front of the fireplace; leaving the whole chimney open for ventilation. The great advantage of this arrangement is that with the stove directly in front of the open chimney, you may have a large volume of air flowing by, and thoroughly ventilating the room, without wasting the heat from the fire. This is a very valuable feature; but it will require a little careful reflection to realize the full importance of it. A clear understanding of this, however, will explain how a large room may be comfortably warmed with gas during two hours for 1d., and at the same time be thoroughly ventilated.

Now, in considering the sanitary value of this system of heating, we must first notice the great deficiencies in the present methods. By consulting the mortality reports, we find that the death rate increases very rapidly, especially in the large cities, in cold, damp weather. The record of deaths is almost as true an indication of the changes in the atmosphere as the thermometer itself. During the siege of Paris, careful observations were made in the city to ascertain the effect of cold on the death rate. It was found that the want of fuel, as indicated by the increased death rate for every degree the thermometer fell, was greater than the want of food. In American cities, where the system of evenly warming the whole house is much more common than it is here, this great increase in the death rate in cold weather does not occur. As I have already said, I have a high appreciation of the quality of heat obtained from the open fire so generally used in this country; but the great drawback is that we do not thoroughly warm, dry, and ventilate our apartments with this dirty, troublesome, and expensive system of heating. The halls and passages are almost invariably cold and damp; and, on account of the difficulty of making a fire in the ordinary grate, the bed-rooms are very frequently left cold and unaired. Much discomfort and suffering, excessive sickness, and a high death rate are the natural consequences.

England has clung very persistently to her dirty, troublesome, open coal fires. She has refused to be lulled and stupefied by the warm, debilitating, heated air of the Americans, or stewed or half baked in the Dutch-oven-warmed atmosphere produced by the Continental plan. These investigations show that, in principle, she is right. The defect arises from the difficulty of carrying out the principle in all cases. But here, in this country, we have that rapid and most astonishing development of the gas interest which has carried the gas, comparatively speaking, into every nook and corner of every inhabited room in the kingdom. This was done primarily for the purpose of supplying light; but we are just discovering that this same gas is the best agent for cook-

ing. And, to add another valuable point to the already great popularity of gas, we see here the possibility of utilizing this agent for securing the very highest results in affording a wholesome and cheerful warmth with the purest air in any and every part of our occupied apartments. Of course, this subject of heating by gas is quite in its infancy. It is hardly to be expected that the first few experiments should have proved an entire success. But the demonstrations already made are certainly sufficient to prove to any intelligent engineer that gas offers the most perfect medium for accomplishing these most desirable results.

It will, however, require a considerable amount of demonstration to convince the ordinary customer who has not the time, inclination, or money to spare for experimenting, to prove these things for himself. But as the gas companies have already been greatly encouraged by the efforts they have initiated to demonstrate to the people the incomparable value of gas for lighting and cooking, I believe that, by an intelligent, energetic, and united effort on the part of the companies, they would soon be richly rewarded by the almost universal acceptance of this agent for warming and ventilation; and they would then earn the gratitude of their many millions of customers by supplying them with the means of using, and, in addition, teaching them how to use this universal and easily-supplied agent, so as to give them genial, wholesome warmth and pure air, all over their house. The great nightmare which weighs so heavily upon the sanitarian—the smoke that hangs in such depressing clouds over our great cities—would then disappear, and the bright, genial, unobstructed rays of the sun would bathe and purify our towns; and instead of an increased death rate appearing on the approach of cold weather, the well-regulated and comfortable temperature of our houses, taken in connection with the cold, bracing and external atmosphere, would give strength, vigour, and happiness to the young and old alike.

Discussion.

The PRESIDENT said Mr. Leeds came from America, where the science of ventilation was, he believed, much better understood and more generally applied than in England. He was sure the members would return him a vote of thanks for his paper.

Mr. C. R. MEAD (Sutton) said that his experience in gas matters extended for a period of more than 50 years, during which time he had seen many experiments on the subject of heating and ventilating; and he ventured to say he had seen one of the best warmed and ventilated houses in the world. This house was occupied by the late Mr. Appold—of rotary-pump notoriety—and was situated in Wilson Street, Finsbury. In or about the year 1848, he (Mr. Mead) had the pleasure of visiting Mr. Appold, and having the mode of warming and ventilating explained. Mr. Appold said that the first thing he did was to have all the floor-boards taken up, and a number of holes made through the neutral axis of the joists, so as to get a passage between the ceilings and the floors above them, by which the warm air might have a free flow. He then had air conductors so arranged that one set should convey the warmed air where required, and another set take off the vitiated air from the room. Having done this, he had the floor-boards relaid, and perforated with thousands of small holes, so as to allow the warmed air to pass up through them, and the carpets over them, into the rooms. In the basement of the house, he had a large gas-stove with an air chamber for warming, without burning the air. This air chamber was furnished with an inlet-pipe, to admit air from a yard at the back of the house, and an outlet-pipe to convey the warmed air to the air conductors in the house. The inlet-pipe was furnished with a large screen made of bunting. This sifted the soot and dust from the air; while a second screen, the bottom of which dipped into a tank of water, slightly moistened the atmosphere passing to the stove. He desired to have the temperature of the rooms at 65°; and the hall and staircases at 56°—the latter being high enough when people were moving about. The regulation of the temperature was managed by the action of a large and ingenious thermometer fixed in the middle of the house, and operating on a very delicate gas-valve, by means of which the supply of gas to the stove was regulated. Mr. Appold, like other inventors, found that air would not always travel as theory provided it should; and to get over the difficulty, he employed a steam-engine, by which he could drive either warm or cold air into the rooms, or exhaust the vitiated air. Mr. Appold had some difficulty with his dining-room, as the temperature rose very fast after the guests had been in the

room for a short time. To obviate this difficulty, he had a pedal arrangement under the table and an ornamental thermometer on the table in front of him; and if the room was getting too warm, he had only to press a pedal with the left foot, and cool air was admitted, passing quietly up through the carpet all over the room, until the proper temperature was restored. On the other hand, if from any cause it fell too low, the pressure of the right foot on another pedal admitted an extra supply of warm air. The whole theory of the business was that warm air should be passed into the rooms all over the floor surface, so that there should be an even temperature throughout the rooms, and that the vitiated air should be carried away through openings in the ceilings; such openings being furnished with properly exhausted air channels. There was only one matter Mr. Appold was not satisfied with, and that was the cost of gas, which, in those days of high-priced gas, amounted to from £9 to £20 per month.

Mr. JOHN CHAPMAN (Harrow) said the papers under discussion were both excellent ones. He regretted, however, there was not time to discuss them; and he feared the consideration of them would have to be left until next year. In his opinion, there was nothing so comfortable as to have a well-ventilated and well-warmed room.

The PRESIDENT said unfortunately there were so few members present, that he feared there would not be any further discussion; and he would ask Mr. Somerville to reply.

Mr. SOMERVILLE said he had only to answer the President's question with regard to Bunsen burners. He did not recommend them; he only mentioned them. On the contrary, he recommended a white-flame burner, because he always found it most difficult and almost impossible to prevent smell from a Bunsen burner. All he said was that if Bunsen burners must be used—some people would have them—take care and have good ones.

Mr. LEEDS, referring to the system of heating the air and driving it into rooms, said that this was an old device. It was done at the Houses of Parliament, and a number of other places; but it came to the original proposition after all—that the air had to be warmer than the air in the room. His principle was to leave the air cold, while the heat was used for radiation. In America he had spent an enormous amount of time and money on the attempt to warm the air, and to get it to go where it ought to; but he had come to the conclusion that it was better to warm the floor.

MR. NEWBIGGING'S CANDIDATURE FOR ROSSENDALE.—A deputation, consisting of the Mayor of Bacup (Alderman Lees), Mr. R. Lord (of Rawtenstall), and Mr. G. Moon (late of Bacup), recently waited on Mr. Thomas Newbigging, C.E., Manchester, and handed to him the sum of £212 15s. 6d., being the balance of his late parliamentary expenses, as promised previous to his acceptance of the candidature.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.—The twenty-seventh annual general meeting of this Association will be held in the rooms of the Royal Philosophical Society, Glasgow, on the 26th and 27th inst., under the presidency of Mr. David Terrace, of Dawsholm. A good programme has been prepared for the business meeting on the first-named day; and if this is got through, the members will have well earned the recreation provided for them on the second. In addition to the President's Inaugural Address, papers will be submitted on the following subjects:—"Gas Burners for Photometrical Purposes," by Mr. G. R. Hislop, of Paisley (being a report on the remit on the subject of the "Best Standard Burner for Scotch Gas"); "A year's Experience in the Manufacture of Sulphate of Ammonia," by Mr. R. Cowie, of Tillicoultry; "Tar as Fuel for Steam-Boilers," by Mr. J. McCrae, of Dundee; "Automatic Gas Lighting," by Mr. G. Keillor, of Nairn; "Selling Gas," by Mr. J. McGilchrist, of Dumbarton; "Regenerative Furnaces for Small Works," by Mr. J. Smith, of Rosewell; and "Scrubbing, Condensing, and Washing Coal Gas," by Mr. W. Key, of Tradeston, Glasgow. The report of the Sub-Committee of the Murdoch Memorial Fund will be submitted to the meeting. The discussion of the above-mentioned subjects will be an excellent day's work; and after it is over the members will dine together in the "Royal Bungalow," at the Glasgow Exhibition. On the following day there will be an excursion to Loch Lomond and Loch Long. The party will travel from Glasgow, via Balloch, to Tarbet, on the former loch, where they will take luncheon. The return will be made from Arrochar, on Loch Long; proceeding via Dunoon (where the journey may be broken for a couple of hours for tea at McColl's Hotel, in the West Bay), to Craigendoran Pier, and thence to Glasgow, which will be reached in good time in the evening. It will be seen, from an advertisement which appears in another column, that this meeting, with its attendant pleasant excursion, is not confined to members of the Association and their friends, but that members of other Associations who are desirous of taking part in it can do so on applying to the Secretary, Mr. R. S. Carlow, of Arbroath.

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(FOR STOCK AND SHARE LIST, see p. 135.)

THE past week has been a bright and active one on the Stock Exchange, after a continued period of comparative stagnation. Prices everywhere are on the upward move; even the unfortunate American Rails seem to be taking the long deferred turn. Foreigners, too, are even a little higher than they were before—thanks to the absence of political alarms. Money remains easy; though it cannot be expected to get any easier. Thus, everything points to the probability of better prices all round. In the Gas Department several advances in quotations have been scored. Foremost, of course, comes Gaslight "A," which has several times marked 260. The reason of its upward move is not far to seek, when it is remembered that the Company, having reduced the price of their gas by 3d. per 1000 cubic feet from the commencement of this year, are entitled to increase the rate of dividend for the half year just completed by $\frac{3}{4}$ per cent. The secured issues are still in demand; and some of their debenture and preference stocks have advanced. South Metropolitan have been very quiet. The "B" has improved 3, as might be expected from its appearance the preceding week. It must not be forgotten that this Company will be entitled to declare a $\frac{1}{2}$ per cent. higher dividend next month. The reports and accounts of the two larger Metropolitan Companies will, therefore, be interesting. Nothing at all has been done in Commercial; but the old stock has recovered 1. Imperial Continental has remained steady, with buyers at 1 higher. Crystal Palace is 5 better, and with reason, seeing what it fetches at the Mart. Some of the minor undertakings have been active, especially Bombay and Monte Video. Their quotations, however, have not moved, though advances have been made in many issues, as detailed in the list at page 135. Water (excluding the more speculative foreign undertakings) has been very quiet; the bulk of business being in Lambeth issues. Most of the Companies, however, show some improvement in quotations. The daily operations were: Monday opened firm and promising. Gas business was mostly in Bombay and Monte Video. Gaslight "A" was quiet, but rose 1 $\frac{1}{2}$. There was a little doing in Water, at moderate prices. There was a shade more activity in Gas on Tuesday, and general firmness. Gaslight "A" rose 1 more; and South Metropolitan "B," and Brentford new, made a similar advance. One transaction in Water was all. Lambeth 7 $\frac{1}{2}$ per cents. rose 1; and the quotation of Southwark ordinary was drawn in closer. The general tendency to improve continued strong on Wednesday. Gas business was mostly in Imperial Continental, which rose $\frac{1}{2}$; and advances to the same extent were made in Continental Unions. Gaslight "A" was erroneously credited with an advance of 5 $\frac{1}{2}$; but in point of fact it did not move at all. The "C," "D," and "E," however, rose 1. Water was an absolute blank; but Lambeth 10 per cents. rose 1. Very little was done on Thursday in gas, except in Gaslight "A," which rose 2 $\frac{1}{2}$. South Metropolitan "B" improved 2; Commercial old, 1; and Crystal Palace, 5. Water had nothing to note. Friday's business in Gas was only moderate; but prices were excellent. British rose 1; but nothing was done in it. Lambeth Water was unusually active; but nothing else was touched. Chelsea and Southwark ordinary improved 1 $\frac{1}{2}$; and New River, 1. Gas was active on Saturday, especially Gaslight "A." The 4 per cent. debentures rose 2. Nothing was done in Water, except New River debentures, which advanced 1. Southwark ordinary had a further rise of 1 $\frac{1}{2}$.

ELECTRIC LIGHTING MEMORANDA.

REVOCATION OF THE GAULARD AND GIBBS PATENT—DIFFICULTIES IN THE WAY OF ELECTRIC LIGHTING AT BARNET—THE BOARD OF TRADE REPORT ON THEIR PROCEEDINGS UNDER THE ELECTRIC LIGHTING ACT—PROPOSED CHARGES FOR ELECTRICITY AT BRADFORD.

THE uncertainty of the law is strikingly exemplified by the case of the Gaulard and Gibbs patent, which has just been upset on the petition of Mr. Ferranti, after it has been before the public for years. Indeed, the patent dates from 1882; and during the past six years the Gaulard and Gibbs system has been exhibited and worked in public without any noteworthy expression of doubt of its originality. In fact, it was a great deal too original for a good many learned professors of physical science, who could not understand it, and consequently followed the fashion of their kind in condemning the principle of the invention at the same time that it was being made by Mr. Westinghouse the basis of the cheapest known system of electric lighting from central stations. It is rumoured that the real petitioners against Messrs. Gaulard and Gibbs were the Grosvenor Gallery Company, who are actually using their system under a licence, but who put Mr. Ferranti forward as the nominal plaintiff, with the idea that if the patent was annulled they would be able to escape payment of royalty. If this is the "true inwardness" of the matter, it has a somewhat unpleasant savour; but any sharp practice of this kind is regarded as right and proper in some varieties of business. The essential fact to be borne in mind, however, is that the Gaulard and Gibbs patent has been revoked; and the system of distributing electricity for lighting purposes by transformers disposed in connection with alternating currents of high tension has been thrown open to the world. It is remarked by the *Electrical Review* that this result will not have much effect upon the commercial prospects of electric lighting, because Messrs. Gaulard and Gibbs were always ready to grant licences for working their supposed proprietary system. The

reputation of the unfortunate patentees for ingenuity in devising, and perseverance in working it out under great discouragement remains; and it is certainly a pity that in the eye of the law all this was wasted, so far as the patentees' private interest is concerned, upon a device which was not patentable.

The proposed electric lighting of the town of Barnet is not yet an accomplished fact. Warned probably by the example of Leamington, Mr. Joel, the electrical contractor, has represented to the Barnet Local Board that the 16-candle incandescent lamps with which they had proposed to light the streets would not be likely to prove satisfactory. It is a remarkable thing that while common batwing burners consuming 5 cubic feet of ordinary coal gas per hour, and generally giving the light of from 12 to 14 candles, are considered quite sufficient for average street lighting, a nominally superior lighting effect from incandescent electric lamps is always a failure. In the case in point, Mr. Joel recommended the Board to have lamps of 32-candle power; but the suggestion seems to have opened the eyes of the members of the Board to the truth that street lighting by electricity is not altogether a settled business. It appears that Mr. Joel, whose name is well known in connection with electric light engineering, wanted to light Barnet with his own arc lamps; but the Board did not see the necessity for them, and preferred something more like the usual gaslight. Then Mr. Joel agreed to fix 16-candle lamps, as desired by the Board; but now he wants to double the nominal illuminating power of the lamps, for fear of a failure such as he admits to have occurred with similar lamps at other places. And he added point to his objections by refusing to sign the contract for the street lighting until the Board consented to meet his views in regard to this matter. After a good deal of discussion, and with much misgiving, the Board gave way to their electrician; and it now remains to be seen whether they will achieve their desire of getting a better light for their streets by means of electricity at a saving on the cost of gas.

The Board of Trade report for the past year upon their proceedings under the Electric Lighting Act has been issued; according to which the only application for a Provisional Order since the last report was that of the South Metropolitan Electric Supply Company, for permission to occupy the City and a select district of the West-end of London. After hearing the objections of several of the local authorities named in the application, the Board of Trade granted an Order restricted to the parishes of St. James, Westminster, and St. Martin-in-the-Fields, with Waterloo Bridge and a small portion of the Victoria Embankment. It may be remarked here that a Bill to confirm the Order was introduced into the House of Lords and read a first time last week; the Standing Orders having been suspended for this purpose. Five applications for Licences are recorded, of which only one, relating to Liverpool, has been granted; besides the Licence to the Kensington Court Electric Lighting Company, which was mentioned in the last report. It is probable that the next report of the Board of Trade upon this subject will contain more matter.

Considerable interest attaches to the Bradford Corporation experiment in electric lighting from a central station, as it will be the first venture of the kind in the United Kingdom, and the first concerning which full and reliable accounts are to be published. It is proposed to sell the current to subscribers either at a charge of 5d. per unit, with 10 per cent. on the cost of the meter by way of rental, or for an annual rental of 20s. per lamp of 16-candle power, irrespective of the hours of burning. This is supposed to be equivalent to gas at 4s. 2d. per 1000 cubic feet. It is rather noteworthy that while the Barnet Local Board flatter themselves that they will get electric lighting from a contractor at a saving on the cost of gas, the Bradford Corporation, who mean to do the work themselves, do not entertain any such vain hope. The Corporation are trying to make three years' contracts with prospective consumers; and they propose to lay the services to the doors of their patrons—leaving them to provide internal fittings—probably reserving the right of inspection.

PRESENTATION TO MR. SAMSON FOX.—Last Wednesday an interesting event took place at the works of the world-renowned Leeds Forge Company, Limited, in the shape of a presentation to Mr. Samson Fox, the founder and Managing Director of the undertaking, on attaining his fiftieth birthday. It was the outcome of a desire expressed by the heads of the departments (twelve in number) to celebrate the remarkable success of the concern, and to express in some tangible way their high estimation of Mr. Fox's personal character and exceptional qualities as an employer. The form of testimonial selected by the donors was a piece of silver plate, and an address beautifully inscribed upon a piece of Leeds forge boiler-plate. The piece of silver had a total weight of upwards of 23 lbs. The large oval of the plateau had, on its upper surface, four views of the Leeds forge engraved upon it, surrounding an appropriate inscription. There were also views engraved upon the plate, representing four of the principal operations in the manufacture of a Fox corrugated boiler-flue. The presentation was followed by a banquet, at which Mr. Fox, the members of his family, and a number of guests were entertained by the subscribers. This took place in a portion of the offices, which was appropriately draped and set out with plants. One special feature of the room was the lighting of it with the new water gas which the Company have been for some time manufacturing for their own use. The Leeds Forge Company are, it is stated, the first in this country to manufacture and adopt this kind of gas for illuminating purposes.

THE OBSERVANCE OF TYPE IN STRUCTURAL DESIGN.

ONE of the most important considerations that can engage the attention of a gas engineer, as of anyone else occupied in works of construction, is the extent to which the idea of a type can be carried out in his designs; that is to say, the degree in which conformity to a certain standard of character can be followed in the class of structures for which he is responsible. Although this consideration is so important, however, it is not invariably recognized as such. Many designers seem to go to work oblivious of the idea of a type; and others only confess the influence of this idea indirectly and incompletely in the repetition of a few characteristics of style, which serve no other purpose than that of enabling an observer to identify their work at the first glance. This latter tendency is rather a trick of design—or it might be described as a mark of individual taste—than real observance of type-forms. The way to distinguish between a trick of designing, which is often no more than a trade mark, and true observance of a type, is to notice in what the particular indications appear. When an engineer always finishes off the tops of his gasholder guide-columns or standards in the same style, or repeats without variation the same string-courses and window-heads in his retort-houses, that is a trick, or as it might be less invidiously called, a mark of individual taste. There is, of course, nothing objectionable in this habit, so long as the favourite design is not bad in itself. It soon becomes recognizable as the brand of a particular designer; so that one can declare from afar who is responsible for the work which displays it. The peculiarity of it consists, however, in its being manifested wholly or principally in superfluities, sometimes called ornaments. It is much easier to show fancifulness in ornament than to let a whole piece of work tell who designed it. Yet even the latter may be done without necessarily involving observance of type. Gas-holders, retort-houses, and other imposing structures, may bear the easily recognizable impress of their creator, and yet be so divergent from others of like origin that nothing approaching conformity to type can be claimed for them. Conformity to type, then, is something more than, as well as distinct from individual expressions of taste in designs of structures. It may be combined with this preference of designers for stock embellishments and trade-marks; but the presence of the one does not, as a matter of necessity, imply the other.

Regard for type should be one of the chief cares of a designer at the beginning of his career as a responsible constructor; but we do not say that he should start with his types rigidly fixed in his mind. It is rather of the essence of a true type that it should be evolved and developed as time goes on and experience ripens; but there must be something fundamental, like a firmly-held principle, to begin with, upon which the developments of the type can grow. Take, for example, the design for a gasholder and tank. The designer must have in mind certain data upon which his work is to be based. We speak only of work that is really designed, and not copied from somebody else's patterns. Here the underlying principles may be that the tank shall be built of the most suitable materials available on the spot, and that the ironwork of the holder and framing shall be of light, easily-handled pieces, comprising the smallest possible variety of sections, and these of the cheapest and most ordinary description. This is quite enough to constitute the leading idea of a type of gasholder construction. With the next opportunity the designer will be able to see wherein the plan may be modified, either out of regard for local conditions or to secure some general advantage; and the type will be yet more distinctly emphasized. So again with every subsequent repetition; the more the type is modified, the more will it be developed and maintained, so that in time men will be able to say "this is one of Mr. Blank's holders," not because of the appearance of a particular finial on the columns or rosette on the girders, but merely from the general conformity to type which they are able to recognize in the work itself. So long as the type is good, this is the highest praise that can be accorded to its creator.

The observance of type descends into much smaller matters than the design of a large structure; and within certain limits, it saves much expenditure of brain power on the part of the designer. In gas making, for example, the right shapes and dimensions of retorts constitute questions upon which much variety of opinion has prevailed, leading to a bewildering complexity of patterns and occasionally to much perplexity on the part of manufacturers. In France and Germany the inconvenience of this multiplicity of sections of retorts has led to the adoption of a few type-forms, which all constructors of retort settings will be bound to respect under penalty of having to pay extra for abnormal patterns. Whether anything like this formal agreement is possible among gas makers in general is doubtful. But it is evident that every engineer who entertains a preference for a particular shape and size of retort should be able to adduce sufficient reasons therefor; and for these reasons he may be expected to repeat this favourite design wherever the conditions are favourable to it. The same may be said of other points of design.

There is the question of the character of the gas-mains inside works. Some engineers have a liking for special castings, in the interest of perfect distribution, the reduction of friction in the flow of gas, &c., while others will not hear of anything but the most ordinary bends, tees, and junctions—letting the gas currents take care of themselves. One man is all for tees and blank flanges for clearing the mains of obstructions, another prefers the easiest of bends when the direction of the flow of gas has to be changed, providing an occasional manhole for inspection and cleaning. Indeed, it is more difficult to point out the details of gas-works

construction in which there is no scope for individuality of design, than to name those in which there is wide room for choice of methods of attaining the same end. We do not say that it is either necessary or desirable for every gas-works to differ in everything from others of the same size. Observance of type is a totally different thing from vainly striving after either originality or oddity of design.

Observance of type is something more than a preference for uniformity of pattern or dimensions; but it frequently finds expression in the latter. When a manufacturing firm have decided upon the type of machine which they intend to make their speciality, the next step is to settle the sizes and patterns in which it is to be made; and the fewer these are, the better. In the beginning of an industry, there is likely to be almost infinite variety in the product; but after the practical requirements of the trade have been sounded, these are cut down to a narrow range; which yet satisfies everybody. Electric lighting engineering in this country is now passing through this stage. Every large order that is given for an installation of incandescent lighting for a mansion or public building, entails a fresh design in the way of dynamos, switch-boards, or some other important fitting, with the necessary consequence that the work is long in hand, expensive, and difficult of repair. It argues a considerable experience of the necessities of an industry when the essential machinery is made to gauge, with interchangeable parts which can be replaced from stock at short notice. The types must be approved by theory and practice before their expression can be multiplied as it were automatically.

There is nothing like sameness or poverty of invention in a strict adherence to type. In the natural world, types are comparatively few, while modifications and developments for special purposes are innumerable. The rudest draughtsman that ever chipped the prehistoric flint or moulded the dateless clay, like him of the present who scribbles on a pavement with a piece of chalk, can indicate the type of a fish or of a man without observance of specific character or individual likeness. So in engineering; the type once established, there is plenty of scope for varying the design for special purposes without contradiction of fundamentals. If only the type is preserved, its modifications must be mutually harmonious and rational. It is when fundamentals are outraged in successive designs from the same hand that there is confusion, and the critic is driven to the conclusion that the designer does not know his business, and that any approach to rectitude of principle which may have been observable in his work is accidental. This is the worst reproach that can be brought upon a designer, and places him upon the level of a child who, playing ignorantly with a musical instrument, has by chance evoked a thrilling chord, only to follow it up with a nerve-shattering noise.

Therefore it is to be urged upon all designers that, in their capacity of creators, they observe, as one of the fundamental laws of their actions, that principle of conformity to type which is the highest expression of perfect skill and sanity. Eccentricity is sometimes striking; and the production of an unlooked-for effect, or of a commonplace effect by extraordinary means, is dear to a certain order of mind. But that is not the highest class of mind. Economy of effort, unity of aim, ease and certainty of execution, are all subserved by observance of type; and the recognition of a new type, the perception of what it is capable of developing into, is a task for the keenest and most original intellect.

THE EDINBURGH AND LEITH CORPORATIONS' GAS BILL.—As mentioned by our Edinburgh Correspondent last week, the Edinburgh and Leith Corporations' Gas Bill came before the Select Committee of the House of Commons, to whom it was referred as an opposed measure, on the 5th inst.; and, the opposition of the petitioners against it having been disallowed, it was formally passed on to the Committee on Unopposed Bills, by whom it was considered on Tuesday last. Mr. Beveridge presented the necessary proofs of the preamble of the Bill, and thereafter went through the clauses *seriatim* with the Committee. The examination of the Bill by the Chairman (Mr. Courtney) was very minute, and lasted a considerable time. At the close, the Bill was signed, and ordered to be reported. This, as shown by our "Parliamentary Intelligence," was done on the same day; the Bill being read the third time on Thursday. It now only awaits the Royal Assent.

THE GAS AND WATER INVESTMENTS TRUST, LIMITED.—In our issue of May 22 last (p. 917), we referred to the registration of a Company, called the Gas and Water Investments Trust, Limited, with a nominal capital of £3,000,000, divided into 600,000 shares of £5 each. We now learn that a strong Board has been formed, and that the first issue of the capital of the Company will shortly be offered to the public. The objects of the Company will be similar to that of other trust companies recently formed; the only difference being that gas and water investments will be made a speciality, and that the Company will guarantee the issues of the mortgage debentures of new and approved gas and water undertakings. The shares of all the recently formed trust companies have been eagerly applied for; and the public estimation of such securities as an investment may be judged by the fact that these shares cannot now be obtained at less than from 10 to 30 per cent. premium. Assuming that the Board of the Gas and Water Investments Trust, Limited, consist of men of the necessary experience and position, and possessing public confidence, we do not see any reason why this Company should not be as successful as those to which we have referred. The Secretary is Mr. J. A. Kellman.

Notes.

RECENT TESTS OF THE WELSCHACH BURNER.

In the course of a report by Professor Henry Morton, of the Stevens Institute of Technology, of Hoboken (N.J.), on some tests made by him of a number of Welsbach burners which he has had in use in his house since the beginning of this year, he gives the following results, which he says have been constantly duplicated with a large number of burners:—

Burner.	Pressure in Inches.	Consumption in Cubic Feet.	Candle Power.
No. 1. ..	1.01	2.25	25.5
No. 1. ..	0.90	2.10	25.5
No. 1. ..	0.80	1.95	24.0
No. 2. ..	1.00	2.30	23.0
No. 3. ..	0.85	2.45	24.0
No. 4. ..	0.95	2.75	33.0
No. 4. ..	0.80	2.47	29.0

The efficiency and economy of these burners, as compared with the standard Argand, will be seen when it is stated that the same gas, consumed with one of the latter burners at a pressure of 8-10ths of an inch, and at the rate of 4 cubic feet per hour, gave a light of 16 candles, or 4 candles per cubic foot; whereas with the Welsbach burners, the lowest result was about 10 candles, and the highest 12 candles per cubic foot. The following results were obtained by Dr. L. Calvert Ford, the Government Inspector of Gas and Meters at Washington, in the course of some tests made by him at the request of Mr. G. A. McIlhenny, of the Washington Gaslight Company (the standard burner, with a consumption of 5 cubic feet per hour, giving 17.99 candles):—

Pressure at the Point of Ignition, in Inches.	Consumption per Hour, in Cubic Feet.	Actual Candle Power.	Value per Cubic Foot in Terms of Standard Candle.
6 tenths ..	2.14	17.01	7.94
7 " ..	2.19	18.42	8.41
9 " ..	2.78	22.65	8.14
10 " ..	2.82	24.11	8.54
13 " ..	2.92	24.95	8.54
Average . . .	2.57	21.42	8.21

The increased illuminating power obtained with the Welsbach burner was found to be equal to 19 per cent., with a saving in consumption of upwards of 48 per cent.

THE PARIS MUNICIPAL DUTY ON ILLUMINANTS.

In a recent number of the *Revue Industrielle*, M. Delahaye shows the amount of *octroi* and municipal dues paid by different illuminating materials employed in Paris. The chief of these are candles, vegetable oil, mineral oil, and gas. The candles principally used are sold in fives and sixes to the packet; the former giving a light of 0.136 carcel, and the latter of 0.131 carcel, with a mean hourly consumption of 10 grammes of stearine. It therefore requires 7.4 of one size of these candles and 7.6 of the other to give the light of a carcel-hour. The mean duty on this is 0.018 fr. The carcel-hour as afforded by colza oil lamps pays 0.0137 fr. duty. With mineral oils the rate of consumption to lighting effect varies greatly with different patterns of lamps; but according to Mr. Boverton Redwood, a consumption of 3.23 grammes should give a candle-hour. Taking the carcel at 8.91 candles, the consumption for a carcel-hour would be 28.77 grammes. For reasons given, M. Delahaye places the average lighting value of petroleum at 35 grammes per carcel-hour. This means an *octroi* of 0.0094 fr. per carcel-hour. The gas sold by the Paris Company, is subject to a variety of imposts, which may be calculated in different ways according to the manner in which they are regarded and the various allowances reckoned. In this way the *octroi* on the carcel-hour by gas may appear to be either 0.0109, 0.0046, or 0.0026 fr.

THE SUSTAINING POWER OF SOILS.

In a paper read before the Civil Engineer's Society of St. Paul (Min.), Mr. Randall Hunt dealt with the supporting power of soils; and specially referred to the treacherous nature of clays, which, as a rule, are hard enough in dry weather, but have the capacity of retaining water once admitted, and becoming softer and softer as the quantity of moisture is increased. It appears from the examples cited by Mr. Hunt that the load on a pure clay foundation should not exceed from 1½ to 3 tons, according to the nature of the clay and the possibility of keeping it tolerably dry. When clay is mixed with other materials, such as coarse sand or gravel, its supporting power is usually considerably increased, becoming greater in proportion with the other materials, up to the point when the mixture forms a mass like natural concrete, in which the clay is the cementing material. Such subsoils will bear loads like the softer rocks. Foundations on coarse sand and gravel are usually successful, in the absence of running water. Loose fine sand may be rendered more fit for building on by ramming in thin layers. The limit of safe loading upon the sandy soil of Berlin is taken at about 2.3 tons; but it has been successfully loaded up to 4.1 tons per square foot. With soft alluvial soils it is found that the supporting power of the soil is greater in proportion as the loaded area is limited; or, conversely, large areas of soft soil will not support as much weight per unit of surface as more limited areas of the same soil.

PETROLEUM v. GAS-ENGINES

In a report upon the Priestman petroleum engine, Sir Samuel Canning and Messrs. H. Alabaster, Gatchouse, and Co., instituted a direct comparison between the working expenses of an engine of this kind and a gas-engine. Priestman's engine consumes common

refined petroleum or kerosene, of about '800 specific gravity, now costing 6½d. per gallon. A 6-horse power engine was selected for the purposes of the trial; giving actually 6·488-horse power on the brake. The consumption of oil with this engine was after the rate of 10·8 pints per hour, or 1·68 pints per brake horse power. It therefore appeared from this test that the cost for oil alone per actual horse power with this engine was approximately 1½d. per hour. The maintenance of the galvanic battery which, by the aid of an induction coil, ignites the explosive mixture in the cylinder of the engine will cost about 2½d. per day of nine hours. Very great stress is laid upon the fact that the makers of this particular pattern of petroleum motor have succeeded in using the ordinary petroleum of commerce, instead of the troublesome spirit which is used for all other engines of the same kind. This is a great advantage, since petroleum oil may be obtained and stored anywhere, without a licence, which is not the case with the spirit. There is little or no residuum with the Priestman engine. The running of the machine is also very regular; and there is no dirt. There is no necessity for oiling the piston; the oily vapour supplying all the lubrication required. It is concluded that these engines can compete favourably with gas at anything over 3s. 6d. per 1000 cubic feet, and they are declared to be suitable "for isolated electric light installations, and even larger operations of the kind, and for every use to which gas-engines can be put; with the special advantage of being capable of employment where gas cannot be utilized."

Communicated Article.

THE SYSTEM OF MONTHLY COLLECTIONS BY GAS COMPANIES.

By A MANAGER ABROAD.

I glean from the papers that come to me by each succeeding mail that the question of which is best—weekly, monthly, or quarterly collection of accounts, is at present agitating the minds of gas managers at home; and several managers having referred to the fact of the system of monthly collections being in existence on the Continent and abroad, and the system being in use on the works of which I am Manager, I thought perhaps I could help my brother managers in forming an opinion on the subject, by laying before them a few of what I consider to be the advantages and disadvantages of the system. At the same time I would say that while writing I have in my mind a works of medium size—say, of from 40 to 50 millions per annum—and that readers may draw their own conclusions as to the advantages or disadvantages of extending the system to works of a larger output.

Taking the generality of gas company's consumers, it will be found that they may be divided into three classes—first, the artisan class, who are paid weekly; secondly, the middle class, paid monthly; and, thirdly, a small majority of the upper class, paid quarterly. In the first case it may be well to consider how far an alteration in the present system would affect these different classes. In regard to the artisan class, it would undoubtedly be a great advantage to the consumer if the system of weekly collection could be adopted and carried out, for, under the present system of quarterly collection, it is easy to imagine what a small percentage of the whole body would at the end of the quarter have laid aside out of their weekly earnings enough money to pay a quarter's gas bill; and as long as the present quarterly system is carried out it will be useless for a gas company to think they will make consumers of the general body of the artisan class. On the other hand, a weekly collection would be a great inconvenience to the middle class, who are paid their salaries monthly, and rather a trouble and useless annoyance to the higher class and the majority of tradespeople. We therefore come to consider the question of a monthly collection. Now, the majority of a gas company's customers are of the middle class, and among the tradespeople; and of these, the former are, as a rule, paid their salaries monthly, while the latter usually settle their accounts monthly. It would therefore be manifestly to the advantage of these two classes of consumers if they could pay their gas bills monthly instead of quarterly. As affecting the artisan class, it would still be out of the reach of some, but at the same time much nearer their grasp than the quarterly system; and by adopting this system, the company would undoubtedly find some fresh consumers among this class. As regards the higher class, I do not think they would suffer any disadvantage by the change from a quarterly to a monthly collection; and a collector soon gets to know those who prefer to settle quarterly, and acts accordingly. With respect to quarterly collection, the only thing to be said in its favour is that it is "old custom;" for it cannot be pointed out as a benefit to the majority of any one of the classes above named. As for the first, it puts gas completely out of their reach; the second forget all about the gas, and at the end of the quarter find the bill so high that it is a great strain on their last month's salary (for in these days of low salaries, how many of the middle class live almost from hand to mouth); while to the third class it is a matter of indifference.

Having dealt with the various systems as affecting the different classes of consumers, it remains to be decided which is the best of the three; and I think my readers will agree with me when I say that the plan of monthly collection appears to be the best for the large majority of the consumers. Each system having its advantages, it may be asked why not adopt all three? But I believe this would only tend to confusion; and, therefore, on the principle

of "the greatest good for the greatest number," I incline to the general adoption of the monthly arrangement.

It will now be for me to deal with the matter as affecting the gas company, but referring directly to the monthly system, which I have already proved to be to the advantage of the consumer. I will therefore, as briefly as possible, point out some of the advantages to be derived from this system of collection. In regard to security, the accounts being smaller, and collected more frequently, the present amount of security may be considerably reduced; for, as is well known, the question of security has frightened many a would-be consumer. For the reason here given there will be fewer bad debts at the end of the year. If from the weather, or any other cause, the gas bills should suddenly increase considerably, a manager, inspector, or collector has a much better chance of being able to explain the reason to a consumer at the end of a month, than if he had to wait for three months, when the occurrence would probably have been forgotten. A greater check is kept on the meters; and if they should get out of order and stop registering (as they will do), it is much better, for obvious reasons, that this stoppage should be discovered within one month than in three months. Monthly collection, bringing the manager, collector, and inspector more regularly and frequently in touch with the consumers, will tend to create more confidence between the latter and the company's officials than exists at present. With a proper system of books, the accounts should be all ready and in the hands of the collector within three days of taking the indices. Everything is kept up much closer, and work in the office is greatly facilitated by the books being made up monthly instead of quarterly and half yearly, at which latter time there is always a quantity of extra work in preparing the half-yearly returns. Each month it would be extremely easy for the manager to investigate the results of his month's working, leakage account, &c., and with each month made up, the work at the end of the half year would be considerably lessened. The company would undoubtedly be benefited by an increase in the number of consumers, owing to the proposed easier mode of payment.

The foregoing are some of the advantages which I consider would be brought about by an alteration of the present system of collection. But I would also put against these the only two serious objections to the alteration. (1) There would undoubtedly be additional work thrown on the office staff. But the employment of an extra clerk would quite overcome this difficulty; and after a time the work would take such a routine form that no difficulty whatever would be discovered in working the system. Again the cost of an extra clerk would soon be compensated by the increase in business and the decrease in bad debts. (2) Extra work on the collectors. I must admit that these long-suffering fellow-mortals would have more work to do. But even with them the system would have an advantage, for they would encounter less grumbling; and, the bills being smaller, there would be much more likelihood of their being paid than the collector hearing so many requests of "Please to call again."

The gas accounts being sent out monthly, to be consistent it is necessary that all the sundry accounts should also be sent out monthly; and for this purpose I divide the sundry accounts into two classes—residuals and gas-fittings. The number of accounts in the former class are so few that it is quite possible, and even necessary for making up the month's return, that these should be got out at the close of each month. I find, in regard to gas-fittings accounts, that it is desirable they should be in the hands of the collectors, to allow of their being presented at the same time as the gas bills; but it will be found almost impossible, without a large staff, to get the gas-fitting accounts ready by the third or fourth day of the month. Therefore adopt the plan of making out (say) April accounts towards the latter end of May, when work is a little slack. I then have them checked and signed by the end of the month, ready for the collector when he receives the gas bills. I may say that a long experience of this has quite convinced me of its efficacy, both in working of books, and also in collection.

By the foregoing remarks I think I shall have proved to my brother managers the desirability of adopting the system of monthly collections; and they will see, I think, from what has been said, all the advantages that would attach to the system. Of course, I am aware that it means a radical alteration in the existing state of things, and will not at first be so easily carried out in England as it would in a foreign country. But I am sure that, after a little experience of the system, its conveniences and advantages, both to the company and consumer, will become so apparent that they will not fail to justify such a reform. Gas companies are so threatened at the present time, on the one hand kerosene, petroleum, &c., that it is absolutely necessary attention be paid to the requirements of the consumer, and if, without serious loss, means can be devised by which the charges on a gas consumer may appear lighter, then it is the duty of the company to adopt such means.

At their first meeting on Monday last week, the new Council of the Society of Arts elected the Duke of Abercorn, C.B., as Chairman for the ensuing year.

The Toulouse Gas Company have just completed an electric light installation for the Théâtre du Capitole; the current being supplied by two 500-light dynamos driven by a 50-horse power "Otto" gas-engine. There are 1000 lamps (fixed on two independent circuits), varying from 10 to 20 candle power; and these are said to give a very satisfactory result.

Technical Record.

THE ASSOCIATION OF MUNICIPAL AND SANITARY ENGINEERS AND SURVEYORS.

The Annual Meeting of this Association was held on Thursday, Friday, and Saturday last week, at the Institution of Civil Engineers, Westminster, S.W., under the presidency of Mr. E. B. ELLICE-CLARK, M. Inst. C.E.

The formal business having been disposed of, on the first morning of the meeting, the President delivered his Inaugural Address, in which he stated that there had been a greater increase in the number of members during the past year than in any year since the formation of the Association. He advocated the combination of private pupilage with study at some technical school as essential to the proper instruction of municipal and sanitary engineers. Alluding to the work yet to be done by the latter class, he said, judging from his own professional experience, that there were 375,000 houses, of over £100 annual value, in London alone, where new drainage works were absolutely necessary. The same condition of things obtained in a greater or less degree in all provincial towns. There was also much to be accomplished in connection with the arterial drainage of towns and the prevention of floods in the great river valleys. In spite of all that had been accomplished within the last 40 years, the sanitary condition of towns was still incomplete. Referring to air pollution by smoke, he remarked that, owing to the cheapness and availability of fuel in this country, the method of obtaining heat in dwelling-houses was only one step removed from the consumption of fuel in an open hearth in the tent of the savage. The same unscientific method of producing heat prevailed (only in a less degree) in nearly all factories in the country. Thus one-half of the effective value of fuel was wasted; and the air was polluted so as to make it, throughout a considerable portion of the year, in most cities, almost insupportable. London fog, which was such a nuisance in the winter, was largely due to the unconsumed carbon caused by smoke, from domestic fireplaces. The future municipal engineer must therefore, among other things, pay attention to the prevention of air pollution by smoke. No doubt considerable advances had been made in this direction; but, in his judgment, an attempt to overcome the difficulty by burning fuel in an open stove would end in failure. They were nearer to a solution of this matter than was generally supposed. The manufacture and distribution of non-luminous gaseous fuel, for heating purposes, from a central station he believed was not very far distant. By this means, they would not only prevent air pollution by smoke, but would be able, in a very large degree, to overcome the difficulty of removing the decaying matters not passed into the sewers. If such a system were at work in any town, there would, of course, be few or no cinders or ashes to be removed from houses; and there should be no difficulty in designing such a stove, fed by gaseous fuel, as would in every house consume the decaying matters which now formed so large a bulk of "house refuse." In his concluding remarks, he advocated a State College or Permanent Commission for original scientific research; and maintained that enormous sums would have been saved if even only the disposal of town sewage had been dealt with by such a competent body.

The reading and discussion of papers afterwards occupied the attention of the members; one of them being by Mr. G. R. Strachan, of Chelsea, on "The Average Meter System." The full text of this paper, with the discussion, will be found in another column. At the conclusion of the paper, the members adjourned to inspect the drainage works at the Houses of Parliament, where the Shone system is in use. The reading and consideration of papers was resumed on the following morning; the first one, by Lieut.-Col. Jones, V.C., dealing generally with the Shone sewerage system. This communication consisted mainly of the author's experience of the system during the past ten years, and also of particulars in regard to its adoption at various places; prominence being accorded to Henley-on-Thames, where he said the system was perhaps more fully carried out than in any other instance of its application yet completed. An exhaustive discussion followed, which, taken on the whole, was very adverse to the system. One speaker thought that it had "merits in a limited sphere and for limited ends;" and again, in reference to the Shone works at the House of Commons, it was stated that though they "were the most beautiful and the cleanest sewage works in the United Kingdom, they stood unique in being the most expensive." The President, referring to the operation of the works at Henley, mentioned that he was there for two or three days in the previous week, and, to use his own words, a more "stinking town" than Henley-on-Thames he had never met with. Another interesting paper was that by Mr. W. Webster, on "Sewage Purification by Electrolysis," in which the author gave a full and explicit statement as to the working of his system; and also made some interesting experiments with water containing sewage, which showed that, after a few minutes' treatment, the particles of sewage rose to the top of the water, leaving the bottom part perfectly transparent. A paper by Mr. W. Santo Crimp (who was unavoidably absent), on "Water Supply," was taken as read. We hope to give portions of this paper on a future occasion.

In the course of the afternoon of Friday, visits were paid by the members to the Lucifon light works, and to Brien's oxygen works (both at Westminster), and afterwards to the Battersea Bridge works. On Saturday, a trip was made down the river, to inspect the Tower Bridge, and the new sewage outfall works at Barking.

MR. VERNON HARCOURT'S NEW PHOTOMETER.

Our readers will remember that in the notice of the first *soirée* of the Royal Society for the present season, which appeared in the JOURNAL for May 15 last (p. 862), brief reference was made to the new photometer devised by Mr. A. G. Vernon Harcourt, called the holophotometer, which was exhibited on the occasion by the makers, Messrs. Woodhouse and Rawson, Limited. In the following issue (p. 911), we gave some particulars of the instrument; at the same time promising an illustrated description of it in a future number. We are now, through the courtesy of the Editor of the *Electrical Review*, in a position to redeem this promise; he having kindly permitted the use of the following illustrations of the photometer. Fig. 1 is a view of the instrument from behind, showing the divided scale; fig. 2 is a view taken from the end of the photometer-bar, showing how the horizontal light from the lamp is transmitted to the disc; and fig. 3 is a view taken looking from the disc, and showing how the vertical light would be transmitted to the disc. In order that the illustrations may be perfectly understood, we reproduce the descriptive matter which has already appeared in our columns.

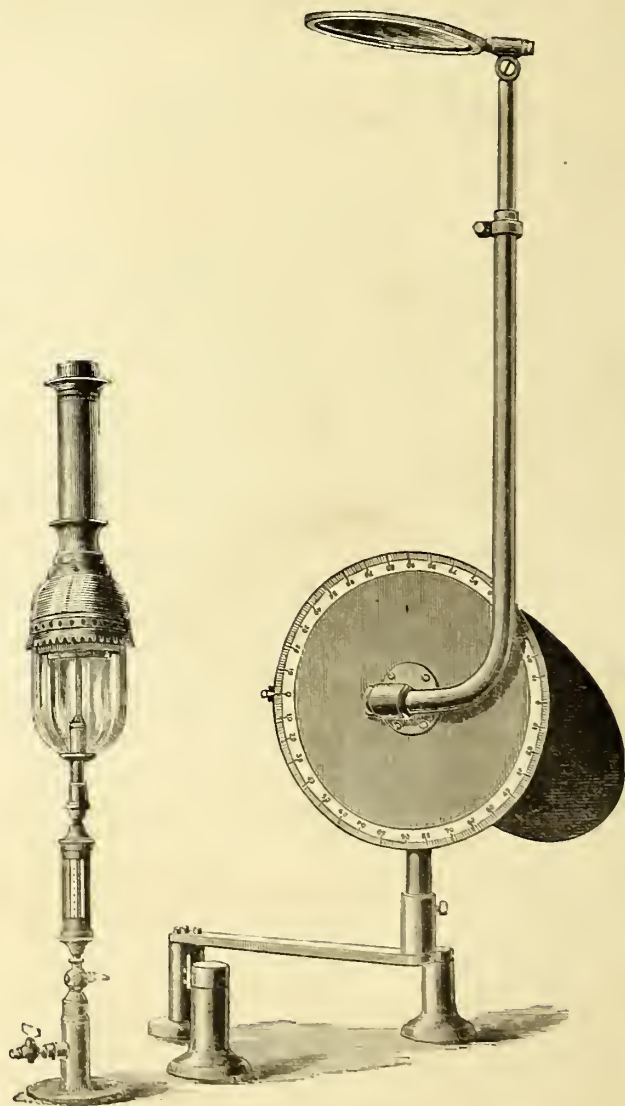


FIG. 1.

The holophotometer has been designed in order to get rid of two difficulties connected with other methods of attaining the same object—viz., to measure the light emitted in every direction by any luminous source. These difficulties are: (1) The movement of the light to be measured or of the standard lamp, neither of which is desirable. (2) The errors caused in the measurement of lamps provided with reflecting fittings, by the assumption that the flame is the zero point from which measurements should be made, whereas, strictly speaking, the principal focus formed by the reflector should be taken as the zero point. Inasmuch, then, as this focus may be several inches away from the flame, and as the length of bar usually employed is 60 inches, it is evident that serious errors may be introduced by the difference between the real and the assumed zero point.

To establish the existence of such an error, and to eliminate it, two things are necessary—viz., that readings should be taken with bars of various lengths; and that the length of the bar should be very great compared with that between the real source of light and the focus formed by the reflector. Both these points are secured by the use of the holophotometer. The instrument is mounted upon a table capable of being moved nearer to, or further from, a

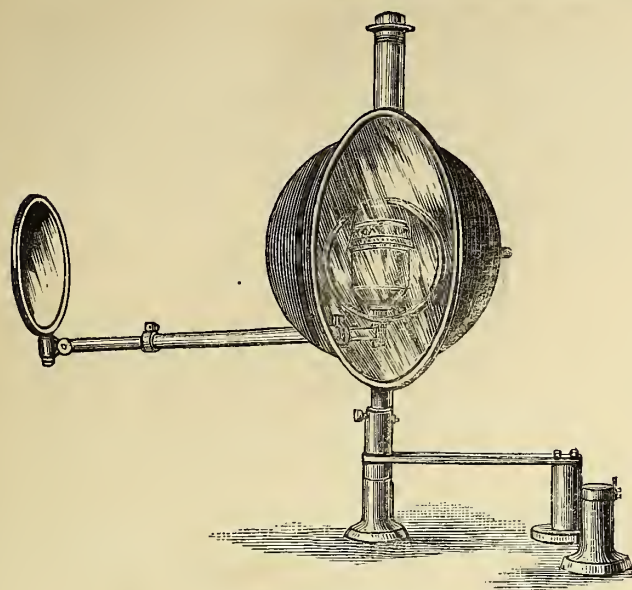


FIG. 2.

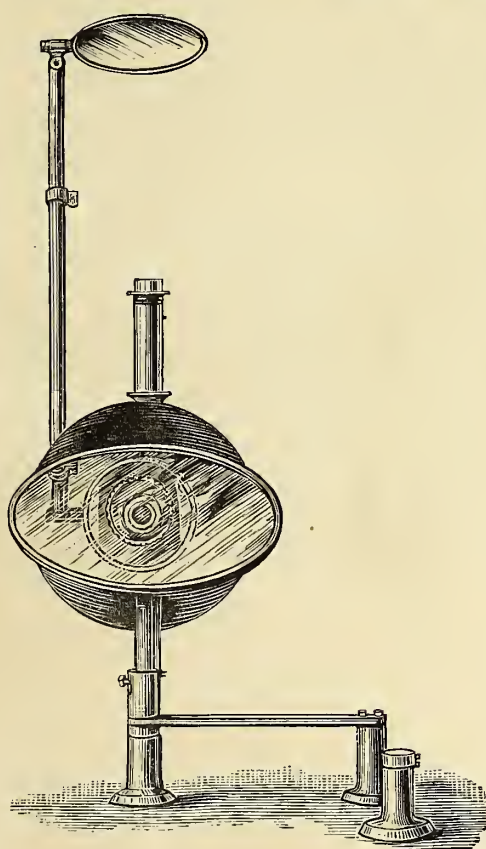


FIG. 3.

fixed table containing a graduated bar with moveable disc (say of the Lethby pattern), and having a standard lamp fixed at the zero of the bar. The lamp to be measured is mounted upon, or is in rigid connection with the moveable table, and is therefore not moved during a series of readings.

The holophotometer consists of an axis working friction-tight in a collar supported by a vertical pillar. The axis is accurately fixed at the same height, and in a line with the centre of the disc. At the end nearest to the disc is placed a large mirror, with its centre concentric with the axis, but so arranged that the plane of the mirror may be inclined and clamped at any angle to the axis. At the other end of the axis is fixed a telescopic arm, carrying a smaller mirror, which is capable of being turned into any required position. The arm being rigidly fixed to the rotating axis of the instrument, to which is also attached the larger mirror, it follows that the rotary motions of the mirrors about the axis are identical. The angles of rotation are measured by the indications upon a divided circle attached to the moving axis, which are shown by a pointer fixed to the upright support.

The mirrors are adjusted in such a way that the light from the lamp to be measured falls upon the smaller mirror, thence is reflected on to the larger one, and finally along the axial line of the photometer disc. As both mirrors rotate together, it follows that if a horizontal beam is reflected correctly, all other beams will find their way along the axis of the photometer. If, therefore, the arm carrying the small mirror be moved through various angles, it will receive the light emitted from the lamp at those angles, and the light will at every angle be transmitted along the axis of the photometer. The divided circle is made large enough to serve as a

complete screen of all direct light; and only the light falling on the small mirror can find its way to the disc. In order that absolute, as well as comparative, tests may be carried out, only one additional measurement need be made. The direct horizontal light is measured without the interposition of the holophotometer (which is mounted so as to be easily moved out of the direct line); then the mirrors are interposed, and a new measurement made. The additional path travelled by the light is allowed for in calculation; and thus the absorption of the mirrors is found once for all for the particular character of light under measurement. It is only necessary afterwards to multiply subsequent values by this coefficient of absorption, in order to obtain absolute measurements at various angles.

The employment of mirrors in photometry has sometimes led to serious errors; but it will be seen by the foregoing description that inasmuch as the relative angle of the mirrors is never changed, and as their absorption is easily calculated and allowed for, the only objections to their use have been guarded against and avoided.

In order to eliminate the second source of error mentioned above—viz., that arising from the formation of a principal focus—it is only necessary to take a series of readings with the table in one position, and then move it to a greater distance and take another series. If a focus is formed at a sufficient distance to produce an appreciable error, it will clearly appear in the difference between the readings at the two distances; and then it is only necessary to wheel the table to such a distance that the discrepancy is inappreciable. In other words, this is equivalent to using a bar of sufficient length to make it practically infinite compared with the distance between the focus and the real source of light.

The instrument has been designed specially for use in light-house work, where it becomes of the highest importance to measure accurately the total light given by any lamp, and not only that emitted in any one particular direction, which may or may not be the maximum.

Preliminary experiments made with the instrument by Mr. Stepney Rawson, at the works of the Woodhouse and Rawson Electric Manufacturing Company, have shown what a valuable instrument it is for the determination of the commercial value of various lamps, as well as for assisting in the many difficult problems of the diffusion and reflection of light. The absorption of the two mirrors used is as already mentioned, stated to be only 1·8 per cent.; but a series of experiments are to be made on this point.

THE AVERAGE METER SYSTEM.

By GEO. R. STRACHAN, Assoc. M. Inst. C.E.,
Surveyor to the Chelsea Vestry.

[A Paper read at the Annual Meeting of the Association of Municipal and Sanitary Engineers and Surveyors.]

The writer has been experimenting with regulator gas-burners for some eighteen months, with a view to ascertain their reliability under various and varying pressures and conditions; and in the course of the experiments, doubt has been raised in his mind as to whether the average meter system is necessary to a reliable and economical determination of the volume of gas consumed in the public lamps. His object in bringing the subject before the Association is to obtain the criticism of the members on his conclusions, in order that the true system may be revealed.

The average meter system, as practised in the Metropolis, is briefly as follows:—Each lamp is provided with a regulator gas-burner which passes a definite quantity of gas per hour under the varying pressures in the mains; and at certain lamps (carefully selected by the gas company and the local authority) meters are fixed which record the volume of gas burned. Each month the meters are read; and, after striking out the returns of those which show a variation of 10 per cent. over or 10 per cent. under the theoretical volume obtained by multiplying the number of hours during which the lamps were lighted into the cubic feet per hour to which the burners are set, an average consumption is obtained for the selected lamps, and this is taken as the consumption for each lamp throughout the district. The question raised is: Are the regulator gas-burners sufficiently accurate to be relied upon for the quantity burned without the check of the meters?

In the following experiments an experimental gasholder and minute-clock by Parkinson were used. When the burner experimented on was fixed over the meter, it was not removed until the experiment with it was completed. In each experiment the gasholder was filled with 5 cubic feet of gas, and was not refilled during the time, so as to secure, as far as practicable, gas at the same temperature and barometric pressure. The increase of temperature in the gas by the increased pressures is common to all the experiments; so that they give a basis of comparison when this slight error is neglected. The water-gauges on which the pressures were recorded were four inches below the regulators. The regulator gas-burners experimented on were bought in the open market without the knowledge of their makers, so as to avoid specially prepared burners; and it is possibly due to this that the results obtained present discrepancies. The names of the makers are not stated in the paper, as the writer does not approve of using the platform of the Association as an advertising medium. The aim of the tests was to find out whether the regulators controlled the consumption of gas under varying pressures at the volume to which they were fixed. The pressures given are water-pressures; thus, 1 inch is 10·10ths pressure, &c.

Experiment 1.—The burner used was a 5-feet fishtail common burner, said to be a "regulator," but possessing no regulating

apparatus whatever. The figures under the pressures give the number of cubic feet per hour :—

	PRESSURES IN INCHES.							Averages.
	1	1·5	2	2·5	3	3·5	4	
A	7·12	8·85	10·70	11·55	12·82	13·52	14·55	11·30
B	6·55	7·67	10·12	10·82	12·00	12·65	13·30	10·44
C	6·58	7·86	10·17	10·75	11·85	12·95	13·87	10·57
Averages	6·75	8·13	10·33	11·04	12·22	13·04	13·91	10·77

These results show that the burners are not regulators. The vertical column of averages shows the greatest variation to be 7½ per cent. The horizontal column of averages shows that the burners at 1 inch pressure passed 35 per cent., and at 4 inches pressure 178 per cent. more gas than they were marked to do.

Experiment 2.—The burner used was a 6-feet batswing common burner, said to be a “regulator,” but possessing no regulating apparatus whatever :—

	PRESSURES IN INCHES.							Averages.
	1	1·5	2	2·5	3	3·5	4	
A	8·87	11·05	12·87	13·77	14·77	16·25	16·70	13·47
B	7·70	10·03	11·50	12·75	14·10	14·95	16·22	12·46
C	8·40	10·85	12·20	13·20	14·52	15·50	16·55	13·03
D	9·38	11·52	12·42	13·65	15·00	16·10	17·90	13·71
Averages	8·59	10·86	12·25	13·34	14·60	15·70	16·84	13·17

The vertical column averages show the greatest variation to be 9 per cent., the horizontal column averages show that at 1 inch pressure the burners passed 43 per cent., and at 4 inches of pressure 181 per cent. more gas than they were marked to do.

Experiment 3.—The burner used was a 5-feet public lamp regulator burner, with a regulating apparatus :—

	PRESSURES IN INCHES.							Averages.
	1	1·5	2	2·5	3	3·5	4	
A	5·82	5·51	5·55	5·47	5·36	5·16	4·98	5·41
B	5·33	5·30	5·23	5·17	5·08	4·85	4·60	5·08
C	5·43	5·47	5·31	5·15	5·05	5·03	4·85	5·18
Averages	5·52	5·43	5·36	5·26	5·16	5·01	4·81	5·22

The vertical column averages show the greatest variation to be 6 per cent., and indicate carelessness in manufacture. The horizontal column averages show that at 1-inch pressure the burners passed 10·4 per cent. more, and at 4 inches of pressure 4 per cent. less gas than they were marked to do, or a total variation of 14·4 per cent. They also show that the regulating apparatus checks the waste of gas at increased pressures, but that the volume of gas passed falls off gradually as the pressures increase.

Experiment 4.—The burner used was a 4-feet public lamp regulator burner, with a regulating apparatus :—

	PRESSURES IN INCHES.							Averages.
	1	1·5	2	2·5	3	3·5	4	
A	4·27	4·57	4·47	4·48	4·45	4·47	4·47	4·45
B	4·18	4·35	4·37	4·32	4·25	4·35	4·36	4·31
C	4·33	4·43	4·50	4·40	4·41	4·40	4·37	4·41
D	3·95	4·06	4·11	4·32	4·22	4·06	3·87	4·08
E	4·30	4·31	4·29	4·32	4·28	4·30	4·12	4·28
F	4·31	4·35	4·40	4·40	4·37	4·37	4·38	4·37
Averages	4·22	4·34	4·36	4·37	4·43	4·32	4·26	4·32

The vertical column averages show the greatest variation to be 9·25 per cent., and indicate considerable carelessness in manufacture. The horizontal column averages, which reveal the reliability of the principle of the regulating apparatus, show that at 1-inch pressure the burners passed 5·5 per cent., and at 2·5 inches of pressure, 9·25 per cent. more gas than they were marked to pass. A study of the figures will show that the regulating apparatus is a good, although not a perfect one. The consumption of gas increases with the pressure from 1 inch to 2½ inches, and decreases from 2½ inches to 4 inches.

Experiment 5.—The burner used was a 4-feet public lamp regulator burner, with a regulating apparatus :—

	PRESSURES IN INCHES.							Averages.
	1	1·5	2	2·5	3	3·5	4	
A	4·18	4·35	4·35	4·33	4·28	4·28	4·32	4·30
B	4·35	4·48	4·56	4·52	4·68	4·63	4·52	4·53
C	4·23	4·30	4·32	4·32	4·33	4·37	4·33	4·31
D	4·13	4·18	4·31	4·30	4·20	4·27	4·22	4·23
E	4·22	4·30	4·37	4·35	4·40	4·37	4·12	4·30
F	4·41	4·47	4·57	4·65	4·63	4·63	4·80	4·59
Averages	4·25	4·35	4·41	4·41	4·42	4·42	4·38	4·38

The vertical column averages show the greatest variation to be 8 per cent., and indicate considerable carelessness in manufacture. The horizontal column averages show that, at 1-inch pressure, the burners passed 6·25 per cent., and at 3 inches of pressure 10·5 per cent. more gas than they were marked to pass. They also show that the regulating apparatus came somewhat slowly into action but that, for pressures of 1½ inches and upwards, it is as near perfect as can be expected; the variation from the average not exceeding 1 per cent. on either side.

Experiment 6.—The burner used was a 6-feet household regulator burner with a regulating apparatus :—

	PRESSURES IN INCHES.							Averages.
	1	1·5	2	2·5	3	3·5	4	
A	6·57	6·60	6·70	6·57	6·27	6·17	5·67	6·36
B	6·57	6·60	6·65	6·63	6·57	6·30	6·10	6·49
C	6·18	6·51	6·62	6·78	6·51	6·55	6·46	6·52
D	5·16	6·41	6·62	6·50	6·30	6·31	5·80	6·30
E	6·27	6·51	6·63	6·71	6·60	6·51	6·16	6·48
F	6·26	6·30	6·55	6·62	6·37	6·23	5·80	6·30
Averages	6·34	6·49	6·49	6·63	6·44	6·34	6·00	6·41

The vertical column averages show the greatest variation to be 3·4 per cent. The horizontal column averages show that at 1-inch pressure the burner passed 5·7 per cent., and at 2·5 inches of pressure 10·7 per cent. more gas than they are marked to do.

A number of other experiments were made, but they do not present new features, except the one which tested the burners to discover the pressures at which the regulators came into action. None of the regulators came fully into action at a pressure below 6·10ths of an inch, and most of them at 8·10ths. The net result of the experiments given is that regulator gas-burners can be made which will not vary in their consumption of gas, at pressures ranging from 1 inch to 4 inches, more than 1·15 per cent. fast and 2·3 per cent. slow of their average consumption. All that is necessary, therefore, is to get the regulator accurately set, and its limits of error are known. The Sale of Gas Act defines a meter as correct which does not register more than 2 per cent. fast or 3 per cent. slow. The tests given herein show that regulator gas-burners can be made as correct as gas-meters.

The question now arises: Do regulator gas-burners in use on public lamps, where exposed to all weathers, temperatures, and barometric pressures, give equal results to those found in the testing-room? The writer is honoured by Mr. Philip Monson, the Gas Superintendent for the parish of Kensington, placing at his disposal the results of the average meter system for eleven years. Each lamp has a regulator burner set to burn 4·5 cubic feet of gas per hour. The meters are read each month, and the records have been carefully collected. More than 4000 lamps are in use on the meter system. The following table shows the average consumption per lamp per hour for each of the eleven years :—

Year	Cubic Feet.	Year	Cubic Feet.
1877	4·55	1884	4·49
1878	4·57	1885	4·49
1879	4·50	1886	4·52
1880	4·43	1887	4·54
1881	4·46		
1882	4·50		11)49·53
1883	4·48		
		Average	4·503

These results are a convincing proof that regulator gas-burners may be relied upon in actual use. The writer has compiled the following table from Mr. Monson's records, showing the average consumption per lamp per hour for each month of the eleven years :—

Month	Cubic Feet.	Month	Cubic Feet.
January	4·38	September	4·53
February	4·51	October	4·49
March	4·45	November	4·50
April	4·53	December	4·39
May	4·49		
June	4·61		12)54·01
July	4·60		
August	4·53	Average	4·501

It will be noticed from this table that the lowest consumption occurs during those months when the hours of lighting are longest, and that this gives an advantage to the local authority if the average meter system is adopted. The following table, based on 4300 hours' lighting per year, shows the amount of this error :—

Month.	Hours of Lighting.	Cubic Feet per Hour.	Total Cubic Feet per Lamp.
January	484·03	4·38	2120·0514
February	397·75	4·51	1793·8525
March	375·68	4·45	1671·3310
April	303·90	4·53	1376·6670
May	260·41	4·49	1169·2409
June	224·52	4·61	1035·0372
July	246·30	4·60	1132·9800
August	294·01	4·53	1331·8653
September	341·90	4·53	1548·8070
October	414·67	4·49	1861·8683
November	454·95	4·50	2047·2750
December	501·98	4·39	2203·6922
Totals, &c.	4300·00	4·50	19,292·6678

If the consumption had been taken from the burners alone, it would have stood at $4300 \times 4.5 = 19,350$ cubic feet per lamp per year, as against 19,292.6678 cubic feet given by the meters, or an error in favour of the gas company of 57.3 cubic feet per lamp per year. In London the price of gas to the public lamps north of the Thames is 2s. 2d. per 1000 cubic feet; so that the saving to the local authority for gas by the average meter system, is 1½d. per lamp per year. Against this there is the cost of the average meter system. The following figures refer to a district containing 4000 lamps, with a meter to every 20 lamps.

Capital Expenditure.

200 meters fixed complete, at £7 10s. each £1500

Annual Expenses.

Interest, depreciation, and repairs on meters, 10 per cent. on £1500 £150
Man's time reading meters: 12 weeks per annum, at 25s. a week 15

This cost, divided over 4000 lamps, equals 9.9d. per lamp per annum, which is incurred to save 1.5d. per lamp per annum.

The figures given refer to a district where the minimum parliamentary limits of pressure are 10-10ths from sunset to midnight, and 6-10ths from midnight to sunrise. As a matter of fact, however, the actual pressures are in excess of these limits. From the continuous recording pressure-gauge in the testing-room at Chelsea, it is found that the pressure does not go below 1.2 inches at any part of the day; and that from one hour before sunset to half an hour after, the pressure rises to 3 inches and even more, and then gradually falls to 1.4 inches by midnight. Where pressures like these are given, the writer is of opinion that the average meter system is an unnecessary check and expense. It may be that in small districts the pressures fall below those stated as the parliamentary limits; and in such cases the regulator burners would not pass their full quantity. The remedy, however, is to make the gas company give a proper pressure, and so save the expense of the meters.

In the course of the subsequent discussion,

Mr. J. LEMON, M. Inst. C.E. (Southampton), said he thought they were all much indebted to Mr. Strachan for his valuable paper; but he must say that the conclusions the author drew were not all in accordance with his. If they could get a gas-regulator perfectly made, then it would do very well indeed; but his experience was that there was no such thing as a perfect regulator. A regulator was only intended as a check upon the consumption when there was great pressure. As regards meters, it was quite true that the percentage given as to the correctness was 2 per cent. one way and 3 per cent. the other. They must have a certain amount of margin. They could not expect that every person would have an absolutely correct meter; and therefore this small margin of 2 and 3 per cent. was allowed in testing meters, so as to provide against that little irregularity which must occur in every mechanical appliance. He took exception to the annual expenses—interest and depreciation—10 per cent. on £1500. He introduced the average meter system in his borough; and he could say that it never at any time cost anything like 10 per cent. for repairs of meters. He considered the 10 per cent. for repairs altogether an outside item. Then as regards the man's time, he used to employ one of the assistants in the office to go round with the man to check the meters; so that there was no extra cost to the borough in this respect. It should be done by the staff in the office; and therefore he thought the item—though it was only £15—ought to be struck out. It seemed rather absurd to spend 9.9d. per lamp to save 1½d.; but, in answer, he said that the gas-regulator was unreliable, and it was necessary to have a meter to get anything like a fair record of consumption. The gas-meter was the only reliable record; and the gas-regulator was not to be depended upon.

Mr. J. HALL, Assoc. M. Inst. C.E. (Torquay), considered that the regulator was as absolutely necessary as a check upon the meter as the meter was a check upon the workmen.

Mr. LEMON: What I say is that you must use the two.

Mr. HALL (continuing) said, as to cost, that the capital expenditure of £1500 appeared to him to be an excessive amount for the size of the meters that were used in street lamps. The depreciation—10 per cent.—seemed also to him to be more than was usual. In regard to reading the meters, he took them four times a year. He went round himself, and read the whole of them in an afternoon for 600 lamps. He did not think they could depend upon an ordinary workman for doing it.

Mr. T. FARRELL (Sherborne), remarked that, in his town, they used the average meter system. The meters were the property of the Board; and they were read once a quarter. It took about 1½ hours to read them. In regard to expense for repairs, the meters had not cost them anything under this head during the eight years they had been in use. The Gas Company were perfectly satisfied with their registration; and so they went on comfortably enough. With respect to the question of governors, he had one of the old night lamps which was situated at the bottom of a street 400 or 500 yards long, and another at the top of the street. One would think that the lamp at the top would consume more than the lower one; but it was quite the reverse—the latter consuming 10 or 15 per cent. more. This, he supposed, was accounted for by the governors not working properly.

Mr. BENNETT (Southampton) said he found that in his town the depreciation was something like 4 instead of 10 per cent.

Mr. EDEB EACHUS (Edmonton) inquired whether it was not worth while to incur expenditure for checking equal to 2 per cent.

on the annual expenditure. There were 4000 lamps at £2 a lamp. The expenditure to check the regulators was £165, or 2 per cent. on this amount; and he thought an engineer would regard this as being a small expenditure to check a large one.

Mr. NORRINGTON (Fulham) drew attention to the fact that different sized regulator burners were used in the experiments. When they dealt with 4-feet regulator burners they obtained truer results; but when dealing with 5-feet and 6-feet regulators they had irregularities.

Mr. GLEDHILL (Heckmondwike) gave it as his opinion that gas-regulators were not to be depended upon. He had far more trouble with the regulators than with the meters.

Mr. GODFREY (King's Norton) said that considerable difficulty arose from the joint partnership of the gas company and the local authority. He would suggest a plan by which this could be avoided—viz., the one adopted by Birmingham, where the local authority provided the meters and the gas undertaking maintained the regulators. If the latter found a regulator bad, they put a new one up. If both meter and regulator belonged to one body, there was sure to be dissatisfaction.

Mr. DE C. MEADE, Assoc. M. Inst. C.E. (Hornsey), said that the author had not given a description of the regulator used. Some did not last anything like so long as others. The old-fashioned one, with the leather diaphragm, lasted a fair average time in fine weather; but wet weather interfered with it. The new metal and steatite regulators lasted longer; but the accumulation of naphthalene from the gas affected the one, and did not affect the other—the steatite—to so great an extent. They had a very simple check in the portable photometer, if they suspected they were not getting the full illuminating power from the gas. They could easily test it; and he really found that they obtained more light than they paid for. This saved all the trouble and expense of the meters. The regulator system, as practised in many of the large districts in London, was a very satisfactory one.

Mr. WEAVER (Kensington) said Mr. Strachan was to be commended for the careful experiments he had made with regard to the lamps in Chelsea. He (Mr. Weaver) thought it would be somewhat premature to adopt Mr. Strachan's system of regulators to the lamps, in preference to the meter system. When they applied the average meter system in Kensington, in 1877, they had a good deal of difficulty to get the Gas Company to agree upon the position of the meters, and to get them down as low as possible in relation to the number of lamps. When the system came into force, he flattered himself that he had done a good thing for the parish; and the next annual report showed a considerable saving in the expenditure for gas as compared with preceding years. One of the great difficulties he saw in depending entirely upon regulators attached to the burners would be that of getting the number of hours of lighting in a large district. For instance, in the case of fogs coming on in winter, he was quite sure there would be some difficulty in keeping a proper record of the lighting. If the company were done out of only half an hour for some 4000 lamps, it meant a decimal of a penny for each lamp.

Mr. J. HEPWORTH, Assoc. M. Inst. C.E. (Carlisle), said that he had listened to Mr. Strachan's paper with very great pleasure; and for the most part he quite agreed with the conclusions he had arrived at. He thought the experiments pointed more than anything else to the fact that they could get good regulators if they chose to do so. He had under his care 1400 or 1500 lamps; and they had not felt it necessary to adopt the average meter system because the gas-works belonged to the Corporation, who also owned the lamps. He had made very careful experiments with regulators; and he thoroughly agreed that for the most part there was no necessity to adopt the average meter system. But where, as Mr. Strachan pointed out, they had a gas company supplying at irregular pressures, then the average meter system became advantageous. They might also have to light at irregular hours, and then the average meter system became valuable. If, however, the hours and the pressure were regular, then they might certainly depend upon having as good results from the use of regulators as by meters and regulators combined.

Mr. STRACHAN, replying upon the discussion, referred in the first place to the cost of the average meter system. He did not think anyone would quarrel with his estimate of £7 10s. for a meter fixed in the box. And if £7 10s. was a fair estimate, then the cost of 200 meters came to £1500. He was willing to allow that a gas-meter had 20 years of life, which he presumed no one would say was inadequate. Depreciation on that was 5 per cent.; and as they could not borrow money in London under 3½ per cent., that made 8½ per cent. They could not do repairs at less than 1½ per cent., and that was 10 per cent. on the £1500; and this he submitted was a fair and proper estimate. Mr. Lemon also said that they did not pay for the time of the assistant. It was no answer to the argument to say they had "in the house" the assistant to check the meters, and that therefore it did not cost anything. He contended that his estimate in this respect was also fair and proper. He was prepared to follow Mr. Lemon's opinion in various matters; but when he (Mr. Strachan) had had eleven years' experience pointing entirely in another direction, he hoped Mr. Lemon would pardon him for not accepting his opinion. At Kensington the average meter system had recorded good results, which were these: That for eleven years they had burned upon the average 4.503 cubic feet; and their regulator burners were set at 4.5 cubic feet. This was as near as one could come to in this world. If eleven years' experience showed that the regulator burners were as accurate as the meters, then of what use were the

meters? This was the point which had not been answered. As to Mr. Weaver's remarks, they had never used any other system than this in Chelsea; and as to how they managed in the case of fogs, he left it to the Gas Company to find out that the lamps had been lit up—(laughter)—and then he simply stated that they started so many hours sooner. He unhesitatingly said that they saved all the expense of the average meter system. The accident of his having 4, 5, and 6 cubic feet regulator burners was owing to the makers not having any others in stock.

Mr. JOSEPH C. INGHAM, of Bury, has been appointed Manager to the Ramsbottom Gas Company.

At the meeting of the Heywood Town Council last Thursday, the salary of the Gas Manager (Mr. H. Hawkins) was increased by £20 per annum.

AMONG the numerous amendments proposed to the Local Government Bill was one empowering the County Council to present to Parliament a scheme for London District Government, and schemes for taking over the powers of the Gas and Water Companies. Clauses embodying these proposals were placed upon the paper by Mr. J. F. B. Firth; and it was suggested that they should follow the 38th clause in the Bill. The terms of the proposal were as follows:—"The County Council of London shall, as soon as may be, submit to Parliament a Bill for the rearrangement of municipal government and administration within the area of the county of London;" and also one "for the purchase or regulation of the undertakings at present supplying respectively water and gas to any part of London, or any of them, or for the provision of a new supply of water, gas, or light to London or any part thereof." These clauses have not yet come before the House of Commons for discussion.

THE French journal *Science Pratique* remarks that the great modern extension of the use of nickel plating for objects of domestic ornament and utility, including gas and water fittings of all kinds, renders it interesting to know how these articles may be cleared from the film that gathers upon them in the course of usage and exposure to the atmosphere. There is an appearance of rust upon old nickelled ware which may be removed in the following manner:—The surface to be cleaned is first greased, and the grease allowed to remain for a day or two, when it must be removed by means of a rag dipped in ammonia. If any spots remain after this treatment, they may be very carefully wetted with a little dilute hydrochloric acid, which must be immediately wiped off. Afterwards the goods must be washed with water, and, when dry, polished with tripoli. In this way, unless the plating is actually worn off, an old nickel plated article may be made to look as good as new.

THE Select Committee on Private Bill Legislation have now agreed upon the terms of their report, and concluded their labours. Two draft reports were before the Committee. The first, submitted by Mr. Courtney, recommended that all Private Bills be considered by a Commission appointed for the purpose; and if approved by this body, should be laid on the table of the House for a certain period before becoming law. The second report, drafted by Mr. Stanhope, also adopted the principle of an outside Commission, but delayed the reference thereto until after the Bill should have been read a second time—in other words, substituting the Commission for the present Committee stage. In recommending the appointment of a Commission, the Committee have suggested that, while its head-quarters should be in London, it should have power to sit in different parts of the United Kingdom, and should be authorized to conduct inquiries by means of one of its members, with two assessors added. It was felt that Mr. Courtney's proposal would involve too radical a change to meet with the approval of members generally; and the second scheme was agreed to. The report, as will be seen by our "Parliamentary Intelligence," was presented to both Houses last Thursday.

MESSRS. J. STOTT AND CO., of London and Oldham, manufacturers of consumers' gas governors, have just opened a new Manchester branch, in the most central portion of the city; their previous accommodation having been found insufficient. The firm, which was scarcely known a few years ago, has sprung into considerable prominence through the reputation gained by their now well-known automatic governors, and at present have branches in nearly all parts of the world. The principal works—where a large number of people are engaged—are at Oldham; and there are also works in Allegheny City (U.S.A.), where they make governors chiefly for controlling natural gas. This is often delivered to consumers at the enormous pressure of 800 inches; but by the action of the Stott governor, it is easily brought down to half an inch. The chief advantages claimed for the governor are exceeding delicacy, accuracy of governing power, and absolute reliability and durability. The construction is such that the action is entirely direct, or it may be said to work on the dead-weight principle. There are no levers or other points of friction, which is an important matter in a self-acting machine actuated by so light a motive power. The 8-inch governor is so carefully adjusted that it will control a single light just as well as the smallest governor made. The materials used in construction are of an imperishable nature, so that the chances of the governor getting out of order are reduced to a minimum; and the makers guarantee it for seven years. The firm have received upwards of 40 highest awards for their governor in competitions; including prizes gained at the Adelaide, Antwerp, and London (Inventions and American) Exhibitions, at the latter of which the American house competed,

HALF-DEPTH REGENERATIVE FURNACES.

At the Eleventh Annual Meeting of the Western Gas Association, held at Chicago from the 9th to the 11th of May (a general review of the proceedings at which, taken from the "Official Report" in the *American Gaslight Journal*, is now appearing in our columns), one of the papers read was on the above-named subject; the author being Mr. F. Bierce, Engineer and General Manager of the Memphis (Tenn.) Gas Company. The following is an abstract of the communication:—

The author explained, at the outset, that the paper was intended rather as a practical recital of conclusions obviously deduced, than an attempt to digest the whole science of furnaces. He then asked, What constitutes a full-depth regenerative furnace? To this question he was unable to give an answer, as he confessed he did not know how to characterize the difference between a full-depth and a half-depth furnace. But on the supposition that the former was a furnace measuring anything from 5 or 6 feet to 12 or 15 feet, according to fancy, the latter should be anything from 2½ to 7 or 8 feet. To carry out the idea of regeneration profitably in practice, the simpler and more inexpensive the device the better. The author built ten benches of sizes, 14 in. by 26 in. and 9 ft. long. He was so situated that he could not excavate low enough for deep furnaces, on account of high water interference; and he did not think fit to elevate, as he had stacks of arches that were good, and he did not want to abandon them. He felt, however, that he could, with a shallow regenerative furnace, on a four hours' run, produce sufficient heat to carbonize as much coal of the kind he used (Pittsburgh) as the retorts would carry without suffocation, to get from the coal a maximum quantity of gas with a minimum of fuel and labour in keeping with his ambition at the time. He proceeded as follows.

It is, I believe, asserted, if not conceded, that a good quality of carbonic oxide is not produced by the passage of air through a bed of fuel less than 2 feet deep, when gas coke is used, from the accustomed draughts in the flues of any ordinary coal-gas bench. It is my observation that good carbonic oxide is produced only from at least 2 ft. 6 in. depth of gas coke, when draughts are not impeded, and a somewhat lively draught is required, unless the furnace be extraordinarily deep. Therefore, I should say, as the result of my observation on this point, make the fuel chamber at least 3 ft. 6 in. deep, for the reason that it requires replenishing once in four hours only (and I believe that it is one aim with all regenerative furnaces to replenish as seldom as possible). A furnace of this depth, and proportioned in width, to be filled full when replenishing, with not over 33 per cent. of the coke drawn from the retorts above, will, in practical use, for good results consume down a foot or more to a point where there is no longer a good quality of carbonic oxide produced in the combustion below; and this is readily determinable from the colour of the product of combustion as it emerges from the top of the fire, also the rapidity of combustion below that point, and its receding distance from the retorts.

I believe no one will deny the claim that a large fire is hotter than a small one of the same degree of incandescence. Now, the combination of these two facts—a large fire and a thorough carbonization of the oxygen—is the fundamental basis of furnace heats, as I view the subject; and starting out from this point of consideration, what is sought is the constructive device for regulating this combination in the most economic consumption of fuel. Following along this line of illustration, if a deep furnace is hotter than a shallow one, the reason is clear to me that the oxygen, the agent of combustion, is carbonized in a stronger degree; which means that if you make one deep enough and put steam enough under the grate-bars, so as to press the combustion area up as near the retorts as possible, at the same time giving it a strong draught, one can quickly destroy the retorts above. On the other hand, if properly constructed on the regenerative principle, the oxide can be converted to acid to any desired extent, and at the same time the rapidity of combustion checked by dampers on the primary air supply—both compensating each other in proportion to the amount of waste products of combustion issuing from the exit chimneys in comparison with the degree of heat attained upon the retort. For example, if there is not enough heat on the retorts, and there are too many waste products, give more secondary or less primary air. Again, if there is not enough heat on the retorts, no waste products, and yet a rapid combustion, it shows that the product of combustion is spent—i.e., the chemical union takes place (at which point is the centre of heat) too low down in the furnace. So just give the furnace some more steam from below, so as to drive or press forward or upward the point of that chemical conversion, so that it takes place where you want it—among the retorts above, instead of in the furnace below. This latter, however, I have found to be fruitful of luxuriant growth of clinker—a chemical combination not much desired—and has its disadvantages.

In this connection it is also my experience, as well as observation, that sufficiently good results are accomplished with a furnace such as I have for my subject, with diligent use in the hands of competent persons; for as profitable distillation of coal can be effected in retort-benches of sixes as I have seen from very deep ones. It may be said, I think, speaking in a general way, that just so much gas of a given quality can be taken from a certain quantity of coal and no more, and that a given sized retort can be charged with so much coal for perfect carbonization and no more, and that a retort will stand just as much heat, according to how much coal is being distilled in it, and no more, without its too

rapid destruction; the object being to accomplish these things by as short a process as possible. Here, then, enters the great agent of complication in all scientific investigations—that of cost and compensation.

A shallow regenerative furnace can be built much cheaper than a deep one; and the life of the two, I imagine, should be about the same. My furnaces cost me between \$500 and \$600 each, including retorts and mouthpieces, and the arch filled complete and connected up; and I have seen deep ones that were said to have cost several thousand dollars each. It looked a little extravagant; however, the difference is great in cost, and little, if any, in compensation. This is my conclusion after comparing results carefully.

With the same fidelity to a deep furnace that I have to a shallow one, I must say that I believe a deep furnace can be manipulated much more easily than a shallow one, considering the character of the common labour in a gas-works as a rule, and the measure of intelligence found in furnace stokers; that the successful or profitable use of a deep regenerative furnace can be more readily depended upon, because it requires less attention and the exercise of less judgment—its advantages being more easily comprehensible, as it appears to me.

It would perhaps be interesting to have shown briefly some comparison of results between the old primitive design of furnaces and the half-depth or shallow regeneratives, as I am operating some of each alongside of each other, only in separate stacks, so that heats are not contiguous; and I get as good carbonization of 50 per cent. more coal from a half-depth regenerative, at an expense of not more than 30 per cent. of the coke, as I do from the old design with a consumption of nearly, if not quite, 58 per cent. of the coke, besides averaging six retorts per man instead of four retorts per man with the old design, without imposing any more trouble on the men beyond the work being hotter.

Another thing of by no means secondary importance in connection with half-depth or shallow regenerative furnaces is the method of introducing the hot coke immediately from the retorts into them—an indispensable adjunct. I had not seen a very systematic arrangement for feeding them; and I spent some thought on this feature. My hot coke is drawn from the two top retorts at the same time through a funnel into the furnace below—this funnel being a very unique implement for the purpose, original in design. In resemblance it impresses one with the idea of the spread eagle. It bears the cognomen, among the negro labourers using it, of the native Southern bird, the buzzard. When we are not using it I hoist it out of the way overhead by means of a $\frac{1}{4}$ -inch wire tiller cord over a couple of 3-inch pulley blocks and a small windlass, and lower it quickly into position for use. It is at once useful, handy, comparatively cheap, entirely simple, and its utility indispensable in connection with furnaces constructed as mine are. I should not refer to this hot coke funnel had I not come to regard it as a part of the system of shallow regenerative furnaces, in utilizing the coke in its incandescent condition.

Replying to questions put in the course of the discussion on the paper, Mr. Bierce said that if he turned on more steam below the grate, it improved the heat in the retort-setting, but at the same time increased the clinker. The latter, however, was softer in character. He clinkered once every 24 hours, and his steam supply was carried in a $\frac{3}{4}$ -inch pipe under a pressure of 60 lbs. Coke breeze was used to raise the steam, and the cost was merely nominal. As shown in his paper, the half-depth furnace could be adapted to the old-pattern arches by excavating a little deeper. The primary air supply was not heated; and he admitted plenty of it—keeping the ashpit door open. He charged from 250 to 300 lbs. of coal into each retort every four hours, and was not troubled with stopped ascension pipes. Mr. Dunbar had worked a bed of three retorts on a similar plan to the one he had laid before the members, with equally good results; but he found that the more steam he admitted the less was the clinker. He supplied the steam from a $\frac{3}{4}$ -inch pipe having holes $\frac{1}{8}$ -inch diameter and 8 inches apart. Mr. Grimmer had been running regenerative benches since 1882, and found they did not want much steam, also that the primary air supply must be well under control. Too much steam reduced the heats; and an opening $\frac{3}{4}$ in. by $2\frac{1}{2}$ in. was quite sufficient for the primary air when the bench was in good order.

THE MANAGEMENT OF THE BROMLEY (KENT) GAS CONSUMERS' COMPANY.—In the JOURNAL for the 12th ult., we intimated that Mr. John S. Dougall was about to resign his position as Engineer and Manager of the Bromley (Kent) Gas-Works. We have now been officially informed that Mr. Dougall's engagement with the Company has terminated.

A LIGHT FOR NIGHT WORK.—Much of the work in connection with the Manchester Ship Canal is being done at night. For this purpose an artificial light is employed, produced from the combustion of oil-gas made from a cheap form of refined tar or creosote. Messrs. A. C. Wells and Co., of Ardwick, have devised and patented an ingenious apparatus for the production of light from this gas; and a light equal to between 2000 and 3000 candle power, of a pure white and steady quality, is obtained. The cost, it is stated, does not exceed 3d. per hour; and petroleum can also be burnt, if preferred, though at a somewhat greater cost. The light being self-contained, there is no need for the employment of steam or air compressors; and being perfectly portable, it can be easily moved as required.

Register of Patents.

DESULPHURIZATION OF GASEOUS PRODUCTS.—Hood, J. J., of Shepherd's Bush Road, W., and Salamon, A. G., of Fenchurch Avenue, E.C. No. 10,127; July 19, 1887. [6d.]

This invention relates to the use of "Weldon mud"—artificially prepared hydrated oxides of manganese—in the desulphurization of gaseous products, so as to fix and recover the sulphur in a merchantable form. The patentees read a paper on the subject before the Society of Chemical Industry last January, as reported in the JOURNAL (Vol. LI., p. 64).

The specification of the invention (which is not illustrated) states that the patentees propose to employ the "mud" either by forcing the gas through the manganese mud held in suspension in water, acidulated or not acidulated, or else the mud is washed practically free from calcium chloride, drained (and if not sufficiently porous, mixed with plaster of Paris or other suitable material), and dried, and placed in layers in a convenient apparatus; the gas being passed over and through it. In desulphurizing gases, such as coal gas, containing sulphide of carbon in addition to sulphuretted hydrogen, besides using Weldon mud to fix the latter, some of the manganese sulphide is employed to absorb or fix the bisulphide, just as lime sulphide is used for a similar purpose. After the manganese mud has been fully charged with sulphur, it is exposed to atmospheric oxidation; and thus rendered again efficient for desulphurization. This revivification may be repeated five or more times, until the material becomes highly charged with sulphur; and it is then treated as follows:—The manganese residues obtained by the desulphurizing process are dissolved in acid; and the free sulphur that deposits is separated—there being little or no sulphuretted hydrogen evolved during the dissolving, if the material has been previously exposed to the atmosphere for some days. The manganese solution is again precipitated with lime; air is blown through to effect oxidation; and the mud, after washing and drying, is again ready for use.

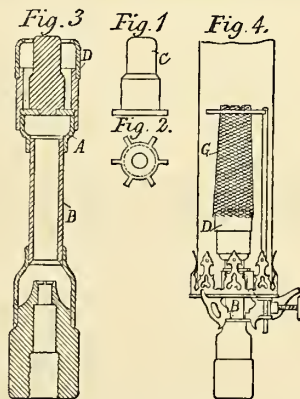
INCANDESCENT GAS-BURNERS.—Imray, O.; communicated from Auer von Welsbach, C., of Vienna. No. 11,195; Aug. 16, 1887. [6d.]

This invention relates to the now well-known Welsbach incandescent gas-burner, as described in patents No. 15,286 of 1885, and No. 3592 of 1886.

It has been found, says the patentee, that by using certain salts of other metals than those previously named, incandescence bodies are obtained which, although not of such advantageous application, may be employed with good effect for strengthening the mantles on account of their property of becoming more or less vitrified by the heating process. These salts are: 1. The niobates of the rarer earths, such as the niobates of thorium, beryllium oxide, cerium oxide; also niobates of zirconium, magnesia, calcium oxide, and alumina. 2. The tantalates of these earths, mixed with each other according to their stoichiometrical proportion. 3. The silicates of the earths, either alone or mixed together in stoichiometrical proportions. 4. The titanates of the earths and mixtures thereof. 5. The phosphates of the earths, and mixtures thereof. 6. Also mixtures of the several salts enumerated under the preceding heads may be used. In using these various salts, the mantles after impregnation by the salts of the rarer earths as described in the previous patents, are impregnated or coated a second time with a solution of the above-named salts or mixtures thereof, by preference at the upper end of the mantle only, where it is supported by the platinum wire. After this the mantle is subjected to the action of a Bunsen flame, as described in the prior patents, for the purpose of burning away the fibrous material and converting the salts into oxides. In order to facilitate the burning away of the fibre, the salt-solution with which the mantle is to be impregnated, may with advantage have mixed therewith some ammonium nitrate. For rendering the prepared mantles better able to stand transport or rough usage, they may with advantage be dipped into a very weak solution of caoutchouc or collodion, which is allowed to drain off and solidify; and this is afterwards burnt off by subjecting the mantle to the heat of a flame in the ordinary way.

GAS-BURNERS.—Pintsch, J., of Berlin. No. 11,298; Aug. 18, 1887. [8d.]

This invention relates to a Bunsen burner "for gas incandescent light illumination, in which a conoidal body is arranged quite or partly in or above the burner orifice for the purpose of obviating explosions in the flame above the burner orifice, and consequently the noise of the flame."

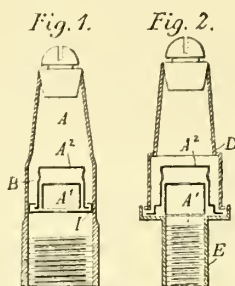


This conoidal body is fixed upon a star-shaped disc set upon the enlarged burner tube orifice A, fig. 3, in such a manner that the mixture of gas and air passes from the burner tube uniformly around the body upwards. Moreover, in order to secure the proper position of the burner tube B, fig. 4, relatively to the burner, upon the tube or enlarged orifice is placed a cylindrical, tapering, or conoidal capsule D, at a uniform distance from the conoidal body, and over the upper end of which the lower end of the tubular incandescent body D (suspended from a rod or frame) is drawn. By reason of the conical body, the green core of the flame will assume an annular shape; and the hottest zone of the flame is displaced

further towards the periphery of the same. Now, says the patentee, as the tubular incandescent body must (owing to the capsule) always remain central relatively to this hottest zone of the flame, the flame will always render the body G incandescent with uniform intensity, and the incandescent body will not be able to change its form. The capsule D and the conical body are both made of refractory material, such as steatite. The capsule D receives a small flange above, extending inwards in such a manner that the flame formed of the mixture of gas and air rising from the annular space between the conical body and the capsule is sufficiently enclosed to remain, especially at this point, at the proper distance from the incandescent body.

GAS-BURNERS.—Haddan, H. J.; communicated from W. M. Jackson, of Washington, U.S.A. No. 5331; April 10, 1888. [8d.]

Fig. 1 shows one form of this burner, for use with an ordinary pillar connection; and fig. 2, a burner with a different regulating device combined with it.



In the former case, A represents the shell of an ordinary house burner, with its tip attached. Into this shell is inserted a gas-regulator B, which consists essentially of a short cylindrical cup A¹ made to fit and slide loosely within a receiving cylinder A²; being provided with a lateral projecting flange which enters a rim turned upon a flat disc I that forms a bottom plate, and which is turned over upon the flange on the cylinder A², and thus holds the parts together. A central orifice is made in the bottom plate; and a similar perforation is made in the top of the cylinder A¹. Small orifices are made in the side wall of the outer cylinder A², which the wall of the inner cylinder A¹ will measurably close when the pressure of gas that enters the inner chamber causes it to rise. The opening in the chamber A¹ is made of sufficient size to pass the predetermined quantity of gas to be consumed under the lowest pressure adapted as a standard of regulation—say 4.10ths of an inch. Under such conditions the hole would be about $\frac{1}{16}$ inch in diameter for 5 feet of gas per hour of about .600 specific gravity. The perforations in the cylinder A² have a delivering capacity greater than the hole in the cylindrical chamber A¹; and their location is such that the top surface of the chamber will line with the lower edges of these perforations when it is made to rest upon the bottom plate.

In fig. 2 a modified form of burner shell is shown; consisting of a base E threaded interiorly to fit a fixture, and flanged at its upper end to form an upturned lip adapted to overlap the flange of the upper section D of the burner shell, and secure it in close connection by wedging it down thereon. The remaining features of the regulator are similar to that shown in fig. 1.

GAS-LANTERNS.—Drew, H., of Clapham, Surrey. No. 6545; May 2, 1888. [6d.]

This invention relates to the construction and arrangement of lanterns for gas and other burners whereby they are rendered more portable, take up less space when packed for transport or storage, and certain portions of them are said to be more efficient, more durable, and less costly than corresponding parts of lanterns in ordinary use.

GAS-HEATED BATHS.—Wright, J. F., and G. E., of Birmingham. No. 6659; May 4, 1888. [6d.]

This invention consists of the combination, with a gas-heated bath of coils of tube through which the water flows to the bath, placed in a heated chamber underneath the bath, and in such a position as to be heated by the flames by which the bottom of the bath itself is heated.

GAS-STOVES.—Saul, D. H., of Shoreditch, London. No. 7236; May 15, 1888. [6d.]

This gas boiling and heating stove consists of two vessels of cast iron fitting loosely one within the other; the space between the two forming the gas-burner. The outer vessel is of cylindrical or other form; the inner is of cup-like form surmounted by rests, for the purpose of placing thereon any vessel to be heated.

APPLICATIONS FOR LETTERS PATENT.

9893.—JONES, J., "Improvements in vertical or inclined retorts for distilling shale, coal, and other analogous substances." July 7.

9917.—HAYMAN, J. M., "Improved attachment for gas-burners." A communication from—Shilton. July 7.

9947.—RAISON, H., "Improvements in water motors or meters, combined or separate." July 9.

10,014.—NICHOLLS, R., "Improvements in regulators applicable to gas, water, air, and steam." July 10.

10,043.—KITSON, A., "Improvements in carburetting gas-lamps." July 10.

10,165.—PURNELL, J. J., "An improved gas motor engine." July 12.

PATENTS WHICH HAVE BECOME VOID.

[AFTER THE FOURTH YEAR.]

5794.—BOULT, A. J., (Jones), "Generating gas from hydrocarbons."

5797.—LINFORD, C. T., and another, "Gas-engines."

5820.—COX, W. N., "Rotary water-motor."

5835.—HARRISON, G. K., "Gas-retorts."

5874.—HILLS, F. C., "Gas liquor for the purification of coal gas."

5932.—IRVINE, R., "Distillation of coal."

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

THE PHOTOMETER QUESTION AT THE GAS INSTITUTE MEETING.

SIR,—The Gas-Works Clauses Act, 1871, Schedule A, Part I.—"Regulations in Respect of Testing Apparatus"—prescribes that the apparatus for testing the illuminating power of the gas shall consist of the improved form of Bunsen's photometer, known as Letheby's open 60-inch photometer, or Evans enclosed 100-inch photometer. The Act does not give any dimensions or other description of the instrument; so that, according to the convenience of the interested parties and to the circumstances of the case, they may carry out the verification of the illuminating power of gas either in a completely dark room or in any ordinary office or room not specially devoted to this sole purpose. Accordingly, for many years past both gas companies and corporations, or local authorities working under the provisions of this Act, have used their discretion, and employed either the Evans or the Letheby photometer, as suited their convenience; and no question has, I believe, hitherto arisen as to any difference in the results obtained with either of these instruments. My own experiments have always shown them to give like results with my 10-candle standard. In fact, both instruments have been adopted by other countries as Government standard instruments, although in this country the Standards Department of the Board of Trade do not possess a standard photometer. They have, however, stamped as a standard instrument an Evans photometer for the Government of New South Wales; the sectional area of this instrument being the same as that of the later forms adopted by the London Gas Referees. They have also stamped a Letheby photometer fitted in a chamber, forming part of the instrument, of certain fixed dimensions, ventilated in a certain manner, for the Government of the Dominion of Canada, who have adopted it as the standard photometer. Both forms of these photometers, slightly modified according to the views of the Gas Referees, are used daily in the verification of the illuminating power of the gas supplied to London, under the most stringent code of regulations known to the world. Three tests only, made during any part of the 24 hours of the day, at the option of the examiner, are averaged, and this average is taken as the illuminating power for the day. Penalties are recoverable for a very slight deficiency.

In Paris the average of a week is taken; and penalties are only recoverable on the average of at least three months. The instrument mentioned by Mr. Dibdin, made according to his instructions, and called by him, in the tables given in his paper on "Photometers," the "open bar" or "portable" photometer, has never received the sanction of the Standards Department; but on more than one occasion, they have found that they could not stamp such an instrument as a legal measure for the verification of the illuminating power, unless it could be enclosed in a chamber of certain dimensions, &c., forming part of the instrument. Therefore I submit that the wholesale condemnation of Evans photometers, founded on comparisons made with that and his open bar in certain rooms, of which no particulars as to dimensions, ventilation, &c., are given, is not what Mr. Dibdin meant to be understood from his paper. I take it that he condemns "one of these converted old-pattern Evans photometers," because the readings made during a series of experiments, by six most experienced photometrists, were surprising.

I readily admit that I should be very much surprised if a 3-inch flame from a standard London Argand, consuming 5 cubic feet of gas per hour, showed a reading equal to 22 candles when tested against a non-variable standard; but I should not be surprised if I saw such a reading, under certain circumstances, after studying the table of results which Mr. Dibdin tells us he obtained when he compared 5 cubic feet of 16-candle gas against different parliamentary standard candles. (See his paper on "Standards of Light," published in the *Journal of the Society of Chemical Industry*, May 31 last.) I fancy if I expressed any surprise, it would be somewhat of that character which you might, perhaps, see depicted on the face of the Warden of the Standards, if he were told that a gentleman with an india-rubber rule had discovered that the Imperial standard yard was several inches too short. I do not say that the particular Evans photometer called the "old converted one" was quite so rigid an example of all that is correct as the Imperial standard yard; but I think that Mr. Dibdin's rule by which he measured it was more than a trifle elastic.

Looking at the third table, which treats of the Evans photometers No. 1 and No. 2, it is noticeable that they give, on the first day, readings nearly in accordance with Mr. Dibdin's "open bar;" the pair of readings being 16 candles by the Evans, and 16.3 candles by the open bar—the latter being the higher. On the second day the pair of readings are only 0.1 candle divergent—viz., 16.5 candles by the Evans, and 16.4 candles by the open bar. In another pair of readings on the same day, both instruments agree perfectly. On the third day the pairs of readings agree again, practically; the difference being that the Evans photometer read 0.1 candle lower than the open bar. On the fourth day there was a pair of readings in which the "open bar" was 0.1 candle lower than the Evans. And so on every day I find pairs of readings sometimes agreeing completely, and sometimes with very slight divergencies one way or the other, until the ninth day. Then comes a change. Photometer No. 3 (which I solemnly suspect is the "old converted one") appears on the list. Most surprising readings are the order of the ninth and tenth days; and these sensational operations, quietly tacked on to the average results of Nos. 1 and 2, go to prove the truth of the proverb that "evil communications corrupt good manners." "From these results," says Mr. Dibdin, "it is seen that the average by the Evans was 0.9 candle over that indicated by the open bar." But leaving out the suspected "old converted one," the difference is only half a candle between the two instruments; the Evans photometer reading the highest. It remains to be proved which of the two photometers is correct.

It is true that some may think that, in the eyes of a municipal officer, a type of photometer which shows half a candle in favour of the gas company should be a bad one. But Mr. Dibdin has earned for himself

the reputation of strict fairness in the discharge of his onerous duties; and no one will believe that any objection he makes against the Evans photometer is in any way influenced by this circumstance. I therefore venture to ask him why, seeing that during eight days concordant results were obtained from the Evans and open-bar photometers, like results should not always be obtained—all circumstances being equal. So long as there are gas examiners with different kinds of sight, and so long as it is convenient to use photometers in open rooms as well as in dark chambers, there must continue to be two kinds of these instruments. In hot climates, the Evans type of photometer is the only one which the gas company or the municipality will use. But both kinds will give equally true results if attention is paid to the ventilation of the room as well as of the instrument itself.

Mr. William King, of Liverpool, uses in the Gas Company's office a photometer which was originally designed by his father, Mr. Alfred King. This is really an open-bar photometer; there being no screens of any kind. It is used in the centre of a large high room with blackened walls. This is the prototype of all the photometers used at present, I believe, in gas testing in this country and in most parts of the world. The name "Bunsen photometer" has always appeared to me to be wrong. It ought, I consider, to be called "King's photometer with a Bunsen disc." The Corporation of Liverpool verify the gas by the aid of an Evans photometer; but I have never understood that there has been any noticeable difference in the average throughout the year between the results obtained by the Company and the Municipality. How the King open-bar photometer would work under the stringent regulations of the London Gas Referees has never yet been tried; but none of the London testing stations are anything like the room in which Mr. King's photometer is used.

From time to time the Metropolitan Gas Referees have introduced improvements in the photometers, testing-rooms, and apparatus—all tending towards greater accuracy and precision; but, as may be seen from the complaint of Mr. George Livesey at The Gas Institute meeting, any alteration must be made with great care, because a very small error, if made, involves great pecuniary consequences. The Gas Referees, as an impartial tribunal, have to decide whether Mr. Livesey's contention is or is not well founded, and whether the Evans or the "Imperial" standard photometer is an accurate instrument. This latter has never been sanctioned by the Standards Department of the Board of Trade, although it is possible the Warden might stamp it. The "Imperial" standard photometer is an attempt to meet the views of all the interested parties, and is the result of suggestions from the Gas Referees, the Gas Companies, and the Metropolitan Board of Works, put together by myself. It is a modification of the Evans photometer, first suggested by the late Mr. T. W. Keates, Chemist to the Metropolitan Board, and the predecessor of Mr. Dibdin.

There are so many points in Mr. Dibdin's valuable paper which are most interesting for discussion, that I am sure every one who reads it will join with me in regretting that it did not receive the amount of attention it deserved at The Gas Institute meeting. If my criticism of it, under one head only, helps to awaken that attention which the great importance of the question raised in the communication merits, I shall have done some service to all who are interested in photometry, and Mr. Dibdin's careful and laborious work will not have been undertaken in vain.

Westminster, S.W., July 7, 1888.

WILLIAM SUGG.

SIR.—I shall be glad if you will allow me to give my testimony on behalf of the Evans photometer. I have had upwards of 20 years' daily experience with it; and I am bound to say it does not deserve the censure passed upon it at The Gas Institute meeting. It is said by some that the ventilation is so bad that the air inside becomes so vitiated with carbonic acid as to affect the burning of the candles; and therefore the readings gradually rise. Why the candles only, and not the gas in the test-burner, should be influenced in this way, is not explained. The fact is that, in the old as well as in the improved form, the gas-burner creates such a current of air in the box, that if a little smoke is put in near the candles, and the doors are closed, it will be found to travel rapidly towards the burner; leaving the air clear in the candle end of the box.

Every winter, especially in foggy weather, the results obtained at the City testing station in Jewry Street, where I officiate, are lower than the Gas Company expect; and I have repeatedly taken off the top and the bottom of the photometer, and left the doors open, without apparently affecting the results in the least. On the other hand, I believe that the results have, at times, been considered too high (not by the Gas Company), and separate testings on an open photometer have been made for some days in a house near by Mr. Heisch; but, as I have heard nothing as to the results, I presume they confirmed the official testings. If doubtful results were due to some defect in the construction of the apparatus, the effect would always be the same; whereas I have in several instances known the same photometer to be blamed for giving both high and low results.

I do not think the suggestion of my friend Mr. Foster accounts for the rise in the readings in tests taken with the Evans photometer. In my opinion, it is due to the rate of consumption of sperm by the candles, which gradually becomes less towards the end of the ten minutes. This is caused through having to counterpoise the candles with the door open, when they are exposed to the draughts caused by the moving and even the breathing of the operator in front of them, the closing of the door, and the vibration consequent upon shifting the candles on commencing the observations. From these combined causes the consumption of sperm is greatest at the commencement, and least at the finish of a test; and hence the rise in the readings.

With the Letheby photometer, the conditions under which the candles burn are the same throughout the test; therefore the readings are more uniform. I am glad to see, by the discussion on Mr. Dibdin's paper, that there are many who think that candles properly used, are not so bad as they have been represented to be. As long ago as 1876 I called attention in the JOURNAL (see Vol. XXVII.) to a few of their weak points, showing that it was necessary, in order to ensure accuracy, to have the bend of the wicks at right angles with the photometer-bar; and I should like to say a little more about them now, but I fear I have taken up too

much of your space already. I will, however, with your permission, return to the matter at some future time.

Poplar, E., July 7, 1888.

W. C. YOUNG, F.I.C., F.C.S., &c.

THE PAY AND POSITION OF GAS MANAGERS.

SIR,—With many of your recent remarks on the question of gas engineers and their pay, and the relative position of the chief officials in corporations and companies, I very cordially agree. Events have occurred, and are still occurring, in the gas world which give point and emphasis to your strictures. The mild sneer at "clerical heads," in which you indulge, will, no doubt, be thoroughly enjoyed by the gentlemen to whom you refer; and they possibly, on their part, will flatter themselves that even you, Mr. Editor, do not know everything.

May I suggest that you do great injustice to certain towns you mention? The fact is that in these towns, in addition to the "clerical head," instead of there being only one engineer and manager, there are actually several, each of whom is responsible for the progress, efficiency, and satisfactory maintenance and carrying on of the work at his particular station. The system is found to promote healthy competition and friendly rivalry, and the working results afford to the Gas Committee and their "clerical head" the means of useful comparison. In the absence of petty jealousies, and with a cordial and good understanding amongst the chiefs, this system will work well. There will certainly be no need for any dark forebodings, even if it be necessary to call in an "experienced" engineer in reference to some unusually important work. These cases, however, are so exceptional, that it will scarcely be wise or economical to keep such an engineer on the spot, and pay him a large salary to attend to them when they arise. I suppose, too, that all engineers do not make good "clerical heads;" at any rate, I know some who figure very badly in the capacity of secretary or accountant. The duties of engineers, managers, secretaries, &c., are so different the one from the other, that no one man can possess in himself the best capacity for each and all of the positions. "Let the shoemaker stick to his last;" and, with easy and clearly defined duties, there will be no difficulty or irritating friction.

Certainly the tendency to cut down or not to pay proper salaries to efficient and trustworthy men of either class is a mean and mistaken policy. Good and upright men of ability are worth good salaries. A few hundred pounds, more or less, in salaries is a small matter compared to the loss or gain which may result from the operations of either engineers or secretaries, or the blunders of committees.

July 11, 1888.

RETORT.

MECHANICAL V. HAND STOKING AT THE MANCHESTER CORPORATION GAS-WORKS.

SIR,—In reply to Mr. Alderman King's letter, in your issue of the 10th inst., I did not intend to suggest that any outlay for new retorts, or setting them, was included in the accounts. I referred only to the foremen and retort setters and labourers named in my letter, whose duties are to clear out the flues, and scurf and repair the retorts while in action. Mr. King has certainly been misinformed, or he would not have stated that any men, more than those mentioned in my letter, were employed to open or auger the pipes—these duties being discharged by the stokers who open the lids, and whose wages were included in the cost I gave. But inasmuch as stopped pipes were practically unknown in the retort-houses where my machinery is in operation, this work was of a light character, although four and five hour charges are worked, and rather high heats employed. The charges for supervision, scurfing of retorts, &c., will vary and increase as the age of the retorts increases.

It is absolutely necessary, in making a comparison between any two systems of carbonizing, to define accurately what charges are included in the carbonizing account; for there is, in practice, great variety in the items that are comprised under the head of "carbonizing wages." For instance, in one case the wages for unloading and wheeling coal, wheeling and stacking coke, and even the exhauster men, will be included; while in another case the unloading of coal and delivering it into the retort-house will be booked to the coal account. The whole of the labour for handling the coke after it is out of the retort will be charged to the coke account, and the exhauster men will be charged separately, or to some other account. Therefore, I am inclined to think that engineers will look upon my figures as eminently practical, and the reverse of hypothetical—or, as Mr. King puts it, "theoretic."

What I point out in detail I still maintain. The cost of wages, from actual practice, by my manual machinery is 1s. 7-5d., and by the compressed air machinery, 1s. 2-82d. per ton; including, in both cases, coal wheeling, breaking and elevating it, machine men, coke wheeling—in fact, all charges from the taking of the coal from the stores to the tipping of the coke in the yard. The cost of the same work done by hand in Manchester is 2s. 6d. per ton.

It is not in Manchester alone that these statements can be confirmed, but in many other works where my machinery is in operation. The largest and most accurate trial, as to the cost of stoking by my machinery, and the amount of the saving obtained, was carried out by the Manchester Gas Committee themselves at their Rochdale Road works, before my appointment as Engineer of the department; and the results of the trial were published in the JOURNAL on March 23, 1880. For the purposes of the trial, No. 1 retort-house was completely isolated from the other parts of the works, and all the coal was carefully weighed, and the quantity and illuminating power of the gas taken. The quantity and cost, taken in each case on the same basis, were as follows:—

No. 1 Retort-House (West's Manual Machinery).
Gas made during five days 10,788,200 cub. ft.
Cost per 1000 cubic feet 1-68d.

The other Retort-Houses.
Gas made per house during five days 9,105,716 cub. ft.
Cost per 1000 cubic feet 3-01d.

Confirmatory evidence as to my accuracy can be found, by anyone who will analyze them, in the annual published accounts of the Gas Committee. I gather from the last annual statement (also from Field's "Analysis"), that the total quantity of coal and cannel carbonized at the various works in Manchester was 292,335 tons; the value of this quantity of coal being £178,301 6s. 8d., or an average of 12s. 2-38d. per

ton. The total wages paid for carbonizing was £32,636 1s. 4d., or an average of 2s. 2½d. per ton. By comparing the detailed charges, compiled in the same way, for each of the two largest works in Manchester, we can get at the cost for carbonizing at each works separately. The figures are as follows:—

Rochdale Road Works.

Amount paid for coal and cannel	£94,683 14 5
Tons of coal, at 12s. 2½d. per ton, to equal this money	155,239 tons
Carbonizing wages, including stokers, supervision and scurffing, &c.	£14,740 16 0
Carbonizing wages (as above) per ton	0 1 10⁄789

Gaythorn Works.

Amount paid for coal and cannel	£54,591 15 4
Tons of coal, at 12s. 2½d. per ton, to equal this money	89,506 tons.
Carbonizing wages, including stokers, supervision, and scurffing	£11,723 12 11
Carbonizing wages (as above), per ton	0 2 7⁄435

Therefore, the difference in favour of the Rochdale Road station, where half the works is now fitted up with my machinery, is 1-646d. per ton, which means a saving for the year, upon 155,239 tons carbonized, of £5592 10s. 2d.

JOHN WEST,

Late Chief Engineer to the Manchester Corporation Gas Department.

Manchester, July 13, 1888.

MR. HUNT'S CRITICISMS ON MR. CARPENTER'S PAPER.

SIR,—I was rather amused the other day, on reading the good-natured growl of our friend Mr. Hunt, in the *JOURNAL* for the 3rd inst., on Mr. Carpenter's paper read at The Gas Institute meeting; but, unfortunately, in the last paragraph his growl becomes a snarl. As to what he says about Mr. Carpenter's paper I have nothing to say at present; and I fancy Mr. Carpenter, if he likes, and when he likes, can take care of himself. But Mr. Hunt exclaims: "What has London done in the last ten years to bring about this great advancement? What has she contributed to this result?" Mr. Hunt says "Absolutely nothing!"

Now, no doubt it would be interesting to your readers to have Mr. Hunt's replies to the following questions:—Within the last ten years, where were the first workable regenerative furnaces built in the United Kingdom? Where did Mr. Hunt first see such furnaces at work in the United Kingdom? Where was the first paper read, with description and discussion, upon such furnaces, giving experiences of their working, &c., in England?

If my memory serves me right, Mr. Hunt will be compelled to reply to these queries "In London." It was in London where they were first tried. It was in London where they were greatly improved. It was in London where the original errors in construction were eliminated and discarded. It was in London where these furnaces were brought to something near perfection. It is in London where they are being still further improved. And it was from London that the Provinces took their copies of the furnaces. After London had set the example and tried them, but not for years after London had made them successful, did provincial managers begin to use them.

It might be asked, in the same spirit, What has Birmingham done? what has she contributed to this result? I will not be so inaccurate or so uncharitable as to say, "Absolutely Nothing!" but will just turn up the last issue of "Field's Analysis;" and one is tempted to say that Birmingham has not done very much, when the fuel account is compared with London. Birmingham, with a credited make of only 41·7 bushels of coke per ton of coals carbonized, uses 23 per cent. of this low make for fuel in the regenerative furnaces; while taking the last in the list of the London Companies, where Mr. Carpenter's furnaces are partly in use at one of the stations, with a credited make of coke as high as 49·8 per ton, the fuel used is only 20 per cent. of this high make. I fail to see what Mr. Hunt has to crow about, or where he gains by "comparing."

It would be also very interesting to your readers, as well as to myself, if Mr. Hunt would name the towns in England where "10,000 cubic feet and upwards per mouthpiece" are obtained. I like the *upwards*; and hope it may turn out something like the Scotchman's "mile and a bittock." Also if he will state what description of coals are used; the duration of the charges; the size and length of retorts; how long such a make has been sustained consecutively, by the same settings and the same retorts; how long the retorts last, and how often the ascension pipes stop; and what is the profit made and the selling price of gas in such towns—because Mr. Hunt seems to imply that a large make per mouthpiece is evidence of good working. But I can tell him of some towns where the make of gas is only about 5000 cubic feet per mouthpiece, and the gas is sold much cheaper than in Birmingham. I can also tell him of a place where they *once* made 12,000 cubic feet per mouthpiece for three consecutive days; and at the end of eighteen days the whole setting was burnt down. Would Mr. Hunt approve of this straining after high makes per mouthpiece? But, waiting to hear from him the names of the towns with the above particulars where he says they make 10,000 feet and upwards per mouthpiece,

I am, Sir, your occasional correspondent,

A. B.

July 14, 1888.

EUROPEAN GAS COMPANY, LIMITED.—The annual meeting of this Company was held yesterday. Mr. H. McLauchlan Backer presided, and moved the adoption of the Directors' report. He referred in high terms to the manner in which the late Chairman (Mr. W. White) performed his duties during the 40 years he had been a Director, 20 of which he had occupied the chief position on the Board; and he also expressed the deep sympathy which the Board felt with the members of the deceased gentleman's family. Allusion was next made to the success of negotiations which had been in progress for some time for the extension of the concession at Bolbec. This had been secured for 20 years, so that the treaty would not expire until 1926. The aggregate increase in the sale of gas at the seven stations of the Company was 4 per cent. The report was adopted; and a dividend at the rate of 2½s. per paid-up share, and in the same proportion on those not fully paid up (free of income-tax), was declared.

Parliamentary Intelligence.

HOUSE OF LORDS.

TUESDAY, JULY 10.

The Nelson Local Board Bill was reported, with amendments. The Gas Provisional Orders Bills (Nos. 1 and 2), the Gas and Water Provisional Orders Bills, and the Water Provisional Orders Bills (Nos. 1 and 2) were reported without amendment; amendments made; and Bills ordered for third reading.

THURSDAY, JULY 12.

The Gas Provisional Orders Bills (Nos. 1 and 2), the Gas and Water Provisional Orders Bill, and the Water Provisional Orders Bills (Nos. 1 and 2) were read the third time, with the amendments, passed, and sent to the Commons.

PRIVATE BILL LEGISLATION.

A report was presented from the Select Committee on Private Bill Legislation, with the minutes of evidence given before the Committee, together with appendices.

SOUTH METROPOLITAN ELECTRIC LIGHTING BILL.

A Bill to confirm a Provisional Order made by the Board of Trade under the Electric Lighting Act, 1882, relating to certain parts of the Metropolis, was presented by the Earl of Onslow, read the first time (Standing Orders being suspended for the purpose), and referred to the Examiners.

FRIDAY, JULY 13.

The Examiners reported that the Standing Order applicable to the Electric Lighting Order Confirmation Bill had been complied with.

The Local Government Provisional Orders (Gas) Bill was read the third time, with the amendments, passed, and sent to the Commons.

HOUSE OF COMMONS.

MONDAY, JULY 9.

ELECTRIC LIGHTING AT THE HOUSES OF PARLIAMENT.

Sir H. Roscoe asked the First Commissioner of Works whether, in view of the serious deterioration of the stone fretwork of the interior of the Houses of Parliament "owing to the corrosive action of the products of combustion of gas," he would undertake to extend the system of electric lighting throughout the building, so as to avoid the "evil consequences" which attend the present system.

Mr. PLUNKET: To extend the present system of electric lighting throughout the whole of both Houses of Parliament would involve a very considerable expenditure—not less than £40,000—for plant. It would, however, probably effect a considerable saving in the annual cost of lighting the Palace. Before making any proposals upon the subject, it would be necessary to consider whether some more economical way of obtaining the necessary current of electricity than that which we now use may be made available.

TUESDAY, JULY 10.

The Edinburgh and Leith Corporations' Gas Bill (Lords) was reported, with amendments.

THURSDAY, JULY 12.

The Edinburgh and Leith Corporations' Gas Bill (Lords) was read the third time, and passed, with amendments.

The Select Committee on the South Staffordshire Water Bill reported that the parties do not intend to proceed further with the Bill.

The report of the Select Committee on Private Bill Legislation (*vide supra*), was presented.

FRIDAY, JULY 13.

The Falkirk and District Water Bill was read the third time, and passed, with amendments.

The London Sea Water Supply Bill (Lords) was reported, without amendment.

HOUSE OF LORDS COMMITTEE.—MONDAY, JUNE 18.

(Before Earl JERSEY, Chairman; Viscount POWERSCOURT, Lord WINDSOR, Lord MANNERS, and Lord HENRIES.)

HEXHAM LOCAL BOARD WATER BILL.

This Bill, which is to enable the Hexham Local Board to construct new water-works for the supply of the town, was under consideration to-day.

Mr. POPE, Q.C., and Mr. MCRAE appeared for the promoters; Mr. BIDDER, Q.C., and Mr. WORSLEY TAYLOR for Mr. W. B. Beaumont, M.P., who opposed the Bill.

Mr. POPE, in opening the case for the promoters, observed that the question involved would not occupy the Committee for any length of time, although it was of considerable importance to the town and district of Hexham. That district was governed by a Local Board; and the Bill before the Committee embodied a scheme for obtaining a better and more efficient supply of water to the district. As far as he knew, the only point of dispute likely to arise was on the opposition of Mr. W. B. Beaumont, M.P., the owner of the land wherein rose the springs which it was proposed to take for the supply. The character of the district had changed since the existing source had been fixed upon as a good one. Instead of being a wild, unmanured country, the water of which was unpolluted, it had become cultivated and highly manured, with the result that the water was no longer suitable for domestic purposes. From time to time of late years the question of an improved supply had come before the Board. Various schemes had been suggested; and at last the Board determined that they would place the whole matter in the hands of a competent Engineer. They consulted Mr. Hubert Laws, and instructed him to ascertain, by an investigation of the district surrounding Hexham, what would be the source of supply which he would recommend. In October, 1887, he presented a detailed report, in which he pointed out that he had examined five sources of supply, among them being the springs known as the Lade Wells. They were springs rising in a formation of millstone grit, and the area feeding them could, therefore, be easily and accurately defined. The actual drainage area of the springs in question was 1350 acres. Mr. Beaumont, the petitioner, was the Lord of the Manor, and to this extent was interested in the matter. At present there were three springs that issued close together upon the area to which he (Mr. Pope) had referred. The works contemplated were of the simplest character. It was proposed merely to construct a reservoir into which these springs might flow; and thence the supply for Hexham would be drawn. The total yield of the three springs appeared to be about 1,500,000 gallons per day. The present requirements of Hexham were about 250,000 gallons a day, or only one-sixth of the entire amount of the average yield of the springs. Allowing for the natural growth of the population of the district for 20 years to come, the maximum amount that would be required at the end of this period would be only 400,000 or 450,000 gallons a day.

At present all this water ran absolutely to waste. There were no mills on the burn into which the springs flowed; so that there could be no objection to the abstraction of the water on this score. The burn ran into other burns, which fell into a larger river, and ultimately into the Tyne. The promoters were seeking simply to avail themselves, for the purposes of Hexham, of 400,000 or 450,000 out of 1,500,000 gallons of water, leaving the residue—at present useless and not available for anything—untouched. The Lord of the Manor's objection, so far as he could gather, was that he believed there might ultimately be mining operations upon the moorland where the springs arose. All he (Mr. Pope) could say in reply was that there never had been any user of the water for mining purposes; that there seemed to be no immediate prospect of its being wanted for such purposes; and, in any case, that if it should be so required there would be plenty available, because the Local Board proposed to restrict themselves to such quantity as would be sufficient for present requirements, and for such a time forward as their Lordships might deem reasonable. The Local Board had approached Mr. Beaumont in every possible way, and had tried to deal with him in the most conciliatory manner. During the negotiations, Mr. Beaumont, he was informed, expressed a desire that the opinion of some independent engineer should be taken; and intimated that if it was found that the scheme was really one for the benefit of Hexham, he would be willing to assist rather than impede it. Accordingly, the whole question was referred to Mr. J. R. Forster, Engineer of the Newcastle and Gateshead Water-Works, who, almost in the capacity of a referee between the parties, examined into the scheme which had been presented by Mr. Laws. He reported that the springs appeared to be permanent, and likely to produce a superabundance of water, not only for present requirements, but for those of many years to come. Mr. Forster added that this was the best available source of supply for Hexham; that the necessary works could be carried out at comparatively little cost; and that the water itself was of undoubted purity. If the Committee sanctioned the scheme itself, there would be no objection on the part of the promoters to ample provisions being inserted for Mr. Beaumont's protection, and for securing him compensation for the abstraction of water rising within his property.

Mr. Robb, Chairman of the Local Board, then gave evidence in support of the Bill.

TUESDAY, JUNE 19.

On the resumption of the proceedings this morning, Mr. Fenwick, M. Inst. C.E., of Leeds, and Mr. G. H. Hill, M. Inst. C.E., of Stockport, gave evidence on behalf of the promoters; the former witness stating that the water of the Ladle Wells was the best that could be found in the district, and the latter expressing the opinion that 25 gallons per head per day, as proposed, was an ample supply of water for a town like Hexham.

Mr. BIDDER, in addressing the Committee in opposition to the Bill, admitted that, in a certain sense, the water proposed to be taken was running to waste; but the prospect of mineral working in the locality was by no means so visionary as had been suggested. There was a perfectly reasonable belief that sooner or later the lead veins, of which indications had been noticed in various places in the district, would be worked; and to take away the water that would be required for dressing the mineral would be to absolutely prevent the development of these works. The history of the water supply showed that the Ladle Wells scheme was a mere caprice of the Local Board, taken up at the very last moment, and decided upon within a month or five weeks of the first suggestion with regard to it being made. He contended that, if a new source of supply was necessary at all, there was another—the Stubly Syke source—which would be ample and satisfactory.

The room was then ordered to be cleared. On the re-admission of the parties,

The CHAIRMAN said the Committee were satisfied that the preamble of the Bill had been proved, and that the measure should be proceeded with; but they would require provisions to be inserted limiting to 350,000 gallons per diem the quantity of water to be drawn from the Ladle Wells.

Mr. WORSLEY TAYLOR observed that he would have to bring up certain clauses for the protection of Mr. Beaumont. There was, for instance, a question as to limiting the supply in times of drought or other circumstances. It might not be necessary for the promoters to take the whole 350,000 gallons every day; and there was something to be said as to the possible effect on the springs in dry periods.

The CHAIRMAN said it must be understood that no considerations as to drought, &c., would affect the decision of the Committee to allow the promoters to take 350,000 gallons per diem.

After an adjournment, to allow of the terms of the Committee's decision being considered,

Mr. WORSLEY TAYLOR brought up a clause providing that on no one day should more than 350,000 gallons, as measured by a gauge, be taken from the springs.

A discussion followed as to the clause imposing a penalty of £10 per day upon the Local Board for taking more than the prescribed quantity of water. The Committee decided to reduce the penalty to £5; and, with some minor alterations, they passed the Bill.

CROMER WATER COMPANY, LIMITED.—The tenth annual general meeting of this Company was held on Monday last week, under the presidency of Mr. B. Bond-Cabell. The report of the Directors stated that the water and meter rental amounted to £658 11s. 2d.; showing, as compared with last year, an increase of £92 17s. 8d. The expenses were £362 1s. 1d.; being an increase of £75 6s. 5d. The profit for the year amounted to £306 11s. 1d., which, added to the balance brought from the last account and the bank interest, made the total of the profit and loss account £455 14s. 8d. After paying interest and certain other charges, there was left £293 12s. 4d. available for division. The Directors recommended a dividend at the rate of 3 per cent. per annum, free of income-tax, which would absorb £254 14s., and allow a balance of £38 18s. 4d. to be carried forward. The report was adopted.

NEW JOINT-STOCK COMPANIES.—The following joint-stock Companies have just been registered:—The North Walsham Gaslight and Coke Company, Limited, with a capital of £6000, in shares of £10 each, to acquire the business now carried on by the North Walsham Gaslight and Coke Company, and the whole of the real and personal property belonging to the Company. The Westminster Electric Supply Corporation, with a capital of £100,000, in shares of £5 each, of which 100 are to be founders' shares, and the remaining 19,900 ordinary shares, with the object of carrying on, either in the City of Westminster or elsewhere, the trade or business of electric lighting. The Barnoldswick Gas and Light Company, Limited, with a capital of £12,000, in £10 shares, with the object of manufacturing and supplying gas or other illuminating power in the parish of Barnoldswick, York, and generally to carry on business as gas and electrical engineers, and every other business connected with the manufacture of gas and electricity.

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

FRIDAY, JULY 13.

(Before Mr. Justice KAY.)

BRAY v. GANDON AND OTHERS.

This motion came before the Court this morning, and was quickly disposed of.

Mr. MARTEN, Q.C., appeared for the plaintiff; Mr. RENSHAW, Q.C., for the defendants.

Mr. MARTEN said the defendants were Mr. Gandon and others, who were sued on behalf of themselves and others, the officers and members of the Council of The Gas Institute; and the motion asked for an injunction to restrain the defendants from excluding the plaintiff from the meetings of The Gas Institute, and from interfering with him in the enjoyment of his privileges of membership and benefits in the property of the Institute until trial of the action or further order, and that the defendants might be ordered to pay the costs.

Mr. RENSHAW, Q.C., said he appeared for the defendants—the Council of The Gas Institute. The question was one as to there being the requisite majority of votes at a meeting; and, in fact, it turned on the question whether a majority could be constituted by two-thirds of a man. The case appeared to him to be governed by that of *Labouchere v. Lord Wharncliffe*; and, under the circumstances, as the defendants were probably, under that decision, in the wrong, they were willing to submit to a declaration in the terms asked for by the writ, to the injunction, and to pay the costs of the action.

Mr. MARTEN said he understood the defendants were willing to treat this as the trial of the action.

Mr. RENSHAW assented.

Mr. MARTEN said he only had to ask further for an order that the persons who had been allowed to defend on behalf of the Institute should be ordered to pay the costs of the action.

Mr. RENSHAW said he did not object to that.

His Lordship made the order accordingly.

SURREY SESSIONS.—WEDNESDAY, JULY 4.

(Before Mr. H. Yool and a Jury.)

SOUTHWARK AND VAUXHALL WATER COMPANY v. LINSEY.

CHARGE OF UNLAWFULLY TAKING WATER.

In this case the prisoner was charged with stealing a quantity of water, the property of the Southwark and Vauxhall Water Company. From the evidence it appeared that in August, 1886, the water to the prisoner's house was withdrawn for non-payment of rates; and since that date the Company had no knowledge whence he was obtaining his supply. They endeavoured to find out; and eventually it was ascertained that he was surreptitiously taking water from the cistern of a house adjoining his own. The matter came in the first instance before the Magistrate at the Southwark Police Court (see *ante*, p. 30); and Mr. Linsey declining to submit to his Worship's decision, was committed for trial.

Mr. LUSHINGTON appeared for the complainants; Mr. AVERY defended the prisoner.

Evidence having been given as to the disconnection of the water service at the prisoner's house,

Mr. J. Pickles said that he was a private detective; and on the 7th of June last he, in company with another officer, kept watch on the cistern supplying the house No. 441, Old Kent Road. At about 11.30 at night someone approached this from prisoner's house, and affixed a hose to the pipe supplying this cistern. On the appearance of a light, however, at one of the houses, the person beat a retreat; taking the hose away. When all was clear again, someone refixed the hose shortly afterwards, and water then ran into the prisoner's butt for ten minutes. In the darkness he saw a hand attempting to withdraw the hose, which he seized. There was a slight struggle, and the other officer identified the prisoner by means of a light. He told Linsey he would be charged with stealing the water; and he replied, "I am done; make it as light as you can on me."

Lane, the companion of the previous witness, corroborated his evidence.

Mr. AVERY contended that it was no offence at criminal law to take water. There was no distinction between water and air; it was free to everybody. Besides, it would have to be proved that stealing water was a larceny; and the only authority they had for this was the decision of two Judges of a Divisional Court, who decided that obtaining a supply surreptitiously was a misdemeanour, but that, however, was in a case where the parties had no statutory powers like those of the present complainants. He further argued that the water belonged to the owner of the house No. 441, Old Kent Road, who, if anybody, was the party aggrieved, and certainly not the Water Company. Therefore, if the case was a subject of larceny, it could not be held that the Company were parties who had suffered any loss. The offence with which his client was charged was not an indictable one; and he was of opinion that proceedings should rather have been taken under one of the Company's Acts of Parliament, for which, on a case being proved, there was a penalty of £10.

Mr. LUSHINGTON held that the Company contracted to supply water simply to No. 441, Old Kent Road, for which a rate was charged, and that the prisoner had no right to obtain his supply from that house. It was proved that Linsey had stolen the water, and had never paid for any since 1886. If his learned friend's argument was right, any householder could supply a whole row of houses, without their occupiers paying a farthing for it. Then the jury should bear in mind that Linsey had been obtaining a surreptitious supply for nearly two years. It was clearly not within his right to do this.

Mr. Yool, in addressing the jury, recapitulated the facts as given in evidence, and said there was really no dispute about them. Prisoner was caught in the act of taking the water, and when arrested said he was "done," and admitted that for two years he had been getting his supply from the next house. Upon the evidence given and the admissions that had been made in Court, the prisoner was not justified in taking a supply of water from No. 441, Old Kent Road; and he (Mr. Yool) should direct the jury to pay no attention to what had been alleged—that when the water passed into the pipe at No. 441, it became the property of the owner of that house, because, as a matter of law, it was decidedly the property of the Water Company supplying it. Having regard to the decision given by two of Her Majesty's Judges in a similar case, he held that water passing through the Company's mains was their property; and anyone taking it, as the prisoner had done, was guilty of larceny. The Company had their obligations to meet; and it was absurd to suppose that a person who took their water should not be liable to punishment for so doing.

Mr. AVERY here contended that proceedings should have been taken under the Company's regulations, by which penalties could be inflicted; and he further argued that stealing water was not an act of larceny.

Mr. LUSHINGTON: That is a mere statutory right which does not take away our remedy at Common Law.

Mr. Yool, after perusal of the Company's Acts, said he would leave to

the jury the points argued. The house in question had been without water for nearly two years; and the way in which the prisoner obtained his supply was undoubtedly an attempt to procure water without paying for it, and thus to deprive the Company of their rights. If the jury found that the prisoner stole the water with the intention of defrauding the Company, then he was guilty of misdemeanour.

After some deliberation, the jury gave a verdict that the prisoner was guilty of taking the water, but not with a felonious intention.

Mr. YOOL (with surprise): That, gentlemen, practically amounts to a verdict of "Not guilty."

Mr. AVERY asked that the verdict of the jury be recorded.

Mr. YOOL said he should have to discharge the prisoner; and he hoped it would be a lesson to him and others not to take water which did not belong to them. He afterwards addressed the jury, stating that he could not account for their decision, as, if the prisoner had no intention of doing wrong, he would not have gone at midnight to obtain his supply of water in the manner he had done, and certainly would not have retreated when a light appeared at a neighbouring house. This very act was conclusive that the prisoner had guilty intentions.

CITY OF LONDON COURT.—FRIDAY, JULY 13.

(Before Mr. Commissioner KERR and a Jury.)

SCRIMGEOUR v. THE NEW RIVER COMPANY.

A QUESTION UNDER THE CONSTANT SUPPLY REGULATIONS.

This was an action which raised a rather important question to water companies and consumers, especially in regard to constant supply. The plaintiff, Mr. Walter Scrimgeour, stockbroker, of Old Broad Street, E.C. sought to recover the sum of £5 10s. from the defendant Company for damages he had sustained at their instance.

Mr. M'CAUL appeared for the plaintiff; Mr. G. LYON for the Company.

Mr. M'CAUL, in opening the case, said the question in dispute was not one of amount; and the decision would affect many persons residing in the same neighbourhood as the plaintiff at Highgate. This district was supplied by the New River Company with water under the Water-Works Clauses Act, 1847. The powers of the Company anterior to 1871 were these: Under the general Water Act and their own Private Acts, every person who provided fittings and put in a communication-pipe and made application to the Company was entitled, as a matter of right, to have a supply of water to his premises. This was an intermittent supply, which would last about half an hour or an hour. In 1871, the Legislature considered that in certain cases water companies should be compelled to give a constant supply; and, accordingly, by the Metropolis Water Act of that year, it was provided that, where the local authority demanded a constant service of water, or where the Company thought it necessary, then it should be given, provided that the Local Government Board considered it was really requisite. Under that Act, in 1887 the New River Company determined that a constant supply of water should be given to the plaintiff's district; and on the 12th of May last year, they served notices upon all the consumers in Highgate (and amongst others the plaintiff) to this effect. The notice recited that the St. Pancras Vestry had required them to give a constant supply, and it directed the plaintiff to effect alterations in the fittings of his house, in the manner prescribed by the notice, from the top to the bottom of the house; the fittings to be such as would suit the constant service. Whether he liked it or not, he was bound to comply with the notice, under serious penalties, which could be recovered in the Police Court. The alterations were made, and the Company's Inspector on the 15th of September went over the house to see the whole of the fittings; and he approved of them. The plaintiff then waited for the constant supply. Three months passed; and on the 9th of March the plaintiff's solicitors wrote to the Company, asking what they meant by having compelled the plaintiff to incur expense, and then not put on the constant service. On March 10 the Secretary of the Company wrote to say the subject would have due attention; and upon being pressed, on the 19th of March, by the plaintiff's solicitors for an explanation, they gave a constant supply to the lower part of the house, and afterwards wrote declining to give it to the upper part. Thereupon the present action was brought to recover £5 10s., the money paid for the fittings, which were now rendered useless. The learned Counsel submitted that the plaintiff was either entitled to a constant supply in the upper part of the house or to the payment of the money expended in carrying out the instructions of the Company contained in their notice.

Mr. LYON submitted that the question in dispute was one of law and not of fact.

Commissioner KERR thought the jury had better be discharged.

Just as this course was about to be decided upon, the learned Counsel could not agree upon it, and the whole case was proceeded with.

The plaintiff was called to substantiate his case; as was also his plumber, Mr. Barber. The last witness was cross-examined at some length as to the way in which the work was done.

Mr. LYON, in addressing the jury, said The Grove, Highgate, where the plaintiff lived, was the highest part in that locality. The Company were not compelled by any Act of Parliament to afford a constant supply to anything like the height of the plaintiff's house. They were not bound to give a constant supply to a higher level than 370 feet above Trinity high-water mark—that was to say, a level of 300 feet, and then 70 feet more for the supposed height of any house. The house in question was, in fact, 66 feet, as he would show, above this level; and accordingly the Company were not compelled to afford a constant service of water.

Mr. M'CAUL: They should have known this before giving notice.

Mr. LYON said he should submit that the Company had fulfilled their contract. They had, in effect, provided a constant supply of water for this house; but it was practically impossible to give a constant service to the upper cisterns in the house. They had done everything in their power, and found it could not be accomplished. He contended that they were entitled to call upon the plaintiff to make every alteration which he had made without any question of constant supply at all. They had given the plaintiff, with pumping day and night, something more than an intermittent service, for the water was pumped into the upper cistern from six in the morning until noon. This was simply to meet the requirements of a closet and a tap for jugs, &c.; there being no bath upstairs.

Commissioner KERR: Plaintiff says, "I paid my money for a constant supply. I altered the fittings at your request, and you approved them. If you had told me I could not have the supply to the upper floor, I might have abolished the water supply altogether."

Mr. LYON: He has not paid his money for a constant supply. He has paid his money in order that he might have his fittings put into the condition we required them to be in.

Commissioner KERR: With a view to a constant supply.

Mr. LYON: Oh, no. The notice commences by saying we "propose" on a certain day to give him a constant water service for these premises; and we go on to give him notice that he must put his fittings in order in accordance with the regulations made—not by us, but formerly by the Board of Trade and now by the Local Government Board. These are

fittings which every house is compelled to have if the Company chooses to require them, whether the supply is intermittent or constant.

Evidence was then called on behalf of the Company as to the height of the house above Trinity high-water mark; and two waste inspectors spoke to having examined the house.

Commissioner KERR summed up by telling the jury the case was eminently one for them.

The jury gave a verdict for plaintiff for the amount claimed; and judgment was entered accordingly, with costs on the higher scale. Leave to appeal was refused.

MARYLEBONE POLICE COURT.—MONDAY, JULY 2.

(Before Mr. DE RUTZEN.)

THE CHARGE FOR WATER FOR PAROCHIAL PURPOSES.

To-day the matter in dispute between the Paddington Vestry and the West Middlesex Water Company, as to the charges made by the Company for water supplied for parochial purposes, which was decided by the Court a short time since,* again came before his Worship.

Mr. MEAD contended, on behalf of the Vestry, that the decision of the Magistrate that the parish should pay the Company 8½d. per 1000 gallons had reference to the water used for the finishing of sewers as well as for that required for the watering of roads.

Mr. POLAND argued, for the Company, that the decision was only as to the watering of the roads.

Mr. DE RUTZEN said he was under the impression from the first that the point he had to decide was as to the watering of the roads only; and his decision was exclusively as to that point. If there had been any misunderstanding, and the parish were not satisfied, a fresh summons would have to be taken out.

Mr. MEAD said the Company had threatened to cut off the supply; and, if the threat were carried out, it would be a serious matter.

Mr. POLAND said the Company would not think of doing that.

NORTHERN COAL TRADE.—The steam coal branch of the northern coal trade is active—the demand being large, and the production good; but the prices have not yet shown the advance which some hoped they would have done. Steam coal is quoted 7s. 9d. for best quality, and thence down to 6s. 9d. for second kinds. Small coal is rather slower in sale; or, rather, the production is a trifle in excess of the demand. For gas coal, the demand just now is slightly increasing; but it is much below the normal amount. Some large local contracts for gas coal are in the market. Household coal is still weak, and the price droops; but there is a good inquiry for manufacturing coal. For coke the demand is brisk; and the exports to Spain are increasing.

BRADFORD WATER SUPPLY.—At the meeting of the Bradford Town Council last Tuesday, a long discussion took place on the subject of the water supply of the borough, especially with reference to a proposal to supplement the present sources by a scheme which has been prepared by the Water Engineer (Mr. A. R. Binnie, M. Inst. C. E.) for utilizing certain water at Grimwith. On analysis this water has been pronounced to be dangerous on account of its action on lead; and a sample is now in the hands of a London analyst, who is testing its liability to contamination from this cause. Apart from this, there are legal difficulties which will interfere with the carrying out of the Grimwith scheme, some of the mill-owners affected by it having made enormous demands for compensation. Elaborate reports by the Water Engineer, the Borough Analyst (Mr. Rimmington), and other gentlemen who have analyzed the water, have been published in a local paper; and altogether the matter is exciting considerable interest. Fortunately there is no dearth of water in Bradford just now; the quantity in store in the high-level reservoirs being sufficient to last till the beginning of November, and that in the low-level reservoirs till Dec. 1 next.

THE CHARGES IN CONNECTION WITH THE HALIFAX COAL CONTRACTS.—Mr. Ellis Lever has written to the Town Clerk of Halifax (Mr. Keighley Walton) the following letter on the subject of the charges which have lately been made in connection with the coal contracts of the Corporation of that town:—"Dear Sir,—I have not yet received any acknowledgment from you of the receipt of my letter of the 5th inst. [see ante, p. 79]. I am going to Germany for a few days; and on my return it will give me pleasure to meet you, and afford you all the information in my possession, on the distinct understanding that it shall be considered as privileged, and not made use of or published except as I suggest. The attitude of some members of the Corporation will, I feel sure, be changed after the inquiries which, in my opinion, ought to be instituted." Mr. T. Fox, of the Silkstone Coal Company, has also written to the Town Clerk declining the offer made by the Council at their last meeting. The resolution of the Council, it may be remembered, was "that Mr. Fox be informed forthwith that if the person referred to in his letter of the 2nd of June be a member of the Council or a servant of the Corporation, his offer to prove his charges, on being indemnified against costs, be accepted; it being understood that such charges shall be proved in a Court of Law." Mr. Fox's letter has not been published; but the *Halifax Courier* says he still adheres to the statements and offers in his previous letters to the Town Clerk.

THE ELECTRIC LIGHTING SCHEME FOR BRADFORD.—The Bradford Corporation, in view of their scheme for erecting a central generating station for providing a regular supply of electric lighting and power, have recently issued a circular to occupiers of business premises in the central portion of the borough, inquiring whether such occupiers would be disposed to take a supply of the current regularly for a stated period—suggested as three years. So far there has been a fair response to the inquiry, though it is somewhat early to enable the Corporation to say to what extent the experiment is likely to succeed. In addition to places of business, the Free Library, the markets, and other public buildings are to be provided with electric light. It is proposed to make the supply continuous except between one a.m. and five a.m., unless otherwise arranged. With respect to price, the Corporation have determined to adopt an alternative system of charge for incandescent lamps—viz., (1) 5d. per unit, the Corporation to supply meters, if desired, at a rental of 10 per cent. on the cost; (2) by an annual charge of 20s. per lamp of 16-candle power, irrespective of the actual hours of lighting. The charge for the supply to arc lamps is to vary with the illuminating power of the lamps as required by the consumer at the rate of 5d. per unit. Ten units with incandescent lamps of 16-candle power produce an amount of illumination equal to about 1000 cubic feet of 15-candle gas. It is pointed out that the price is unavoidably higher at first than gas at its present low rate in Bradford. But against this are to be set the advantages which it is stated the electric light has over gas. The Corporation propose to carry the supply up to the buildings; the internal fittings being provided by the consumer.

* See JOURNAL, Vol. LI., p. 828.

Miscellaneous News.

PARA GAS COMPANY, LIMITED.

An Ordinary General Meeting of this Company was held last Thursday, at the London Offices, 16, St. Helen's Place—Mr. ROBERT MORTON in the chair.

The SECRETARY (Mr. T. S. Borradaile) read the notice convening the meeting, and it was agreed to take as read the Directors' report and accounts for the half year ending March 31 (see *ante*, p. 80).

The CHAIRMAN, in moving the adoption of the report and accounts, said that but for their being in a position to declare a dividend, there would have been no meeting called that day. The working for the half year under consideration had been much more satisfactory, he thought, than in any similar period the Company had had for a number of years past. The report said that the revenue for the six months was slightly in excess of that during the previous half year, but somewhat less than the corresponding period of 1886-7. This was, however, more than accounted for by the discount of 10 per cent. which had not been allowed during the half year under consideration, which was not allowed during the corresponding period of 1886-7. The private lighting did not increase as the Board could wish, or as he had hoped it would. The Company were, as had been said before, in severe competition with kerosene; and the beautiful lamps they now had, and the excellent light which these lamps gave from kerosene, induced people to use them in preference to gas. The consideration of means to alter this state of things was constantly before the Directors; and they had evidently not succeeded by the reduction in price, or rather the discount, in doing very much. Their Managers had written to the Directors on the subject; and they hoped they might be able to do something shortly which would bring back to the Company some of the old consumers, who were using kerosene while they had all the gas-fittings in their houses, and perhaps add to the number of consumers. The second paragraph in the report showed that the expenditure had been considerably reduced in some of the most important items; and the result was a profit of more than £6400 on the half-year's working. The heavy expenditure on repairs, which was necessitated by the state of the works some three or four years ago, had practically ceased; and they were informed that, notwithstanding the comparatively small amount charged for repairs in the half year—£216 9s. 8d., as against a sum of £1000 in the preceding half year, and he thought nearly £1700 in the half year previous to that which corresponded with the one under consideration—the Manager reported that the works and the property of the Company were in good condition. Perhaps the most important paragraph in the report was that which referred to the change in the management. Mr. Hall, who, as reported at the last meeting, took charge of the works on the 2nd of August, 1887, elected to come home on the termination of his agreement with the Company. He had been three years in Pará; and he (the Chairman) might say it was a great disappointment to the Directors when he informed them that he intended returning to England at the end of his engagement. He had shown such energy and was doing so well, that they were hopeful he would continue. Although a very liberal offer was made to him, he declined it at the time. He afterwards, however, regretted it, and wrote saying that he would accept the terms offered, and remain for another three years, or, at all events, until such time as the petition to the Imperial Government, which the shareholders had before them at the last meeting, was settled in some way or other. The Board had, however, by that time engaged a successor to Mr. Hall; and he had now come home. They had obtained some valuable information from him with regard to the position and working of the Company. In his place, as they saw, Mr. J. Gibson Newbigging had been appointed. He was the son of Mr. Thomas Newbigging, of Manchester—a man well known in the gas world, and who was himself for some years, a Manager in Brazil, and a successful Manager. His son was at that time a lad, and was quite conversant with the Portuguese language, which, however, he had lost before he went away. The Board hoped that, having had a knowledge of it when he was younger, it would help him in re-acquiring it. He wrote hopefully of the concern, although at the same time evidently appreciating the difficulties he had to contend with; and the Directors were hopeful that what he was doing would result for the benefit of the Company. The next paragraph in the report referred to the petition which he had already mentioned; and the amount of routine and red-tape which was attached to all these things was very harassing and disappointing to the Board. It seemed that it could not be pushed forward faster than had been done. They would notice that the repayment of duties had received the attention of the Provincial Government; and a speedy settlement of this matter was anticipated. The Board hoped nothing would come in the way to prevent it. Then they referred again in the report to the fines. He (the Chairman) was tired of speaking about this; but the Provincial Government were evidently not tired of inflicting them; and they went on from month to month in a way which—well, he had characterized it several times before, and he did not intend to refer further to it than to say, that the vigorous action which Mr. Hall took before he came home was about to be repeated by their new Manager—Mr. Newbigging—and whether this would result in anything more beneficial to the Company than the last remained to be seen. The question of a new contract continued very much as it was when the shareholders last met. The agent in Pará, who was working it for the Company, was at present in this country, or on his way to it; and the Directors hoped to see him, and learn something more definite as to the prospects of its passing the Assembly either sooner or later. In conclusion, he need scarcely say he was pleased to be in a position to propose a dividend, though it was a small one. He begged to move—"That the report and accounts of the Directors to the shareholders, as presented, be and are hereby approved and adopted."

Mr. A. H. HENRY seconded the motion. He observed that there was one question to which the Chairman had not drawn attention, and that was the exceptional expenditure the Company were liable to, compared with English Companies, in providing houses with gas-fittings, which they were obliged to do. They did not get much credit for this, and had to write off a large amount for it.

Mr. G. BLUNDELL remarked that the question of fines seemed to come up at all their meetings; and he thought it would be well if the Chairman would give the shareholders some information as to this matter, so that they might have some idea as to what steps should be taken to protect themselves from them. It was difficult for the Board to deal with this question, because the Provincial Government seemed to have some sort of arbitrary power which it was hard to fight. If the matter was put a little more prominently forward, to show the basis of the claims, he thought perhaps it would go some way to open the eyes of the shareholders on this side as to what, as the Chairman said, was something permanent, and something which the proprietors considered as most unjust.

The CHAIRMAN said he did not think Mr. Blundell could have been at the last meeting. The matter he referred to was fully put before the shareholders then, in considering the petition which was addressed to the

Imperial Government at Rio. The Secretary had just handed him a report of that meeting, which contained an extract evidently from the report of their Manager, and he might first mention that there were some three or four men called Rondas, who went round, in the interests of the police, every night. They were supposed to go round; but whether they went or not, they made statements which caused the infliction of fines. In the report to which he referred, the Manager said:—"We also found the Police Rondas inspecting the illumination of certain streets from corners thereof, considering, when one lamp happens to be a little farther apart than its neighbours, that between these there must be a lamp out, which is duly noted—'Tab Street, three lamps out'—and the Company is fined. On these occasions, I have insisted on seeing the lamp without the light, and found that not even a lamp-post existed. On other occasions we have had the greatest difficulty in convincing the Police Rondas that the lamp in front of the Café Chic, Largo de Polvora, could not be considered a public lamp out, nor those of the Company's station in Estrada Independencia as public lamps with small lights, seeing that in both instances they belong to private parties and consume kerosene." The Company had had no complaint for three years as to the quality of the gas. It was simply as to small lights and lights extinguished. All the lamps might be fully alight at seven o'clock at night, and then five minutes afterwards, through a tropical shower, half of them might be out. They considered that this was a circumstance over which they had no control. At the same time they were not allowed the benefit of it; and were fined accordingly. It was not only for the small lights, but what the Rondas, who had no technical knowledge, chose to fine for.

The motion was then carried unanimously.

The CHAIRMAN moved the declaration of a dividend at the rate of 7 per cent. per annum (less income-tax) on the £5 per share called up on the preference shares for the half year ending March 31, to be payable on the 1st of August.

General TUPPER seconded the motion, which was agreed to.

The CHAIRMAN moved that a dividend at the rate of 4 per cent. per annum (free of income-tax) on the ordinary shares of the Company be declared.

Mr. HENRY seconded the motion and it was adopted.

Mr. ENNIS, in moving a vote of thanks to the Chairman and Directors, said the accounts obviously showed a great improvement. They obtained a dividend larger than they had received for a number of half years past; and a more gratifying fact was that the dividend might have been at the rate of 8 per cent. per annum, but the Board had judiciously kept it at the lower figure.

The CHAIRMAN briefly replied; and said he was sorry the Board felt so impotent, being so far from the seat of operations. They could not help this, however; but would endeavour to do the best they could under the circumstances.

EDINBURGH AND LEITH GAS COMPANY.

The Annual Meeting of this Company was held on Monday last week—Ex-Bailie TAWSE in the chair.

The TREASURER (Mr. J. S. Gibb) read the Directors' report, which stated that, after deducting £15,000 for dividend declared, the year began with a balance in its favour of £8253 5s. 4d. As it was expedient, while the negotiations for transfer were in progress, to keep the business profits for the year to May 15 last intact, the Directors took from this balance, towards meeting parliamentary expenses, £1121 17s. 2d.; leaving £7131 8s. 2d. to be carried forward. The net profit on last year's business was £26,313 16s. 1d. These two sums gave a gross amount of £93,445 4s. 3d. From this, the Directors recommended that a dividend at the rate of 10 per cent. per annum, free of income-tax, be declared—one-half to be payable on Aug. 1 next as usual; and, in view of the transference of the Company to the Corporations, and the terms of that transference, the balance at such time as the Directors may afterwards appoint. Before bringing out the above balance on the year's transactions, there had been deducted the whole year's expenditure, including a full allowance for the maintenance, repairs, and replacements of works and plant, as well as for all other outlays chargeable against revenue. The parliamentary expenses could not be ascertained as at May 15, beyond what is mentioned above; and therefore remain to be met. The Directors desired also to draw special attention to the Manager's report on the excellent state of the works and plant, as indicating the principal causes, combined with economy in management, of the highly gratifying results of the year's business. These results the Board acknowledged were very largely due to the foresight, skill, and professional capacity of the Manager. The Directors recommended that, in view of the winding up of the Company, the accounts that have been kept under the heading of the tear and wear fund, the meter renovation fund, and the accident insurance fund, together with the net balance brought forward at the beginning of last year, being profits of former years that have been expended on the works and plant of the Company, and are now represented by works and plant and not by cash, should be closed and adjusted. This will not at all interfere with the profit of the year now closed; while the balance will then be about met by cash at the bank, or by debts due to the Company. Referring to the transfer of the works, the Directors said that, after a year of much anxiety and very difficult and delicate negotiations with the Corporations of Edinburgh and Leith as to the acquisition of the Company's undertaking, an agreement had been come to within the last fortnight which they regarded as fair and reasonable for both parties. If the Bill of the Corporations was passed as now proposed, the works would be under their charge as from Aug. 1 next; but the Company would continue for the purposes of winding up.

In his report, the Manager (Mr. F. T. C. Linton) first referred to the extensions and additions at the works, authorized in the spring of last year. These, he stated, were finished in the autumn; and the re-construction of the works which the Board had had steadily in view for the past five years, was thereby completed. The works were now equipped throughout with apparatus and plant of the newest and most approved description. They were capable, at the present moment, of dealing with a largely increased manufacture of gas; and for a very moderate expenditure, they could be made adequate for double the present business of the Company. The result of the reconstruction had been to reduce, year by year, the cost of the manufacture of gas. During last year the whole of the manufacture was for the first time effected with the improved apparatus; and therefore the economy arising therefrom could now be exactly ascertained. In the year 1883-4—the year prior to the commencement of the reconstruction—the cost of each ton of coal carbonized was 15s. 2d., and the cost per ton for the manufacturing charges was 6s. 10d.; making for coal and manufacturing charges 22s. per ton. During the past year these costs had been 11s. 1d. and 5s. 8d. respectively; making for coal and manufacturing charges 16s. 9d. per ton, and showing a saving of 5s. 3d. per ton of coal carbonized, as compared with 1883-4. The quality of the gas supplied to the public was 26.69 candles on an average in 1883-4, and during the past year 28.13 candles; so that the reduction in cost had been coincident with an increase in quality to the extent of 1.44 candles. This saving was not

due to any reduction in the price of coals, as the prices of individual coals were generally higher in 1887-8 than in 1883-4. It was entirely owing to the new carbonizing plant, permitting certain cheap canal coals to be largely used (which, with the ordinary retorts, could be used only to a very limited extent), and to the saving of labour with the new apparatus. On the quantity of coals used (39,744 tons), the saving amounted to £10,433, and showed, in a very striking manner, the wisdom of the policy adopted by the Board of keeping the works abreast with modern improvements. The other works and plant were in a thoroughly efficient condition, as regards the gasholders, main-pipes, and service-pipes. This was amply proved by the continued reduction in the quantity of unaccounted-for gas. In the past year this was only 7.63 per cent of the gas made.

The accounts showed a total charge of £234,720 14s. 11d. The gross revenue was £79,058, of which £64,620 16s. 2d. was derived from the sale of gas and meter-rents, and £14,438 16s. 4d. from the sale of residual products. Coals and lime cost £23,225; and the maintenance of works and plant, with replacements, £4047 14s. 2d. The heritable property and works and plant, with meters, were stated at the value of £204,905 4s. 1d.

The CHAIRMAN, in a speech of some length, moved the adoption of the report and balance-sheet.

The DEPUTY-CHAIRMAN (Mr. C. S. Chalmers) seconded the motion, which was unanimously adopted.

On the motion of the CHAIRMAN, the provisional agreement between the Company and the Corporations was unanimously approved.

Mr. W. WHITE moved, and Mr. R. A. LOCKHART seconded, that a special vote of thanks be awarded to the Directors for the manner in which they had conducted the negotiations with the Corporations.

The proceedings then terminated.

METROPOLIS GAS SUPPLY.

The Chief Gas Examiner for the Metropolis (Dr. Williamson, F.R.S.) has presented his report on the quality of the gas supplied by The Gaslight and Coke, the Commercial, and the South Metropolitan Companies, during the quarter ending June 30. The following is an abstract:—

I. *With respect to Illuminating Power.*—The average illuminating power, in standard sperm candles, at each of the testing stations, was as follows:—

The Gaslight and Coke Company—	
Jewry Street, E.C.	16.5
Kinghorn Street, E.C.	16.7
Dorset Buildings, E.C.	16.8
Ladbroke Grove, W.	17.7
Devon's Road, E.	16.8
Carlisle Square, Chelsea	16.5
Camden Street, N.W.	16.3
Graham Road, E.	16.5
Kingsland Road, E.	16.9
Spring Gardens, Charing Cross, S.W.	16.5
Grove Gardens, Regent's Park, N.W.	16.7
Lambeth Road, S.E.	16.5
Millbank Street, S.W. (canal gas)	20.8
Commercial Gas Company—	
Wellclose Square, E.	16.5
Parnell Road, E.	16.5
South Metropolitan Gas Company—	
Hill Street, S.E.	16.5
Foster Place, S.W.	16.2
Stoney Lane	16.4
Lewisham Road, S.E.	16.3
Blackfriars Road	16.2

It will be seen from these results that the average illuminating power has been higher than the parliamentary standard at all the testing stations, more especially at the Ladbroke Grove station of The Gaslight and Coke Company.

II. *As regards Purity.*—Sulphuretted hydrogen has not been present in the gas at any of the testing stations. The average amount of sulphur in other forms than this was considerably less than that allowed—viz., 17 grains—at all the testing stations, especially at the Devon's Road station of The Gaslight and Coke Company, and the Parnell Road station of the Commercial Gas Company, where it averaged less than half the quantity permitted. Two or three slight excesses of sulphur were reported during the past quarter at the Foster Place and the Blackfriars Road stations of the South Metropolitan Gas Company. Ammonia was generally present at all the testing stations (excepting those of the City of London) more or less frequently during the quarter, but only in slight quantities. On no occasion was there any excess.

GAS v. ELECTRICITY.—The *Electrical Review* says: "It is always being said that big gas companies are not afraid of the electric light; but a letter which The Gaslight and Coke Company has sent to the Kensington Vestry with reference to the Town Hall, which is proposed to be lit with the electric light, points rather to the contrary. They have written to the Vestry suggesting that an improved system of lighting and ventilating the Town Hall by means of gas should be tested, and offering to defray the cost of all the necessary fittings for trying the system in a portion of the building. Is not this the first time that a gas company has been driven to offer to do work for nothing?"

CORRUPTION OF CORPORATION OFFICIALS.—Lord Randolph Churchill has given notice of the following important new clauses to the Local Government Bill:—(1) Every person who, being a member, officer, or servant of any corporation, council, board, commission, or other public body whose expenses are wholly or in part defrayed out of local taxes, rates, or assessments, shall, by himself, or by or in conjunction with any other person, corruptly promise, solicit, pay, receive, or agree to pay or receive, by or for himself, or by or for any other person, any gift, loan, fee, reward, advantage, or gratification whatever in respect of any contract work, purchase or sale of land or property, or any other matter or transaction, or proposed transaction whatsoever in which the public body of which he is a member, officer, or servant is concerned shall be guilty of a misdemeanour. (2) Any member, officer, or servant of any board or other public body as aforesaid shall on trial and conviction for a misdemeanour under this Act be liable, at the discretion of the Court before which he is convicted, to be imprisoned for any period not exceeding two years, with or without hard labour, or to any fine not exceeding £500; and shall be incapable of being elected to serve upon (and if elected his election shall be void) any board or other public body for seven years from the date of his conviction, and in the event of a second conviction for a like offence he shall, in addition to the foregoing penalties, be forever incapable of serving upon any such board or other public body, and his name shall be struck off the list of persons entitled to vote at a parliamentary or any other election; and any such officer or servant in the employ of any such board or public body by the fact of such conviction shall forfeit his right and claim to any compensation or pension to which he would otherwise become entitled."

GAS LIQUOR WORKS AND THE ALKALI ACT.

In the JOURNAL of the 3rd inst., we dealt generally with the recently-issued twenty-fourth annual report of the Chief Inspector under the Alkali, &c., Works Regulation Act (Mr. A. E. Fletcher), and gave some extracts from the reports presented by the District Inspectors associated with him. We now complete our notice by reproducing those portions of the remaining reports in which our readers are most interested.

In the South Midland District (No. 5), which is under the control of Mr. E. Jackson, F.C.S., there were 4 gas liquor or liquid ammonia, and 57 sulphate of ammonia processes under inspection last year. Two works in which sulphate was manufactured ceased to register; but, on the other hand, three new ones, and one dealing with gas liquor, were put upon the books. The method of dealing with the noxious gases are as follows:—In 43 works they are arrested in oxide of iron; in five, they are burned in oil of vitriol chambers; in three, they are passed into the hydraulic main; and in two the Claus process, with final scrubber and purifier, is adopted. No. sulphuretted hydrogen was evolved in two works; and the remaining two were idle. At one of the five works mentioned, where burning and passing into the vitriol chambers is the recognized method of dealing with the sulphuretted hydrogen, considerable trouble was experienced in maintaining some portions of the apparatus in repair, when this method was resorted to. Difficulties of an unusual character were met with; and it has resulted in resorting temporarily to burning the sulphuretted hydrogen, and sending the sulphurous acid into the chimney, pending a more effectual method of treatment which is now under consideration. This is the only work in the district where one of the methods above referred to is not now used. At eight works additional oxide of iron purifiers were added during the year, to ensure greater safety in working. We learn that caking of the oxide of iron on the girds has become less frequent, owing to more effectual condensing space at works where it was deficient. The extension of the use of coke scrubbers for drying the gases before entering the purifier still continues; they are employed at nine works in the district for this purpose. The yield of sulphate of ammonia per ton of coal carbonized in the best works, and where coal is moderately rich in nitrogen, is 30 lbs., and even 31 lbs. have been obtained. The general adoption of one of the methods above described for arresting the sulphuretted hydrogen given off in the manufacture of sulphate of ammonia has resulted in a considerable reduction of sulphur acids escaping into the atmosphere throughout the district. When this class of works were first brought under protection, it was found that there were only seven cases in this district where any provision was made for dealing with the foul gases other than the combustion method—i.e., burning the sulphuretted hydrogen, and sending the resulting sulphurous acid into the atmosphere (or, still worse, permitting the sulphuretted hydrogen to escape unburnt). It may prove interesting to put into figures the saving thus effected by arresting the sulphur compounds generated over burning and sending into the atmosphere, as showing the beneficial operation of the Act. The gas water in this district may be taken as containing 0.50 per cent. available sulphur. In some instances it is as low as 0.25 per cent.; while 0.80 per cent. has also been found. Through the kindness of the managers, I am able to state that, taking the average of six typical works, 2500 gallons of gas water have been required to produce a ton of sulphate of ammonia. The total sulphur acids now arrested are equivalent to 2070 tons of sulphuric anhydride, or 828 tons of sulphur—a figure equal to the recoverable sulphur from vat waste in a moderate-sized alkali works. This to the sulphuric acid and sulphate of ammonia manufacture is equal to 2526 tons of oil of vitriol; and from the sulphate of ammonia produced in the district, gives a saving of 24 per cent. of the sulphur required to produce the oil of vitriol used, taking 15 owt. of oil of vitriol per ton of sulphate of ammonia. I may remark that there is one work in the district where it is claimed that from 20 to 25 per cent. of the sulphuric acid required for the sulphate of ammonia works is obtained from this source. In other works, where the sulphuretted hydrogen is burnt and sent into the oil of vitriol chambers, the quantity of sulphur from other sources—such as coal pyrites, spent oxide, &c.—is not accurately known, so that the distinct saving cannot be ascertained. As regards the total oil of vitriol thus recovered, it may not appear to be a large figure, considering the area over which the works representing the total are spread. I give, however, three works, showing the amount of oil of vitriol kept out of the atmosphere in the vicinity of the works in each particular case in a year (such works are usually only in operation from six to nine months of the year, so that the quantities given below would be spread over a shorter time):—(1) Large work, situated in an important residential suburb of a large town; 211 tons of oil of vitriol kept out of the atmosphere per annum by adopting a method for arresting sulphuretted hydrogen. (2) Large work, situated in an agricultural and manufacturing district; 259 tons do. (3) Large work, situated in a populous portion of the town; 616 tons do. Feldmann stills are now in operation at four works in the district, and others are in course of erection. One work (No. 1542) is selected by Mr. Jackson for special mention. The manager has erected a Simons or Grüneberg still. The gas liquor is pumped up into a tank large enough to hold a 24 hours' supply, from which it gravitates to the still, passing on its way through a superheater, whereby the waste heat from the saturator is utilized, and delivering the water into the still at about 180° Fahr. The saturator is of a usual pattern. The foul gases are made to pass through a series of iron pipes air-cooled; and the sulphuretted hydrogen and carbonic acid enter a Claus kiln, and pass on into the chamber, where the sulphur is deposited. The residual gases, on leaving the chamber, go into a vertical scrubber packed with limestone kept moist with water, where any sulphuretted acid is taken up, and thence into an open oxide of iron purifier to arrest any sulphuretted hydrogen. The rate of make is equal to 1 ton of sulphate of ammonia per day. The air is carefully measured. The sulphur-kiln has not yet been emptied. The acidity of the exit gases, when examined, has been found 1.10 grains of total acids as sulphur trioxide per cubic foot; but sulphuretted hydrogen is always present in distinct quantity. At another works, where the Claus method is also in operation as far as the ultimate result is concerned—preventing the escape of noxious gases—the apparatus has been quite a success; but as regards the Claus process proper, the gases entering the scrubber and leaving the chamber have possessed very variable and high acidities. The experience of the previous year was confirmed—both sulphuretted hydrogen and sulphurous acid escaping together. As to the general condition of the sulphate of ammonia apparatus, it has been maintained in very fine order. At another works, the Claus apparatus has only been in work for a short period, and the plant is now undergoing considerable alteration. So far it appears better to work this process with a trace of sulphurous acid at the exit, since with the admission of a slight excess of air sulphuretted hydrogen is almost always found; thus keeping the sulphuretted hydrogen in slight excess it is arrested in oxide of iron, whereas if sulphurous acid escapes it is absorbed in the alkaline scrubber, and so sulphur is lost. Mr. Jackson thinks that a little more experience with the peculiarities of the process may perhaps result in a more approved form of kiln, whereby the curious point of

sulphuretted hydrogen and sulphurous acid escaping together in considerable quantities may be prevented.

Coming to the south-west of England and South Wales (district No. 6), we find from Mr. Fryer's report that many improvements were carried out last year in the plant connected with the manufacture of sulphate of ammonia. Particulars are given of these alterations. There are 61 works registered where the manufacture of muriate and sulphate of ammonia is carried on; and these produced about 6500 tons of sulphate during the year. The average of the purifiers in this district shows that 82 cubic feet of oxide of iron, occupying 54 square feet of area, are employed per ton of sulphate made per week. A continuous system of distillation is in use at some of the works, while an intermittent system is employed in others. The manufacture of sulphate was commenced at two works which were previously under inspection for other processes; and two new works applied for certificates during the year. One of these is a small works where not more than 400 tons of coal are carbonized per annum; and sulphate plant was erected there by Mr. John J. Jervis, Manager of the New Swindon Gas Works. A coke scrubber is made use of instead of the enormous length of cooling and condensing pipes usually considered necessary. The purifier merely consists of a heap of oxide of iron; and the pipe conveying the sulphuretted hydrogen is brought through the centre of the heap downwards, terminating in four radiating channels made by loose bricks covered with an ordinary purifier grid. This form of purifier, Mr. Fryer says, is not only simple and inexpensive, but performs its work effectively.*

Owing to the ill-health of Mr. Brereton Todd, the Inspector for district No. 7 (the south-east of England), he was temporarily relieved of a portion of his duties; the north-eastern counties being given to Mr. F. N. Sutton, F.I.C., F.C.S., an Assistant of the Chief Inspector. In the district reported upon by Mr. Todd, there were last year 31 sulphate of ammonia works registered, in which 4219 tons of salt were made. The sulphuretted hydrogen which had to be dealt with in these works had previously been so mixed with vapour that there was some difficulty in getting it dry enough for decomposing. The coke column recommended in the previous report for retaining or condensing this vapour has been so effectual, that Mr. Todd thinks it will soon be in general use. In many of the works it has already been adopted. He considers it is the greatest improvement made since the process came under inspection. There was only one complaint last year, which was investigated in August by the Chief Inspector. Although the owner did not believe that his works were the cause of it, Mr. Todd felt convinced it was the result of his men neglecting to keep sufficient fire during the night for burning the sulphuretted hydrogen. The owner has, therefore, now erected two large oxide purifiers. During the six years that sulphate of ammonia works have been under inspection, there have been only two complaints, both being about works in which the sulphuretted hydrogen was burnt instead of being decomposed in an oxide purifier. Particulars are given of the methods employed for testing the vapour and sulphuretted hydrogen generated during the manufacture of sulphate of ammonia.

In the portion of the district under Mr. Sutton's inspection, there are 33 sulphate of ammonia works, in which 29,906 tons of sulphate were produced last year. Many important improvements were effected in the plant; and the general condition of the works is reported as satisfactory, although alterations are required in several. Mr. Sutton confesses that he was not able to bestow very much attention on this class of works during the year, owing to want of time. But he gives the following particulars as to the works he visited. The Claus sulphur-recovery process was erected, and is now being used at one large works; but at present it is not altogether satisfactory as regards the means of absorbing the final gases escaping from the depositing chambers. It is a great improvement upon the former method employed in dealing with the foul gases; the output of sulphate being large, and the sulphuretted hydrogen having been formerly burnt in the boiler fire. Another large works has since June been experimenting in burning the sulphuretted hydrogen direct into the vitriol chambers, instead of absorbing it in oxide of iron, and then burning. The experiment has been so successful that lately the whole amount of sulphuretted hydrogen produced has been burnt into sulphurous acid, and converted into sulphuric acid direct; thus saving a considerable sum in the cost of labour. As the process has only been working for a few months, it cannot yet be definitely pronounced a permanent success. Another Claus plant is being erected at a gas-works which is about to commence the manufacture of sulphate of ammonia. At one works a new and improved kiln has been built for burning the sulphur gases from the saturator; the resulting sulphurous acid being made to raise steam by passing through the flues of an old Cornish boiler before entering the Glover tower on its way to the oil of vitriol chambers. The absorption of sulphuretted hydrogen in oxide of iron at some of the works is unsatisfactory, chiefly on account of insufficient cooling plant; the gas entering the oxide too hot, and saturated with moisture. Where coke scrubbers have been adopted, all such difficulties have been entirely removed. To give an example of the effect of coke in reducing the temperature and moisture of gases, at one works, where the cooling plant itself is somewhat small, an iron cylinder 30 feet high by 4 feet in diameter, filled with coke, was erected. This is unnecessarily high; it being an old disused piece of plant which was made use of for the purpose. The gases are hot on entering this, but perfectly cold and dry when leaving it. Each of the two purifiers is 9 feet by 4 feet by 6 feet deep, having a single bed of oxide 5 feet thick, which only requires changing once in six months; the make of sulphate for that time being 20 tons. No trace of caking or back pressure is noticeable; and the oxide is very rich in sulphur on removal. Many of the works still burn the foul gases from the saturators; but in five cases only can they be said to be thoroughly burnt. At two of these works, the resulting sulphurous acid passes to the vitriol chambers; at the other three, a special kiln is employed, having three flues one above another. The gas enters quite cold at the bottom with an excess of air, and burns continuously; a gas-jet being so placed that the sulphuretted hydrogen cannot fail to burn. The gas-jet is only a precaution which is rarely needed; for the fire-brick lining of the flue is always at a bright red heat, and no escaping sulphuretted hydrogen has ever been noticed. The average acidity of two of the chimneys connected with these flues is 1 grain and 1.15 grains as sulphur trioxide per cubic foot of the gases. In all other cases the system of burning the gases cannot be commended; and it is to be hoped many of these works will during next year adopt the method of arresting their sulphuretted hydrogen in oxide of iron.

It now only remains to deal briefly with the report on Scotland, where, as already stated, 65 processes relating to the manufacture of sulphate and muriate of ammonia were under inspection last year; 31,668 tons of sulphate being made. In regard to the gas-liquor works, Mr. W. S. Curphey (the co-Inspector with Dr. Blatherwick) stated that the use of the oxide of iron purifier is being extended; and in five works this method of dealing with the noxious gases was adopted during the year. The number of smaller works where burning of the gases is still con-

tinued is considerable. The average results of tests taken in these cases shows an acidity equivalent to 0.36 grain of sulphur trioxide per cubic foot. This is a low figure even for coal smoke, and is attributable in part to small escapes of ammonia, which in one instance was observed to entirely neutralize the acidity of the chimney gases. Continuous stills in the larger works are gradually displacing the older boiler-like form, in which each charge is worked off separately. In the former, the production of noxious gases is uniform throughout the operation—thus facilitating their destruction; in the latter, the production of noxious gases is very irregular—the chief portion being driven off in the early part of the distillation.

THE GAS AND CHEMICAL WORKS OF THE LEICESTER CORPORATION.

Last Thursday week, on the invitation of the Chairman of the Gas Committee of the Leicester Corporation (Alderman E. Wood), the members of the Town Council and a number of other gentlemen inspected the extensions now in progress at the Aylestone Road gas-works, and also the chemical-works, of the Corporation. The party were accompanied by the Gas Engineer (Mr. A. Colson, Assoc. M. Inst. C.E.). In connection with a notice of this visit, one of the local papers gave the following particulars as to the works:—

The determination to enlarge the Aylestone Road works, in order to place the Gas Committee in a position to meet the anticipated demand for gas, was come to by the Town Council, on the Committee's advice, in the early part of last year. In a report submitted by Mr. Colson, it was shown that the maximum daily consumption of gas had increased from 3,620,000 cubic feet in 1883 to 4,947,000 cubic feet in 1887, and that the existing works, both at Belgrave Gate and Aylestone Road, should not be relied upon to maintain the supply beyond the winter of 1889 and 1890. The Committee were authorized to erect at Aylestone Road, according to plans submitted by the Engineer, a second section of the works, which, when completed, will be capable of manufacturing and delivering an additional $\frac{1}{4}$ million cubic feet of gas per day. The estimated cost of the works is £150,000. But it is neither necessary, nor is it the intention of the Committee, to spend at present more than £100,000, as with this expenditure the works can be made capable of meeting the demand for gas for five or six years, after which the remaining £50,000 will be expended to complete the works as the consumption of gas increases. The works (with which good progress has been made) have been designed with the view to the utmost economy of labour in working. The whole of the retorts will be placed in one house—a stage house—measuring internally 368 feet long and 80 feet wide; and when finished it will be 43 feet from floor-line to roof. At present the building is only about 25 feet high; but Mr. Colson anticipates having it roofed in before Christmas. The house will contain 240 retorts, each 22 feet long, all of which will be heated by regenerator furnaces, and will be capable of carbonizing 400 tons of coal per day, equal to a make of about $\frac{1}{4}$ million cubic feet of gas. On either side of the retort-house are coal-stores, 50 feet wide, running the entire length of the house. The coal will be delivered direct into the stores by overhead railways, and deposited in front of the retorts through suitable openings in the division walls between the retort-house and coal-stores. In designing the retort-house, care has been taken to make it suitable for any kind of stoking machinery it may hereafter be advisable to adopt. In the spacious coke-yards on either side of the house, railway sidings have been laid down, and wagon-docks constructed for the convenience of loading coke opposite; and within a short distance of the retort-house will stand a fine block of buildings, consisting of boiler and engine rooms, fitting and carpenters' shops, smithy, foreman's office, workmen's wash-house, baths, and mess-room; also (with a separate entrance) a good reading-room. At present only the foundations of this block are in. Nothing, as yet, has been done towards the erection of either condensers, washers and scrubbers, engines and boilers, or purifying plant. The erection of the latter the Committee will defer as long as possible, in order to see the results of various experiments now being made in different parts of the country with the object of the more complete elimination of the sulphur compounds. Some of the experiments have proved so far successful that the Committee are sanguine of being able to supply gas from their new works, when completed, of far greater purity than has hitherto been done, either here or elsewhere, and this by processes that will not create any nuisance whatever. Two gasholder tanks are practically finished. They are 200 feet in diameter and 38 feet deep, and are built of brick and stone, concrete and puddle. The holders will each contain 2 $\frac{1}{2}$ million cubic feet of gas. The Committee expect to have the works ready for making gas in the early part of the year 1890; but one holder will be completed by next summer. The total productive capacity of the Aylestone Road works when the present extensions are completed will be a little over 7 million cubic feet per day.

The chemical-works, the erection of which was commenced in 1885, were completed last year. They are placed at the back of the gas-works, at the extreme end of the land belonging to the Gas Committee, and abut upon the River Soar. The object of so placing them was not only to secure good river frontage, but also to locate the works as far as possible from all dwellings. Here the ammoniacal liquor is worked up into sulphate of ammonia and sulphur; while the tar, crude naphtha, heavy naphtha, light oil, carbolic acid, creosote, green oil, anthracene, naphthalene, and pitch are produced. The best modern appliances have been provided, and the most approved methods are adopted in the manufacture of these products; and so carefully are the various operations carried on that practically no nuisance whatever arises therefrom. In the centre of the works is a small plot of ground, cultivated, with the object of ascertaining whether anything is given off in the manufacturing processes in any way detrimental to vegetation. Here are to be seen growing in as healthy and flourishing a condition as in any country garden a variety of flowers and vegetables. The total cost of the works was a little less than £20,000, which sum included the widening of the River Soar and the construction of wharves and a railway siding. The works have been visited by many deputations from all parts of the country, and are considered to be quite model works and second to none. The chemical manufactory at the old works at Belgrave Gate has, since the opening of the new one, been entirely abandoned and dismantled.

After the inspection, the party took luncheon in a marquee erected on a field adjoining the chemical works. Alderman Wood presided, and, in responding to the toast of "The Health of the Chairman and Members of the Gas Committee," said the consumption of gas in the borough during last year was a little more than 900 million cubic feet, and their present rate of progress would bring them up to nearly 1000 millions this year; so that the Gas Committee were not behind in their duty when they recommended the extension of the works they had seen that day. The progress of the gas-works had been a fortunate thing for the borough. Since the Corporation had acquired the works, the price of the gas had been reduced from 2s. 10d. in the borough and 3s. 4d. in the outlying districts, to 2s. 4d. in the borough and 2s. 8d. outside; and this meant an annual reduction of £18,000 to the customers of gas. In addition to this, although they gave £250,000 premium for the works, they had contributed £150,000

* The apparatus here referred to was described by Mr. Jervis at the meeting of the South-West Association in March last (see JOURNAL, Vol. LI., p. 553).

in a period of 2½ years to the reduction of the rates, had accumulated a reserve and renewal fund amounting to nearly £20,000, and paid off £35,000 of the capital. He asked those present to judge whether the character and stability of the works had not been fully maintained while this was being done. Nor had it been effected at the expense of the men employed by the Gas Department. The wages of the men in 1881 were 16s. a week; last year they averaged 29s. a week, independent of the officials. So that fair attention was paid to the remuneration of those who "bore the burden and heat of the day." Alderman Wood then referred to the change in the management which took place a few years ago. He was gratified to say that not a single member of the Committee, so far as he knew, had any cause to regret the appointment of their present Engineer. Mr. Colson had devoted himself as far as possible to labour-saving appliances; and by one alteration alone saved his salary twice over every year. He paid special attention to the chemical works, and prepared plans and recommended them to the Committee. They were adopted and carried out without a single penny for "extras," or a single accident; and the present extension of the works, involving an outlay of something like £150,000, was being done entirely under the superintendence of their Engineer. He thought they would feel, therefore, that the greatest possible credit was due to Mr. Colson. He was there early and late; and the credit of the success of the department was largely due to the industry and ability of their Engineer.

ARBROATH GAS CORPORATION.

THE PAST YEAR'S WORKING.—PROPOSED EXTENSION OF THE WORKS.

The Annual Meeting of the Arbroath Gas Corporation was held last Thursday—Provost Anderson in the chair. The accounts for the year ending the 31st of May last, with the Auditor's report thereon, were submitted. From the abstract of the accounts it appeared that the revenue from gas during the year was £8341 15s. 2d.; from gas meters, £281 5s. 10d.; tar sold, £362 2s. 9d.; cinders sold, £49 9s. 3d. Except on meters, there was an increase on all these items. On the year's working there was a surplus of £180 2s. 2d., as against a surplus of £41 18s. 6d. last year.

Mr. CARGILL, Convener of the Finance Committee, said the accounts showed a saving during the year on materials of £44 17s. 3d., on the retort account of £59 4s. 3d., and on the meter account of £24 19s. 2d. In the pipe account there was an increase of £30 14s. 2d., explainable by additional mains having been laid down in new streets and renewals. Salaries and wages showed an increase of £71 12s. 8d. The explanation given of this by the Manager (Mr. R. S. Carlow) was that had there been more work done in connection with the retorts, and the wages paid for this work should have been debited to the retort account, instead of to the general wages account. On rates and taxes there was an increase of £23 9s. 1d. The interest account had decreased £12 10s. 9d., owing to certain annuities having been paid off. A sum of £200 had been charged for repairs during the year; £85 2s. 11d. had been credited to the account for consumers' share of profits; and there was in addition £64 3s. 7d. of previous balances at the credit of that account. The total revenue for the year was £8623 1s.; being an increase of £406 15s. 5d. on the previous year. This large increase was accounted for by there having been no rebate allowed, and also by there having been paid close on £200 for the increased quantity of gas consumed in the street lamps. Mr. Carlow's estimate for the latter had proved to be correct. The result of the whole transactions was a credit balance of £180 2s. 2d., one-half of which went to the Town Council for public improvements, and the other half to the credit of the Gas Commission and to the consumers by way of rebate. The property account had increased by £172 3s. 5d., and now stood at £10,817 6s. 9d. Upon the whole, he considered the year's account very satisfactory. Turning to the estimates for next year, he found that they showed a credit balance in favour of the Corporation of £225, which would have been increased by £200 had they not deemed it advisable to credit the sinking fund with £400 instead of £200, in view of the surplus anticipated for the current year, and the largely increased expenditure on the proposed extension of the works. The estimates were less upon the whole, especially on the items of coal and lime; the saving on which alone would be about £300. In conclusion, he formally moved the approval of the report.

Baillie KEITH seconded the motion, and it was adopted.

The estimates for the ensuing year were approved of; and, on the recommendation of the Committee of Management, it was agreed to fix the price of gas at 4s. 3d. per 1000 cubic feet (being the same as last year), and to allow a rebate of 1d. per 1000 cubic feet to consumers, which would leave a balance of £11 12s. 8d. at the credit of this account.

The CLERK (Mr. D. Chapel) read the report of Mr. R. Mitchell, Engineer of the Edinburgh Gas Company, who had been requested by the Corporation to inspect the works, and give his views on the report of the Sub-Committee respecting the proposed extension of the works at a cost of about £7000. Mr. Mitchell stated that he had visited Arbroath on three occasions, and had very carefully examined the gas-works and adjoining property of the Commission, and was in a position to consider fully the recommendations of the Sub-Committee for rendering the works more efficient; thereby increasing the productive power, so as to meet the requirements of the town for a considerable number of years. In taking up the report, he would for convenience sake follow the whole question in the order dealt with by the Sub-Committee. First as the erection of new works. Had the present works of the Commission been in a dilapidated condition, whereby a large outlay for renewal would have been required in a few years he would have recommended, without hesitation, that such expenditure should be laid out upon a new site; and no piece of ground was better adapted than the town land or that adjoining, where a connection with the railway could be easily formed, thereby saving all cartages, and having additional advantages in disposing of the refuse. The residual products, too, could either be sent off by rail, or manufactured on the spot. A better supply of gas to the low-lying part of the town could also be satisfactorily secured with a smaller initial pressure at the works. Notwithstanding all these advantages, however, it did not appear to him that such an expenditure at the present time would be either judicious or prudent, owing to the high state of efficiency of the present works. Next as to regenerative furnaces. He considered that for works like those of the Arbroath Corporation, the setting of eight retorts recommended by the Sub-Committee would be quite unsuitable. No matter what overlapping, with smaller settings, might be made, they could not possibly work the setting in the same continuous manner as could be done with a setting of five retorts. As to additional storage, he agreed with the recommendation of the Committee that a new gasholder and tank should be constructed on the vacant piece of ground adjoining the present large holder, and that provision should be made in its construction for its being telescoped at any future time if found necessary. He also agreed with the Committee as to the desirability of having additional purifying space. Not only were the present purifiers in a dilapidated condition, but they presented too small an area for the quantity of gas requiring to be passed. He considered the estimate of saving given by the Manager in the event of new purifiers being erected very moderate indeed, and should be inclined

to say that the saving would not be less than £100 per annum. He agreed with the Manager and the Sub-Committee in their proposal to lay an independent main direct from the works to the lowest parts of the town; and recommended that it should be proceeded with at the earliest convenience of the Commission. In conclusion, Mr. Mitchell stated that the arrangements made by the Commission for financing the cost of the extensions were to his mind thoroughly satisfactory. The Committee of Management recommended (with one dissentient) that the Corporation should adopt the Sub-Committee's report as qualified by Mr. Mitchell's report, with the exception that the suggestion of the latter in regard to the setting of the retorts be not adopted; and that, as recommended by the Sub-Committee, eight retorts should be put in one oven, and that the final decision as to the proposed extension of the works should be deferred one month to allow of further consideration of the matter. After some conversation, the Committee's recommendation was adopted.

THE ROCHDALE GAS COMMITTEE AND THEIR GAS MANAGER.

MR. BRAY'S CHARGES AGAINST THE COUNCIL OF THE GAS INSTITUTE.

At the last Meeting of the Rochdale Town Council—the Mayor (Mr. J. E. Petrie) presiding—the Gas Committee presented the following resolution:—"The Committee, having listened to Mr. Ball's explanation of his connection with The Gas Institute, and of his share in the doings of the Council of that Institute with regard to the matters published by Mr. George Bray in pamphlet form, and distributed to members of this Corporation, resolved that the Committee are perfectly satisfied with the explanation of Mr. Ball."

Alderman PETRIE, in answer to a request for further information, explained the origin of the difference between Mr. Bray and the Council of The Gas Institute, and pointed out that it was four years after the Crystal Palace Exhibition when Mr. Ball was elected a member of the Council. All he had had to do in the matter was voting against Mr. Bray's proposal to appoint a Committee of investigation. It was a matter of opinion on Mr. Ball's part; and the Committee could not find fault with him in voting according to his judgment. At any rate, they saw no connection between anything he had done there and his work as the Manager of the Rochdale Gas-Works; and, having this view of it, the Committee were perfectly unanimous in saying that Mr. Ball's explanation was satisfactory.

Mr. SHARP asked if the Corporation subscribed anything to the Crystal Palace Exhibition.

Mr. HANDLEY: Do the Committee intend to ask Mr. Ball to withdraw from the Institute?

Alderman PETRIE: He is no longer on the Council. Mr. Handley wishes to know if we asked, or did we think of asking, Mr. Ball to retire from the Institute on account of what he has done. [Mr. TOPPER: Or what other people have done.] Certainly not. As to Mr. Sharp's question, I am not aware that we subscribed a shilling to the exhibition.

Mr. HANDLEY said he had carefully read through Mr. Bray's pamphlet; and as that had now become public property, the Council ought to make some inquiry as to the truth of the allegations therein made. He thought very highly of Mr. Ball as a Gas Manager; and he believed that Mr. Ball would see it to his credit and advantage in every way to withdraw from the management of the Institute.

Mr. WATSON did not think the Council had anything to do with the personal dispute between Mr. Bray and any members of The Gas Institute. He objected to the Council entering into the matter, considering that Mr. Ball did not go on the Council till four years after the exhibition, and that he was not now connected with the management of the Institute in any way.

Mr. W. LORD said he was not completely satisfied with the report of the Committee's investigation. He did not consider the Council should enter into the matter of the dispute between Mr. Bray and the members of The Gas Institute; but he certainly thought there was room for further explanation as to the position which Mr. Ball occupied in relation to the Institute. He thought the Committee might perhaps investigate a little further, and place the ratepayers in a better position to judge of the matter.

Mr. KERSHAW remarked that they could only inquire into the matter by hearing both sides; and this would mean great expense. Even if they did that, he thought they would get no nearer in the end. He did not think Mr. Ball was to blame for anything he had done.

Alderman LITTLEWOOD said that at the last meeting of the Council he voted against the proposed increase in Mr. Ball's salary, not because he objected to it *per se*, but on the broad ground that it was inadvisable to increase the salary of any public servant who was under the shadow of, it might be, a distant imputation. He was sorry the explanation now given could not be furnished at the last meeting, as he could then have supported the proposal to increase Mr. Ball's salary. As the Chairman of the Gas Committee had said, the Council had nothing to do with the dispute between Mr. Bray and the members of The Gas Institute, against whom he made certain charges. All they were concerned with, as members of the Council, was Mr. Ball. It appeared that his transactions had simply been that, on the Council, he voted with those gentlemen as to whose conduct Mr. Bray wanted an inquiry. He thought it was quite probable any of them would have done the same. The only other connection with Mr. Ball in the pamphlet was that Mr. Bray levelled general charges of venality and corruption against certain people. He did not know that Mr. Ball was in any shape or form connected with those charges.—Mr. Bray specified no one as to them; and it would be very unfair to go to a public servant and say, "Here are some general charges; I don't know whether they apply to you or not, but you must prove yourself innocent." A man would have no hold on his character if charges could be brought in that way. If specific charges of corruption were made against Mr. Ball, the Council could look into the matter; but at present Mr. Ball could only ask to prove himself innocent of something which was not charged against him.

Alderman MILNE said that, after hearing Mr. Ball's statement, he felt so satisfied that he at once moved that the explanation was satisfactory to the Committee. He was quite sure that any member of the Council would have taken the same view of the matter if he had been at the Committee meeting.

Mr. T. CHEETHAM said that, having been a member of the Gas Committee for several years, he had come much in contact with Mr. Ball; and whenever Mr. Bray's name had been mentioned, he never remembered Mr. Ball saying a word derogatory to his character or in depreciation of his burners. Even Mr. Bray made some "honourable exceptions" in levelling his charges; and he (Mr. Cheetham) thought Mr. Ball was more sinned against than sinning.

Mr. ROBINSON said he believed Mr. Ball to be an honest man; and another opinion he had formed was that Mr. Bray was a disappointed man, and was making indiscriminate charges.

The Mayor said he had received a letter from Mr. George Bray in reference to the remarks he had made about that gentleman's pamphlet

at the last meeting. He then said that the pamphlets had been sent out at an unfortunate time, and that perhaps it had been done intentionally, as they had come to every member of the Council on the night before the decision as to Mr. Ball's salary. He took this view of it; and many others did the same. Mr. Bray stated in his letter that this was not so. He (the Mayor) unhesitatingly expressed his regret that he had put a construction on the matter which Mr. Bray said was not a correct one. The Gas Committee's minutes were then passed.

RECENT SALES OF SHARES.

On Tuesday last, Messrs. Edwin Fox and Bousfield sold at the Auction Mart, Tokenhouse Yard, about one quarter of a King's share and also 20 £100 new fully paid-up shares in the *New River Company*. The first 13 lots each comprised the 96th part of a King's share; the prices realized being: Three lots, £930 each; one, £925; four, £920; two, £915; and three, £910. The next 16 lots each consisted of the 130th part of a King's share, and produced: Two, £700; two, £680; one, £675; one, £660; eight, £650; and two, £640. The 20 £100 new shares, the last dividend on which was at the rate of £12 2s. 6d. per annum, were sold as follows:—Three at £355; three at £354; one at £353; three at £352; and ten at £350. The total amount produced by the portion of the King's share was £22,530; and by the new shares, £7036—making together £29,566. As will be seen by the above figures, the 96th parts of a King's share fetched fairly uniform prices, although the bidding for them was very inert. The succeeding lots—the 130th parts of a share—experienced a serious drop from £700 to £640; while the offers for the new shares were brisk and even.

Messrs. Blake, Haddock, and Carpenter, of Croydon, disposed, on Thursday, of 15 fully paid-up shares in the *Mitcham and Wimbledon Gas Company*, on which 10 per cent. dividends had been paid, at £20 5s. per share, and of 7 similar shares at £21 each.

At the Royal Hotel, West Hartlepool, last Wednesday, a number of shares in the *Hartlepool Gas and Water Company* were sold by public auction by Mr. Hunter. There was a numerous attendance, which included the Chairman and several Directors of the Company, and the bidding was spirited. There were 61 shares, each of £5 value, in the "A," "B" and "C" classes, and these sold for prices ranging from £7 10s. to £7 13s. apiece; and 47 £10 shares in the "D" old and "D" new classes. In these classes, the paid-up shares sold for £14 11s., £14 12s., and £14 13s. 6d. each; whilst those on which £9 only had been paid went for £13 14s.

THE ELECTRIC LIGHTING EXPERIMENT AT LEAMINGTON.

At the Meeting of the Leamington Town Council on Monday last week, the Watch Committee reported that the Midland Electric Light and Power Company had applied for permission to erect four arc lamps on the Town Hall; and recommended that the same be granted, on condition that the lights were placed at a distance of not more than 30 feet from the ground. In moving the adoption of the report, Alderman Wackrill explained that in the first instance the wish of the Company was to place these lights in the clock tower, at an altitude of 100 feet. Dr. Eardley Wilnot inquired if the application of the Company to introduce the arc light was not practically an admission on their part that the incandescent light now in use was a failure; also, if it was not a fact that the latter lamps were becoming worse every day, and what steps were being taken to bring the light up to the requisite standard. Alderman Wackrill denied that the application of the Company in any way implied that the present lighting was a failure. With regard to the experiments in connection with the electric lighting scheme, he said they would be continued as long as they were found to serve a useful purpose. Mr. Crowther Davies pronounced the incandescent light a miserable failure, and said the state of things which led him two months ago to move that notice be given to the Company to terminate the contract had been aggravated. He thought the Company had failed to light the town in a satisfactory manner. If they granted the Company permission to place on the Town Hall four arc lights each of 2000-candle power, the brilliancy of these lights would make the incandescent lights in the streets look like farthing rushlights. He held that the Council ought not to continue paying £400 a year for the present unsatisfactory system of lighting the Parade. Mr. Bright said that, though the incandescent light had not been sufficient for street purposes, it was an admirable illuminant indoors. He was in favour of the introduction of the arc light, as it would be one way of overcoming the failures of the past. Mr. Barter White feared that an attempt to light the Parade with the arc light would neither be economical nor satisfactory. After further discussion, the voting was taken, and the report adopted by a majority of one.

METROPOLIS WATER SUPPLY.

According to the returns furnished to the Registrar-General by the London Water Companies, the average quantity of water supplied daily to the Metropolis in the past month was 175,570,123 gallons, as against 179,578,401 gallons in the corresponding month of 1887. The number of houses served last month was 739,252, or at the rate of 237 gallons per house, and 30·4 gallons per head of the population. In June, 1887, the number of houses was 726,193; and the quantity of water allowed for each person, 31·7 gallons. Of the entire bulk of water supplied last month, 87,971,114 gallons were drawn from the Thames, and 87,599,009 gallons from the Lea and other sources.

Dr. E. Frankland, in the course of his report to the Registrar-General on the quality of the Metropolitan Water Supply last month, makes the following remarks:—"The Thames water sent out by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies again exhibited a further reduction in the proportion of contained organic matter, which was unusually small in all the samples examined. All the samples were clear and bright. Of the water principally drawn from the Lea, that distributed by the New River Company contained less, and that by the East London Company slightly more, organic matter than the Thames supplies. Both samples were clear and bright. The deep-well water pumped by the Kent Company and by the Tottenham Local Board of Health contained, as usual, only a very small proportion of organic matter; while in the sample of the Colne Valley Company's supply, the organic matter was distinctly in excess of the average for this water."

INCREASED STOREAGE FOR CLITHEROE.—The Clitheroe Town Council have accepted a tender of Messrs. Ashmore, Benson, Pease, and Co., Limited, for the erection of a two-lift telescopic gasholder, at a cost of £1714.

REDUCTIONS IN PRICE.—The Directors of the *Isle of Thanet Gas Company* have given notice that, as from the 30th ult., the price of gas to private consumers will be reduced from 3s. 3d. to 3s. 1d. per 1000 cubic feet, also the charge for meters; and every facility will be afforded to those who are desirous of consuming gas, whether for lighting, cooking, or heating purposes.—At their meeting last Thursday, the *Heywood Town Council* decided to reduce the price of gas from 4s. 2d. to 4s. per 1000 cubic feet, with the present discounts.

TARAPACA WATER-WORKS COMPANY, LIMITED.

The Statutory Meeting of this Company was held last Tuesday, at the Cannon Street Hotel, E.C.—Mr. R. HARVEY in the chair.

The notice convening the meeting having been read, The CHAIRMAN said that, as the shareholders knew, the meeting was held in order to carry out the requirements of the Limited Liability Companies Act. Of course, they would scarcely expect that much progress had been made up to the present time. However, they had a report from the Engineer (Mr. W. R. Copland) which would be read, so that they might form an idea as to how far the works had progressed. He might mention that they had received a cablegram from Iquique, which told them how the Arica and Provedora water business was working which they took over from Colonel North, and on which the shareholders were promised in the prospectus 6 per cent. interest. He (the Chairman) was pleased to say that the amount received for the profits on that business was more than sufficient to pay the 6 per cent. interest, and that at the end of the six months they would have their dividend warrants sent out. The shareholders would also be glad to know that the staff, which sailed in the *Gulf of Trinidad*, had arrived safely at a port on the coast.

The Engineer's report on the progress of the works, to which the Chairman referred, was then read. It stated that the progress up to the present consisted principally in the manufacture and shipment of the materials required in the construction of the works. About 60,000 cast-iron pipes, which would extend to more than 100 miles, were required to complete the main conduit to Iquique and the various branches. Of this quantity, 16,760 pipes, or 28 per cent. of the total, had been shipped to Iquique; besides which some 3000 pipes were at present in course of shipment, or rather lying ready at the foundry. In addition to the above, there had been shipped about 50 per cent. of the lead and rope yarn required for jointing the pipes; 200 tons of Portland cement for foundations of water-tanks; about 21 tons of galvanized sheet iron; and the tools and appliances required in carrying out the works. The whole of the sluice-valves had been made and tested, and now await shipment. The construction of the 15 large malleable iron tanks for the storage of water at Iquique and at various points on the line of piping was proceeding rapidly; and three 50-foot diameter tanks would shortly be ready for shipment, while a number of the others were well advanced. The report concluded by stating that the Resident Engineer (Mr. Tuckwell) sailed from Liverpool on May 12, and was reported at Coronel on the 25th ult. It was therefore probable that by this time he would be in a position to get the works commenced.

The CHAIRMAN observed that the pipes sent out were sufficient for 28½ miles; and the diameters were 9, 7, 6, 5, 4, and 3 inches. There were 13 miles of 9-inch main. At the rate they were going on at present, the Engineer said that the whole of the pipes would be shipped within the six months from the commencement of the work—that was, three months from now. He (the Chairman) thought that within the 1½ years the Tarapaca Water-Works would be in full working order. The promise in the contract was two years.

No question being put by the shareholders, the Chairman declared the meeting closed.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday*.

The excellent results of the past year's working of the Edinburgh and Leith Gas Company have been partly discounted by the announcement, in connection with the transfer negotiations, that the profits of the Company were "about £27,000." As the report of the Directors in another column will show, this amount has not been quite reached; but the figure brought out—£26,313 16s. 1d.—is a magnificent rise from the sum of £18,491 which was reported a year ago. Without desiring to institute invidious comparisons, I may point out that the increase in one year of £7822 upon a make of 400 million cubic feet compares very favourably with the increase of nearly £13,000 which was reported the other day as having been made by the Edinburgh Company, whose output is taken at 800 millions. To be in the same ratio, the increase of profits in the Edinburgh Company ought to have been over £15,000. There are, of course, considerations that do not appear on the surface, which may disturb these calculations; but, taken as announced to the public, the above reflections lie on the surface. The great reduction in the cost of production which is referred to in Mr. Linton's report to the Directors is the most convincing testimony to the advantage which is to be derived from the employment of modern appliances. This report of Mr. Linton's should not be lost sight of by the civic authorities in the meantime, because it demonstrates what they may be able to do when they get the gas supply into their own hands, and shows that, if they profit by the experience of the Leith Company, and produce the whole of their output in a similar manner, there will be, at once, an augmentation of their available profits to the amount of several thousand pounds yearly. The low percentage of unaccounted-for gas—7·63 per cent.—is also a noteworthy feature in the Company's business—being the best proof that the whole of the plant is in good order.

Judging by the proceedings before the House of Commons Committee on Tuesday, the Edinburgh Corporations' Bill is likely to have a swift passage through the Legislature. The Joint Committee of the Corporations will thereby come in in a canter; and, in the short-lived memory of the public, will thus be likely to get credit beyond what they are entitled to. The date of transfer is close at hand; and both Gas Companies are already setting their house in order before quitting it for ever. To them the recollection of the past, with its rich returns, must be exceedingly sweet. It is to be hoped that the shareholders will enjoy no less pleasure in the return which they will have from the Corporations; and that, on the other hand, the Corporations may be able to conduct the undertakings with as much success as the Companies have done. The arrangements for the transfer have not proceeded far yet; but up to the present everything has gone smoothly since the agreement with the Leith Company was come to.

At the meeting of the Bromley Ferry Gas Commissioners on Monday, it was reported that the revenue for the past year was £5116 17s. 11d., and the expenditure £4939 7s. 6d. In the previous year these sums were £5275 18s. 7d. and £4965 5s. 4d. respectively. There is thus a decrease of revenue to the amount of about £159. With reference to this, it should not be forgotten that a year ago the revenue from meter-rents was reported to have amounted to £238 7s. 6d., and that a reduction of the charge was then made, as the result of which the return from meters during the past year was only £58—a difference of £180 7s. 6d., which more than represents the loss of revenue. Taking into account that £47 more was realized for secondary products than was estimated for, the state of the revenue shows that the amount of gas consumed was not up to that of the previous year. Perhaps the least satisfactory portion of the annual statement is that which refers to the increase of leakage from 6·81 to 8·17 per cent. The Commissioners are reducing the cost of their works by large sums year by year. They seem to be in a cheeseparing mood just now, as is exemplified by their recent reduction of the Manager's salary. It might

be worth their while considering whether the sound financial position of the Commissioners may not be impaired by this policy if it be carried too far, and to remember that works well equipped and well conducted are essentials to obtaining successful financial results.

The Tayport Police Commissioners on Monday resolved to approach the Dundee Water Commissioners with a request for a supply of water at a rate equivalent to that in Dundee. The Commissioners had offered water at 5d. per 1000 gallons; but, following the advice of Chief Magistrate Young, the Commissioners thought it would be preferable that a rate should be levied. Mr. Young said he calculated that a rate of 1s. 4½d. per pound on a rental of £6235 would be sufficient. In Dundee it is 1s. 2d. per pound.

The annual meeting of the Kirkcaldy Gas Company was held yesterday. It was reported that during the past year 686 yards of mains were laid; so that the mains now extend to 28 miles 1105 yards. The manufacture of gas for the past year was, per station meter, 66,305,600 cubic feet, as compared with 63,169,200 cubic feet in the previous year; the increase being 3,136,400 cubic feet. The profit and loss account for the year showed a net profit of £3236 3s. 5d. Out of this it was resolved to pay a dividend of 7s. 6d. per share, equal to about £2755 5s., and to carry the balance of £479 18s. 5d. to the credit of the depreciation fund. The meeting adopted the Directors' recommendation that the price of gas for the current year should be continued at 2s. 4d. per 1000 cubic feet.

The accounts of the Elgin Gas Commissioners for the past year show the output of gas to have been 13,022,050 cubic feet, and the revenue from its sale £3808. Meter-rents produced £116 9s.; and stove-rents £24 7s. 7d.

The Alloa Burgh Commissioners last Monday received the annual statement by the Gas Committee from which it appeared that during the past year £250 were spent on renewals, chiefly of the retort-bench, and that of a debt of £26,200, a sum of £6550 had been repaid; reducing the debt to £19,650, as against £23,250 when the Commissioners took over the undertaking in 1877. During the year the output of gas was 2½ million cubic feet more than in the previous year, while the coal account was £79 less. The Commissioners recommended that the price of gas should be reduced from 3s. 9d. to 3s. 6d. per 1000 cubic feet, and that discounts ranging from 2½ per cent. for accounts from £20 to £35, to 7½ per cent. upon those above £100, should be allowed. There was some conversation over this proposal; several of the Commissioners thinking that the small as well as the large consumers should have the benefit of a discount. The scheme, it was explained, would reduce the revenue by £130 a year; and, if applied to all customers, would be equal to a reduction of 1½d. per 1000 cubic feet. The Commissioners' recommendation was adopted. It was stated that the charge for public lighting was to be reduced from 10s. to 14s. 11d. per lamp.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

In his capacity of Secretary of the North British Association of Gas Managers, Mr. R. S. Carlow, of the Arbroath Gas-Works, has just issued a capital "hill of fare" for the twenty-seventh annual meeting of that body, which is to be held in Glasgow on Thursday and Friday, the 26th and 27th inst., under the presidency of Mr. David Terrace, who was for so many years the zealous and efficient Secretary of the Association. In addition to the President's address, which is expected to be of considerable interest, there are no fewer than seven papers set down to be read, all dealing with subjects of practical importance to those engaged in the gas industry. On the evening of Thursday, the members of the Association and members of other similar bodies (who are freely invited to attend this year's meeting), and lady friends will dine together in the "Royal Bungalow," at the exhibition. The lady friends, many of whom are expected to visit the exhibition during the day, will have every facility offered them for inspecting the gas heating and cooking arrangements in the Bishop's Castle Café kitchen, which has already been described at some length in the JOURNAL. On the following day (Friday), there will be a capital excursion to Loch Lomond and Loch Long. It is expected that Mr. G. R. Hislop will be elected to the presidency of the Association in succession to Mr. Terrace; and that the meeting next year will be held at Dunfermline—a place of great interest, and one which is now easily reached by railway from all quarters. The fact that it is near the Forth Bridge will also, doubtless, aid in fixing that place for the twenty-eighth annual meeting of the Association.

The annual report on the accounts of the Johnstone Gas Commission has been issued. It shows that for the year ending the 15th of May, the gross profits amounted to £2908 19s. 9d.; and the net profits, after payments in reduction of loans, &c., to £499 18s. 3d. The works are valued at £20,813—not including £939 10s. of outstanding debts. The loans on the works amount to £21,252 12s. 5d. During the year there was paid for coals the sum of £1274 15s. 5d.; and for lime, £14 12s. For salaries and wages, the payments were £752 17s. 10d.; and the interest paid was £914 9s. 4d. The year's total revenue from gas was £3908 4s. 7d., and that from secondary products, &c., £198 14s. 3d. At present the price of gas is 4s. 4½d. per 1000 cubic feet, which is expected to be continued during the current year.

The report recently submitted to the Kilmarnock Town Council by the Gas Committee shows that the profits on the past year's working of the gas undertaking amount to upwards of £3000; and in view of this favourable state of affairs, the Committee have unanimously recommended a reduction in the price of gas from 3s. 11½d. to 3s. 6½d. per 1000 cubic feet—that is to say, a reduction of 5d. per 1000 feet.

At a meeting of the Greenock Gas Trust Committee last Tuesday, there was submitted the annual statement of the income and expenditure in connection with the gas supply for the past year. The profits were shown to be £4300; and it was agreed to recommend that the price of gas be reduced from 3s. 9d. to 3s. 6d. per 1000 cubic feet. There is a proposal to hand over to the Police Board £3000 to help in reducing the general taxation, and to devote the remaining £1300 to the liquidation of capital charges of former years and also to the sinking fund. These various matters, however, have yet to come before a full meeting of the Gas Trust for final settlement.

It is expected that the surplus profits on the Paisley Corporation gas undertaking for the past year will admit of the price of gas being reduced to 3s. 9½d. per 1000 cubic feet, if not even lower.

A statutory meeting of the Kilmory Gas Commissioners was held last Monday, at which the Auditors' annual report was submitted. The past year's profits amount to about £300, from which there has to be deducted the sum of £140 to pay principal and interest on the loan; leaving a balance of about £160 of clear profit, which the Commissioners propose applying to the reduction of the debt incurred on the new works, over and above the amount which they have already borrowed. It is proposed to reduce the price of gas from 4s. 7d. to 4s. 2d. per 1000 cubic feet.

The Directors of the Carlisle Gas Company have agreed to reduce the price of gas from 4s. 2d. to 3s. 9d. per 1000 cubic feet.

The Bothwell and Uddingston Gas Company held their annual meeting on Monday. From the balance-sheet and Directors' report for the past

year, it was shown that the profits made by last year's working, after charging revenue with all repairs and depreciation, amounted to £1307 3s. 9d., which sum added to £655 19s. 6d. brought forward from the previous year's accounts gave a total on appropriated profits of £1742 7s. 5d. On the recommendation of the Directors, it was agreed to apply £900 in payment of a dividend at the rate of 10 per cent., leaving a balance of £842 7s. 5d. to be carried forward to next year. The quantity of gas sold during the year was 16,966,300 cubic feet; being an increase over that of the previous year of 550,400 cubic feet. Including the quantities consumed in the public lamps and at the gas-works, the total consumption was 17,726,300 feet, as against 17,115,900 feet in the preceding year. To supply this amount, there was manufactured 19,096,300 cubic feet; and the leakage and unaccounted-for gas only reached the very low total of 7.1 per cent. It has been found necessary to proceed with the erection of a new gasholder to meet the increasing consumption of gas. The price of gas has been reduced to 4s. per 1000 cubic feet.

The annual meeting of the Irvine Gas Company was held on Tuesday, when the annual statement of accounts was submitted. A dividend at the rate of 10 per cent. on the original shares was declared. The increase in the consumption of gas was reported to be 540,000 cubic feet; and the gas had an average illuminating power of 26.75 standard candles.

At the last meeting of the Port-Glasgow Town Council, a long statement was made by one of the members, regarding more alleged trickery in conducting the gas affairs of the town; and he submitted a proposal which did not even find a seconder. His statement dealt chiefly with the lighting of private streets by the municipal authorities. It was subsequently reported that contracts had been made for the supply of 2600 tons of gas coal, at an average price of 11s. 2d. per ton. On the recommendation of the Gas Committee, it was agreed to reduce the deposits on meters used by consumers and the annual hire for the same.

As is usual just before the annual Fair holidays, the Glasgow pig-iron market has been very lifeless this week. Scotch warrants fluctuated in price between 38s. to 38s. 1d. one month. The close yesterday was 38s. cash buyers. Very little business has been done in Scotch special brands; and prices have not changed during the week. Cleveland warrants have been selling at 31s. 10½d. per ton, and hematite iron at 42s. 10½d. to 42s.

The demand for coal of various kinds continues to be rather brisk; but there is no improvement to report in regard to prices. Main coal is being shipped at 5s. 6d. f.o.b. at Glasgow, and steam coal is realizing 7s. 3d. to 7s. 9d. at the coaling cranes.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, July 14.

Sulphate of Ammonia.—There is practically very little change in the market, though quotations have hardened all round. Somewhat better prices have been accorded by consumers; and the dealers were obliged to follow suit. The principal transactions this week are at £11 12s. 6d. f.o.b. Hull; and £11 10s. f.o.b. Leith and Liverpool. The inquiries for August and September are very large; but the orders are either limited too low to admit of business, or they are taken up by speculators, of whom some cannot resist running the risk of the market, notwithstanding the passiveness of producers, who seem in no hurry to dispose of their present small make, and will not sell "forward" in the conviction of realizing better values before long. A continuance of the present unsettled weather would greatly favour the consumption of sulphate; and in anticipation of an active demand, higher prices do not look so far off as they were generally reported to be. The parcels on the market continue to be limited; and they are generally readily bought up at sellers' prices when purchasers find that they will not succeed in making bargains.

LONDON, July 14.

Tar Products.—The market has a holiday character about it. Business done is extremely small; and most of the products are hanging fire. Benzol is nominally quoted higher; but no business of any moment is reported. Prices: Tar, 15s. to 20s. per ton. Benzol, 90 per cent., 2s. 7d. per gallon; 60 per cent., 2s. 4d. Toluol, 1s. 6d. per gallon. Solvent naphtha, 1s. 1½d. per gallon. Crude naphtha, 30 per cent., 1s. per gallon. Light oil, 3½d. per gallon. Creosote, 1½d. per gallon. Pitch, 13s. to 16s. per ton. Carbolic acid (crude), 3s. 5d. per gallon. Cresylic acid, 10d. per gallon. Tar salts, 15s. per ton. Anthracene, 30 per cent., "A" quality, 1s. 4d. per unit; "B" quality, 1s.

Ammonia Products.—Sulphate is distinctly dull, and buyers all round are offering lower prices. The ever-increasing make of this article is a weak feature; and there are many who think that the ensuing season will bring much lower prices. Prices: Sulphate of ammonia, £11 2s. 6d. to £11 5s. 6d. per ton, less discount. Gas liquor (5° Twaddell), 8s. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 2d. per lb. Carbonate of ammonia, 3½d. per lb. Muriate of ammonia, brown, £18 per ton; white, £28. Sal ammoniac, £30 per ton.

[From the *Chemical Trade Journal*, July 14.]

Sulphate of Ammonia.—Lower prices continue to be offered at all the ports; and the manufacturers do not see their way to refuse business at the reduced values. Last week the agent of The Gaslight and Coke Company reduced his price by half-a-crown without being able to secure orders; proving beyond a doubt that the stuff is not yet wanted. Beyond a few West Indian orders, there is no inquiry, and may not be for some weeks yet. Fortunately we are on the period of shortest production; so that there is not much fear of any inordinate quantity being put on the market this month. Hull value is stated at £11 6s. 3d., while Leith and London is put down at £11 8s. 9d.; but these prices are quite abnormal, and represent a value reduced by speculation rather than the intrinsic value of the article.

Tar Products.—Never was the tar products market in a more unsatisfactory state than it stands at the present moment. With high values for tar the products from it are certainly weaker than a few weeks ago, although every effort is made to induce a contrary opinion. Meanwhile Continental consumers will not come forward to purchase; and there is but one outlet. The fact is that since we predicted a fall in the value of benzol, the trade has been forced into another channel. The Continental consumer has not taken so much benzol as formerly; but he has taken aniline instead, which at 8½d. has suited him better than purchasing benzol. This was the only way in which the price could be kept up. All other tar products remain without material change. The pitch market is a little disturbed by the late report of higher prices than usual being obtained; and some are holding to their stocks for a rise, but we have already expressed the opinion that there is no hope in the immediate future for this article.

SEVERE GAS EXPLOSION IN PARIS.—An alarming explosion of gas occurred in Paris, on Monday evening last week, at a restaurant known as the Grand Café. The building, which is three storeys high, was shaken from top to bottom. Only a few customers were in the house at the time, and no one was killed; but about 15 persons were injured, several seriously. The damage done to property is estimated at upwards of 100,000 frs.

HAWICK GAS COMPANY.—The annual general meeting of this Company was held on Friday, the 6th inst.—Mr. T. Laidlaw in the chair. The report of the Directors, the principal portions of which were given in the JOURNAL on the 3rd inst. (p. 35), with an abstract of the accounts, was adopted. Mr. Laidlaw was re-elected Chairman; and after some complimentary remarks by him on the Manager (Mr. J. Smith) and the Secretary (Mr. G. Grier), these gentlemen were re-appointed.

IMPROVED VALUE OF TAR.—At the meeting of the Walsall Town Council on Monday last week, the Gas Committee recommended that a contract should be entered into with Messrs. Robinson Bros. for the sale to them of all the surplus tar made at the two gas-works of the Corporation during one year from the 1st of July inst. Mr. Russell (by whom, in conjunction with the Town Clerk, the fresh contract for the sale of the tar had been arranged) mentioned that a gain of £100 a year would result to the town from the new terms.

THE BRISTOL GAS COMPANY AND THE GAS-FITTERS.—It may be remembered that shortly after the announcement that the Bristol Gas Company would supply gas-stoves, &c., to the public, and would fix them, a large number of the gas-fitters of the city memorialized the Company on the subject, and represented that the new departure proposed might injure their trade. The Company, having duly considered the memorial, have replied that they are only following a course which other gas companies long ago adopted.

THE CADOGAN ELECTRIC LIGHT COMPANY, LIMITED.—This is an undertaking started "to supply electric light from a central station to Belgravia and the Cadogan estate," the capital being £45,000. Money says of it: "The capital is altogether too insignificant, and will very likely be squandered in futile experiments. It is difficult to see what practical result can be achieved. It is true that the district is one of the most aristocratic of London; but we have yet to learn that such a recommendation carries any guarantee for the financial success of a veritable fad."

ANNUAL EXCURSION OF THE DOVER GAS-WORKS EMPLOYEES.—Last Wednesday the annual excursion of the *employés* at the Dover Gas-Works took place—Hampton Court being the locality selected; and a thoroughly satisfactory day was spent. The Chairman of the Company (Mr. W. Mannering) expressed his pleasure at seeing the men enjoying themselves; and said he hoped that for many years to come he should have the pleasure of meeting them on similar occasions. He remarked that since the previous excursion Mr. R. Herring had established a benevolent fund and a reading-room at the works. These were useful additions; and he was glad to say both were doing good work. Hearty cheers were given for Mr. Mannering and Mr. Herring. The latter gentleman, in reply, requested all the staff to continue to assist him as they had hitherto done; and said if they did this, he would endeavour to make the Dover Gas Company as prosperous in the future as it had been in the past. The party left Hampton Court for Dover at 7.45, all heartily pleased with the excursion.

THE SHEFFIELD CORPORATION WATER-WORKS LOANS.—At the meeting of the Sheffield Corporation last Wednesday, the Town Clerk read a communication from the Local Government Board with reference to the application made by the Corporation to borrow certain sums of money for the completion of the water-works and for other purposes. Authority was given to borrow £87,844, instead of £127,641 applied for. In the first place the Local Government Board had not included £574 paid to some shareholders in the late Company who took capital instead of annuities, on the ground that the Corporation could borrow this without the sanction of the Board. With regard to the Damflask reservoir, the sum allowed was £13,882, instead of £16,440 asked for. With regard to the Oaken Clough extension, the Corporation not having yet arranged for the purchase of the land, the Board deferred their sanction to the loan for this purpose until such arrangements had been made. The loan of £11,550 asked for was accordingly not sanctioned. The Corporation applied for power to borrow £29,370 for the extension of water-mains, spread over three years; but the Board sanctioned the borrowing of £6000, with permission to apply again when this was expended.

THE MANAGEMENT OF THE WARRINGTON GAS-WORKS.—The *Warrington Guardian* says: "There is no doubt now about the determination of the Gas Committee to tender their resignation in a body (with one or, it may be, two exceptions) at the next meeting of the Town Council. The resignation does not necessarily imply that the services of all the members must be dispensed with. This would be a deplorable mistake. We hope to see not a few of them return to the Board, and give the ratepayers the benefit of their great experience and disinterested devotion to public duty. Their hands will be greatly strengthened by an infusion of fresh blood. We doubt not, at the same time, but that Mr. Haddock, the new Manager, will feel relieved from the incubus of a rather stereotyped system of managerial control. He should have a free hand; and if he is all that his best friends represent him, he will be able to make many alterations and improvements. That he has a large field to work on in this respect no one will deny. We understand," adds the *Guardian* (which has opposed the Committee's proposal to retain the late Manager's services), "that Mr. Paterson, with that high sense of honour for which we have always given him credit, has generally recognised the necessity for giving Mr. Haddock all credit for any improvements he should carry out, and has declined to accept the office of Consulting Engineer for one year. In acting as he has done, Mr. Paterson has, in a measure, given the severest blow possible to the Gas Committee. Further comment on this question in the meantime is unnecessary."

THE WOLVERHAMPTON CORPORATION AND THE BILSTON WATER SUPPLY.—At the last meeting of the Wolverhampton Town Council, Alderman Wright moved the adoption of the annual report of the Water Committee which showed that the profit on the last financial year amounted to £1776, and that the sales of water had been £523 in excess of those of the previous year. A new table was added to the report, from which it appeared that the quantity of water supplied to Bilston had risen from 80,769,375 gallons in 1886 to 119,573,228 gallons last year; and as a constant service was now being given to the people in the town, the supply would probably increase to 200 million gallons. Referring to the opposition by the Bilston Township Commissioners to the Wolverhampton Corporation Provisional Order, he said ostensibly it was against the application for power to increase the reserve fund from £5000 to £10,000 and to apply any surplus profits to the augmentation of the Improvement Fund. He could not understand why such objections should be raised, as if the powers were conceded they would not affect Bilston. It seemed, however, that the real objection to the Order was to be found in the fact that somebody had advised the Commissioners that they could secure a water supply at half the price they were paying to Wolverhampton; and they were therefore desirous of getting rid of their contract. An agreement, had, however, been entered into in perpetuity as to the water supply; and the payment could only be revised every 21 years. The Bilston opposition collapsed in the House of Commons; and whether they would go to the House of Lords remained to be seen. He thought it was scarcely likely that the Upper House would cancel an agreement so deliberately entered into, and confirmed only a few months ago.

COATBRIDGE GAS COMPANY.—The report of the Directors of this Company and the statement of accounts and balance-sheet for the half year ending June 30 last, prepared by the Manager and Secretary (Mr. T. Wilson), show that the affairs of the Company continue prosperous. The total income for the six months was £5489 12s. 9d.; and the profits were £2131 13s. 2d. This, with the balance of £247 17s. 5½d. brought from last half year, makes the sum of £2379 10s. 7½d. applicable to dividends. The unaccounted-for gas was at the rate of 16 per cent.; and the average illuminating power 26.4 standard candles. The half-yearly meeting of shareholders will be held next Tuesday, when the Directors will recommend the payment of maximum dividends at the rates of 10 and 7 per cent. per annum on the old and new stocks respectively, free of income-tax.

THE COST OF THE SOUTHAMPTON NEW WATER-WORKS.—At the last meeting of the Southampton Town Council, a return was presented from the Water Engineer (Mr. Matthews), showing the parliamentary estimate and the actual cost, including outstanding liabilities, on the Otterbourne works. The expenses strictly connected with the works were estimated at £55,690, and cost £50,090. The railway siding made by the South-Western Railway Company, the purchase of lands and easements, &c., were estimated at £4310, and their cost was £6471; bringing up the totals to £60,000 estimated, and £61,562 cost. Then the lining of the well, which was not contemplated in the estimates, came to £789; making the total cost of the works, £62,351. The net excess of the cost of works under the control of the Corporation, below the estimate, was £599 3s. 2d. The net excess of the cost of contemplated works, above the parliamentary estimate, was £1562 3s. 4d.

PROPOSED ADDITIONAL CAPITAL FOR THE FAVERSHAM GAS COMPANY.—An extraordinary general meeting of the Faversham Gas Company was held last Wednesday to consider a proposition submitted by the Directors to apply for a Provisional Order to authorize the increase of the Company's capital from £20,000 to £28,000. Mr. W. E. Rigden presided, and explained the reasons the Directors had for taking this step; one being that, on account of the new Local Government Bill, in view of which they, and every other gas company, felt it was incumbent upon them to place themselves in the strongest possible position. In the event of a District Council, or any other governing body, being placed in power, the Company would be in a much safer position with a Provisional Order, not only in regard to the right to lay down mains within and beyond the borough, but also if the local authority should open negotiations for the purchase of the undertaking. He moved a resolution embodying the Directors' proposition; and it was carried unanimously.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 114.)

Issue.	Share.	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share.	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.					£ s. d.
GAS COMPANIES.								
590,000	10	12 Apr.	10½	Alliance & Dublin 10 p. c.	10	18½—19½	..	5 7 8
100,000	10		7½	Do. 7 p. c.	10	13½—14½	..	5 7 2
900,000	100	2 July	5	Australian (Sydney) 5½% Deb.	100	109—111	..	4 10 1
100,000	20	30 May	10	Bahia, Limited	20	22—24	..	8 6 8
200,000	5	11 May	7½	Bombay, Limited	5	7—7½	..	5 0 0
40,000	5		7½	Do. New	5	5—5½	..	5 9 1
380,000	Stock	15 Feb.	11½	Brentford Consolidated	100	223—228	..	4 18 8
110,000	"		8½	Do. New	100	163—168	+1	4 18 2
220,000	"	14 Mar.	10½	Brighton & Hove, Original	20	43—45	..	4 13 4
320,000	"	12 Apr.	11½	British	20	45—47	+1	4 15 9
50,000	10	14 Mar.	11	Bromley, Ordinary 10 p. c.	10	20—22	..	5 0 0
39,000	10		8	Do. 7 p. c.	10	13½—14½	..	5 10 4
328,750	10	30 May	8	Buenos Ayres (New) Limited	10	13½—14½	..	5 10 4
200,000	100	2 July	6	Do. 6 p. c. Deb.	100	106—109	..	5 10 1
150,000	20	29 Feb.	7	Cagliari, Limited	20	25—27	..	5 3 8
550,000	Stock	12 Apr.	13½	Commercial, Old Stock	100	265—270	+1	5 0 0
130,000	"		10½	Do. New do.	100	205—210	..	5 0 0
121,234	"	28 June	4½	Do. 4½ p. c. Deb. do.	100	120—125	..	8 12 0
557,320	20	14 June	12	Continental Union, Limited	20	44½—45½	+½	5 5 6
242,680	20	"	12	Do. New '69 & '72	14	29½—30½	+½	5 10 0
200,000	20	"	9	Do. 7 p. c. Pref.	20	35—37	..	4 17 3
75,000	Stock	28 Mar.	10	Crystal Palace District	100	205—215	+5	4 13 0
234,060	10	27 Jan.	12	European, Limited	10	25—26	..	4 12 4
120,000	10	"	12	Do. New	7½	17½—18½	..	4 17 7
354,060	10	"	12	Do. do.	5	11½—12½	..	4 16 0
5,468,350	Stock	15 Feb.	12½	Gaslight & Coke, A, Ordinary	100	257—262	+5	4 13 6
100,000	"	"	4	Do. B, 4 p. c. max.	100	97—102	..	3 18 5
665,000	"	"	10	Do. C, D, & E, 10 p. c. Pf.	100	260—265	+1	3 15 6
30,000	"	"	5	Do. F, 5 p. c. Prf.	100	125—130	..	3 16 11
60,000	"	"	7½	Do. G, 7½ p. c. do.	100	183—188	..	3 19 9
1,300,000	"	"	7	Do. H, 7 p. c. max.	100	168—173	..	4 0 11
465,000	"	"	10	Do. J, 10 p. c. Prf.	100	258—263	..	3 16 1
1,061,150	"	14 June	4	Do. 4 p. c. Deb. Stk.	100	118—121	+2	3 6 1
294,850	"	"	4½	Do. 4½ p. c. do.	100	125—130	..	3 9 3
650,000	"	"	6	Do. 6 p. c. do.	100	172—177	..	3 7 10
8,600,000	Stock	11 May	10	Imperial Continental	100	202—205	+½	4 17 7
75,000	5	14 June	6	Malta & Mediterranean, Ltd	5	43—51	..	5 14 3
560,000	100	3 Apr.	5	Met. of Melbourne, 5 p. c. Deb.	100	114—116	..	4 6 2
541,920	20	14 June	6	Monte Video, Limited	20	194—201	..	5 17 1
150,000	5	30 May	10	Oriental, Limited	5	9½—9½	..	5 2 7
60,000	5	28 Mar.	7	Ottoman, Limited	5	6—7	..	5 0 0
420,000	100	2 May	6	People's Gas of Chicago—				
500,000	100	1 June	6	1st Mtg. Bds.	100	104—109	..	5 10 1
100,000	10	26 Apr.	10	2nd Do.	100	92—97	..	6 3 9
500,000	Stock	29 Feb.	15½	San Paulo, Limited	10	15½—16½	..	6 1 2
1,350,000	"	"	12	South Metropolitan, A Stock	100	315—320	..	4 16 10
141,500	"	"	13	Do. B do.	100	243—247	+3	4 17 2
550,000	"	28 June	5	Do. C do.	100	250—260	..	5 0 0
60,000	5	29 Feb.	11	Do. 5 p. c. Deb. Stk.	100	135—140	..	3 11 5
				Tottenham & Edm'ton, Orig.	5	11—13	..	4 4 0
WATER COMPANIES.								
717,467	Stock	28 June	9	Chelsea, Ordinary	100	249—254	+1½	3 10 10
1,720,560	Stock	12 Apr.	7	East London, Ordinary	100	192—197	..	3 11 1
700,000	50	14 June	9	Grand Junction	50	120—124	..	3 12 7
708,000	Stock	29 Feb.	10½	Kent	100	267—272	..	3 17 2
1,043,800	100	28 June	9	Lambeth, 10 p. c. max.	100	251—256	+1	3 10 4
406,200	100	"	7½	Do. 7½ p. c. max.	100	200—205	+1	3 13 2
200,000	Stock	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	117—120	..	3 8 8
500,000	100	27 Jan.	12½	New River, New Shares	100	348—353	..	3 8 8
1,000,000	Stock	"	4	Do. 4 p. c. Deb. Stk.	100	123—128	+1	3 6 2
902,300	Stock	14 June	6	S'hwk & V'xhall, 10 p. c. max.	100	160—165	+8	3 12 9
126,500	100	"	6	Do. 7½ p. c. do.	100	151—156	..	3 16 11
1,155,066	Stock	14 June	10	West Middlesex	100	264—269	..	3 14 4

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* * See Advertisement on Page III. of the Wrapper of this week's issue.

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* * See Advertisement p. 90 of last week's issue. Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

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BRISTOL UNITED GASLIGHT COMPANY.

THE Directors of the Bristol United Gas-

light Company are about to appoint a CHEMIST at each of their Avon Street, Canons' Marsh, and Stapleton Road Works, and invite applications for the appointments.

The candidates selected will be required to devote the whole of their time to the duties of their respective offices, and must be capable of making the usual tests and analyses required in Gas Manufacture.

The commencing salary in each case will be £80 per annum.

Personal canvassing will be a disqualification. Applications with copies of testimonials must be sent in, addressed to the Chairman of the Company, not later than Ten a.m. on Monday, the 30th of July prox.

JAS. V. GREEN, Secretary. Gaslight Offices, Canons' Marsh, Bristol, June 21, 1888.

BRISTOL UNITED GASLIGHT COMPANY.

THE Directors of the Bristol United

Gaslight Company are about to appoint two RESIDENT GAS ENGINEERS, to take charge of their Avon Street and Stapleton Road Works respectively, and invite applications for the appointments.

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The salary in each case will be £300 per annum.

Personal canvassing will be a disqualification. Applications with copies of testimonials must be sent in, addressed to the Chairman of the Company, not later than Ten a.m. on Monday, the 30th of July prox.

JAS. V. GREEN, Secretary. Gaslight Offices, Canons' Marsh, Bristol, June 21, 1888.

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J. MELLOR, Secretary. Eccleshill, near Bradford, July 14, 1888.

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THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JULY 24, 1888.

THE PRESENT CONDITION OF THE GAS INSTITUTE.

THE Gas Institute is at present in a state only to be properly described as critical; and some time—probably months—must necessarily elapse before all the steps required to terminate the crisis brought about by recent events can be taken. There is consequently ample opportunity for all necessary explanation and discussion of the position; and we therefore propose to devote this article, and one or two more if requisite, to an examination of the situation of the Institute as created by the proceedings of the Council and the legal effect of Mr. Bray's action, in order that the general body of members may realize how they are affected by these matters, and make up their minds as to their own conduct. Our motive

in undertaking this task is purely a desire to assist in composing differences, allaying irritations, and clearing up misunderstandings among the ordinary members of the Institute, which may have arisen out of the agitation so long kept alive by Mr. Bray for his own ends. We do not deceive ourselves for a moment into hoping that anything we can do will satisfy or soothe Mr. Bray; but we believe that the general body of members of the Institute must be heartily sick of the "Bray incident," and must desire nothing better than a return to the ways of peace and harmony in which they lived together before the Bray and Sugg feud disturbed the whole atmosphere breathed by gas engineers and managers.

Unfortunately, the *fiasco* terminating the lately attempted expulsion of Mr. Bray from membership of the Institute seems at a first glance to place yet a greater obstacle in the path leading to the resumption of fraternal relations among members. Whether this is really so, or whether the existent crisis can be taken advantage of for putting an end to all the cross-purposes that have troubled the peace of members and hindered the work of the Institute of late years, remains to be seen. The time for mutual reproaching between members holding opposite views is past, if it ever was present. We do not address these observations to those ill-conditioned persons, if such there be, who prefer strife to amity, envious disparagement of their fellows to mutual respect, and who rejoice like "ill birds" in "defiling their own nest." We address ourselves to the great bulk of gas engineers and managers of the United Kingdom, who, joining The Gas Institute for their own and the general good, have grieved to see it transformed into a bear-garden, and its meetings degraded into occasions for the venting of bitterness, hatred, and jealous passion directed to private ends. It must be admitted that peaceable men of this stamp have much to complain of. As at present appears, they have reason to accuse the Council of disastrously muddling the business which they were elected to manage in a proper manner. The Council must have been fully aware of the nature of the responsibility which they incurred when they proposed to the last general meeting to compulsorily remove Mr. Bray's name from the roll of membership. They knew that every loophole presented to the enemy in their procedure would be made the most of, to their own discredit and the plaguing of the Institute; and yet they made a miserable tactical blunder, which was exposed in all its naked hideousness on their first recourse to competent legal advice. Let us say this much, and then have done with it. If the Council had been properly advised in a legal sense, the present crisis would not have arisen. They made a shocking mistake, however, and they must bear the blame for it. The elaborate vote by which 126 members out of 188 recorded their agreement with the Council respecting the treatment to be accorded to Mr. Bray has been annulled by the effect of what is practically a slip in a matter of law; but it is impossible to overlook or minimize the consequence. Mr. Bray remains a member of the Institute, and for this reason the members of Council and others, to vilify whom he has abused the opportunity presented by his membership, must act up to their declarations, and retire.

It is a point of honour with those gentlemen whom Mr. Bray has attacked by name to withdraw from any society which contains him. Mr. George Livesey was the first to give expression to this resolve; and although the method and occasion chosen by him for making this declaration may not commend themselves to the individual judgments of all who have been associated with him in this matter, they agree with its spirit. The immediate effect of the legal proceedings of the 13th inst. will therefore be to diminish at a blow the Executive of the Institute to the President (Mr. Henry Woodall), and at most two or three members of Council—possibly not one. Certain of the more responsible office-holders—such as the Trustees, the members of the Finance Committee, and the Secretary—must remain at their posts to carry on the necessary routine business until they can be relieved; but henceforward not one of the members implicated in any way in the recent dealings of the Institute with Mr. Bray will take any part whatever in the society. We do not know how many will decide to resign, or how or when this decision will be carried into effect and made public. The fact, however, is certain; and we are able to say positively that some of the resignations are even now in the hands of the Secretary, and more will be ready for presentation at the next Council meeting, which is to be

held in a few days' time. No other course than severance from the Institute at the earliest moment is possible for any of these gentlemen possessing the most ordinary self-respect. How far the defection will spread, it is at present impossible to foresee. Members will, of course, exercise their right of private judgment upon this point, which is purely one of honour in which no man can desire to influence his fellow. Seeing, however, how widely Mr. Bray's allegations against gas officials identified with the Institute were cast in his latest pamphlet, it is very probable that a large number of engineers and managers of gas-works may decline to associate with him for the future. In any case, the withdrawals will be sufficiently numerous and important to create a crisis of the greatest gravity in the life of the Institute; and the emergency will be so pressing as to render it imperative for the President to call a special meeting in the autumn.

It is an extraordinary result of a blunder in law that the members who have received the support of large majorities of their colleagues in the Institute should be compelled to quit the organization, while the member of whom all but a small minority desire to be rid remains. So it is, however, and the situation must be faced. What may be the ultimate outcome of the present state of affairs is uncertain. The only positive fact to be dealt with now is that, as a consequence of Mr. Bray's legal victory, all the chief office-bearers and most of the leading men whose names have been identified for years with The Gas Institute, and before its day with the old British Association of Gas Managers, will throw up their connection with it. Is this a desirable result? It will be for the members who remain to answer this question by their conduct at the extraordinary general meeting to which they will be convoked by their President. Neither directly nor indirectly will the retiring members seek to control in the slightest degree the action of their former colleagues. If these should decide that they can carry on the work of the Institute better without their old leaders, the latter will not protest against such a decision. There will be no passion about it; but time, which tries all things, will show whether these men can better exist without the Institute, or the Institute without them. If they were superfluous, tyrants, a "clique," wire-pullers, self-seekers, and upholders of corrupt practices, as Mr. Bray and his followers have said of them many times, then the Institute is well rid of them and their works. If, on the other hand, they were the life and soul of the Institute—if they and their friends provided all the papers, contributed all the discussions, transacted all the tedious and formal business, and, by their character and willingness to impart their knowledge to the humblest inquirers, attracted to the annual meetings most of the hard-working members to whom these gatherings are something more than outings attended by unlimited free feasting and drinking—then with their retirement the organization must become moribund. Not one of them will move a hand to influence the verdict upon themselves which their whilom associates will return at the forthcoming special meeting. The votes to be cast then will not be their votes; the *agenda* will not be compiled by them. They have done with the Institute for good and all. Being fallible men, unused for the most part to the nice formalities of the conduct of a meeting under all the severities of the law, some of them have blundered. All that, however, is now beside the question. If they are no lawyers, they are at least competent guardians of their own honour; and in thus promptly renouncing fellowship in a society where their reputations have been attacked, they take the only course open to them without incurring the sacrifice of self-respect and public esteem. If it lasts, Mr. Bray may have The Gas Institute all to himself now, so far as they are concerned. He may bring forward in their absence yearly motions condemning them in all the relations of life, and may make speeches thereon likening them to every notorious criminal of the day. Nothing of this kind will affect them more, for they will have gone; and Mr. Bray will be at liberty to enjoy himself in his favourite pastime behind their backs.

MANCHESTER AND ITS NEIGHBOURS.

An attempt is being made by some of the customers of the Manchester Gas Committee to obtain a reduction in price. The dissatisfied are the Local Boards of the several townships beyond the city limits. They are of opinion that they and their constituents are unfairly taxed by the citizens, and have resolved to make a muted demand for more equitable treatment. The chief cause of complaint appears to be the differential rate; and the argument for its abolition is that

some neighbouring authorities—Salford and Stockport to wit—do not put such a tax upon the extra-municipal consumers in their supply districts. Whatever may be the result of the appeal, it is certain that the outside consumers are not too liberally dealt with by the Gas Committee. They take something like one-third of the gas produced at the various works belonging to the Corporation; and as, in addition to the differential price, they are, by the municipal system of financing, made contributors to the cost of lighting the city streets, besides bearing one-third of the charges annually reckoned for depreciation of works, the repayment of the mortgage debt, and the costly improvements paid for out of gas profits, they should be able to make out a very good case indeed for a substantial reduction. The question seems to be in some measure bound up with a much-discussed project for the extension of the city boundaries. From time to time, more or less fanciful schemes are put forth for the constitution of a "greater Manchester." Some of these actually contemplate a city whose borders shall be so extended as to include towns as far distant as Oldham and Rochdale; embracing an area of which the population would about equal that of the Metropolis itself. There is not the slightest prospect of any such proposal as this being carried into effect; but it is no secret that the City Fathers are anxious to bring the district more immediately surrounding the city into the very closest alliance with it. Places like Newton Heath, Gorton, and Moss Side, though not in the city, are really of it. Probably none but the rate collectors and the nuisance inspectors and their tribe know, to any degree of certainty, where the boundaries of the city end and those of its neighbours begin. Manchester is anxious to absorb these places; and is almost sure to do it some day; and the suspicion is entertained that, pending amalgamation, it does not disdain to make as much out of them as circumstances will allow. It is therefore not improbable that when the deputation go to the Gas Committee, they will receive a hint that relief from the burden they now have to bear may be obtained by joining hands with the city.

THE COUNTY GOVERNMENT BILL AND GAS AND WATER SUPPLY.

As will be seen from our "Parliamentary Intelligence" to-day, an attempt was made by Mr. Firth to add to the County Government Bill a clause empowering County Councils to promote and oppose Bills in Parliament without obtaining the consent of the ratepayers; and also to enable the prospective London County Council to promote Bills "for the purchase or regulation of the undertakings at present supplying water and gas to any part of London, or any of them, or for the provision of a new supply of water, gas, or light to London or any part thereof." This, as Mr. Ritchie pointed out, was tantamount to the repeal of the Borough Funds Act; and it was opposed by the Government upon this ground, and also for the reason that the whole question of Private Bill Legislation is unsettled. Mr. Firth's proposal was strongly supported in the House, especially with the modification of limiting the new public bodies to dealings with authorized undertakings, and restricting them from setting up competing works. Upon a division, the proposed clause was rejected by a majority of 8 only—a significant indication of the desire of Parliament to confer large powers upon the new County Councils. A second clause, casting upon the London County Council the duty of reforming the system of Local Government for the Metropolitan area, and including powers to regulate, acquire, or compete with existing Gas and Water Companies, was likewise rejected—the latter portion of it by a majority of 40. This is so far satisfactory. With regard to the general proposition that the provisions of the Borough Funds Act should not apply to the County Councils, we are disposed to agree to it, or the reason that the Act, as at present enforced, appears either farcical or unjust in the majority of cases. For once when it operates as a salutary check upon a rash Local Authority, there are ten instances of its appearing as a matter of form or as an obstacle to the carrying out of a sound piece of policy by such a body. And even when it comes into operation, it is more often as the tool of a noisy demagogue than as the weapon of a wise friend of the people. The more power there is entrusted to the new Local Authorities—within certain limits, of course—the more likely they will be to use this power with a due sense of responsibility. Provided that the County Councils are prevented from misusing public money to compete with private enterprise, we can see no good reason why the duty of promoting and opposing Bills in Parliament should not be confided to them; and thus the, in most cases, futile

restraints of the Borough Funds Act might be removed. This will certainly come in time; and it is as well to recognize the prospect at once.

THE REPORT OF THE JOINT COMMITTEE ON PRIVATE BILL LEGISLATION.

THE report of the Joint Select Committee of the House of Lords and the House of Commons appointed to inquire into the present system of Private Bill Legislation has been issued, and forms an interesting compendium of facts and opinions relating to this important subject. The Committee examined members of both Houses, as well as many official, professional, and other witnesses having experience of Private Bill business; several of them being representatives of associations or of local bodies interested in the subject. The report recites that the present system of Private Bill Legislation had its beginning in 1837, so far as the House of Lords was concerned; but the House of Commons did not fully apply it until 1855. It is admitted that the existing system is an improvement upon that which preceded it; but that improvement is still possible. It is a noteworthy fact (as remarked in the report) that every witness whose attention was directed to the point, whatever his view upon Private Bill Legislation in other respects, expressed or implied a preference for the Committees of the House of Lords, as composed of less fluctuating elements, and possessing a higher degree of *quasi*-judicial training and experience than the members of average Commons Committees. Other points in connection with Private Bill procedure—such as the argument for local inquiries, the expense of the present system, and its centralization—are brought out in the report, wherein also the alleged causes of expense are dissected and discussed. It appears that the Private Bill business is a paying one for the nation, seeing that the fees paid by suitors have amounted, on an average of the past ten or twelve years, to £58,000 per annum for both Houses, while the expenses have not exceeded £20,000 a year according to the highest estimate. After going into all these matters, the Committee observe that it remains for consideration whether the time has not come for a more comprehensive reform of Private Bill business than any that has been adopted since 1837. Broadly, three proposals were put before the Committee. The first was for the establishment of Commissions entrusted with the powers and functions of Private Bill Committees; the second, for Joint Committees of both Houses; the third, for an extension of the system of Provisional Orders. It is remarked that the demand for a Commission, with the possibility of local inquiry, was preferred by a majority of witnesses from Scotland and Ireland, but condemned by a powerful group of witnesses representing the most experienced authorities. As against the proposal for Joint Committees, it is remarked that while they would probably save the expense of a second contest in the case of one-fifth of the total number of opposed Bills in the year, they would fail to satisfy the demand for local inquiry, and would afford a less measure of relief to members of the House of Commons than is commonly supposed. On the whole, the Committee are brought to the conclusion that, although a Commission must necessarily be an experiment, it presents the best hope of an adequate solution of the difficulties of the situation. The cost of a competent tribunal would probably be considerable; but it might be provided out of the £40,000 annual surplus of suitors' fees. Here the recommendation of the Committee ends. They leave to the Government the duty of carrying it out; and, under these circumstances, it will be some time before anything further is done.

LORD R. CHURCHILL'S BILL AGAINST "COMMISSIONS."

THE Bill of Lord Randolph Churchill, for rendering the acceptance of "commissions" by officers of corporate bodies a penal offence, has been withdrawn in consequence of the somewhat unintelligible opposition of the member for the Camborne Division of Cornwall, who was understood to hold views of his own respecting the manner in which this matter should be dealt with. As, however, since this triumph of obstructiveness, the honourable member has been suspended for a month for misconduct towards the Speaker, there is no prospect of his doing anything in this line during the short remainder of the present session. What will be the upshot of the business remains for the time uncertain. Lord Randolph's proposals did not err on the side of mildness; and were perhaps open to the reproach of an attempt to make political capital out of the existing condition of public feeling aroused by the disclosures in the course of the inquiry of the Royal Commission upon the proceedings of the Metropolitan Board of Works. If one were to inquire too

closely into this aspect of Lord Randolph's action, however, the result would not be of much practical value. At a time when the manufacture of political capital is the main occupation of statesmen of all parties, it would be sheer pedantry to disparage the merits of any proposed piece of legislation on the ground of its presumptive bearings upon party politics. It is sufficient for the occasion to note that Lord Randolph's reforming zeal has suffered a check; but we do not suppose that the present irritation of the public mind on the subject of official peculations will be allayed until some legislative measure has been passed to remove the existing uncertainty respecting the application of the forms of law to those offences against the moral code which have of late shocked the public conscience. In the eyes of many people, the pending proceedings with reference to the Metropolitan Board of Works, marked as they are from week to week by summary dismissals of the incriminated officials of that remarkable body, will be deprived of their point if they do not result in the placing of some legal obstacle in the way of the occurrence of a similar scandal in other quarters.

END OF THE WARNER LIBEL CASE.

THE unpleasant case of libel upon Mr. W. J. Warner, of South Shields, has been satisfactorily terminated by the unqualified withdrawal of all imputations, as will be seen from the report of the proceedings at the Durham Assizes appearing in another column. The facts are few and simple. Richard Cunliffe, at one time employed under Mr. Warner as inspector of a gasholder tank in course of construction, was discharged from the Company's service some time after the termination of the work in question, and a claim for overtime preferred by him was disallowed. For this and for failure to obtain further employment under the Company, Cunliffe bore a grievance against Mr. Warner, whom he accused, in a letter to one of the Directors, of managing the business confided to him in a "deceitful and unscrupulous way," and of "blundering" in such a manner that the tank cost £2000 more than it should have done. In the usual fashion of libellers, Cunliffe protested that he was in possession of proofs of his allegations; and the result of his accusations was an action by Mr. Warner to clear his character. Cunliffe was committed for trial by the South Shields Magistrates, as reported in the JOURNAL for May 1 last; and when the case came before Mr. Justice Cave, yesterday week, the prisoner found he had no option but to throw himself upon the prosecutor's mercy. It was made abundantly clear that Mr. Warner entertained no vindictive feeling against Cunliffe, whose aspersions, as was confessed, were exaggerated under the effect of a partial view of the facts, and were published under a sense of personal grievance. The case having terminated in this way, the only thing to regret about it is that it was ever necessitated by Cunliffe's ill-considered attack upon his former chief. Mr. Warner deserves the sympathy of his friends and professional colleagues in the position in which he was placed by the rancour of a discharged subordinate; but it must be admitted that the incident has ended in the best possible way. It would not have been any gratification to Mr. Warner, if the case had gone to its end, to reflect that the vindication of his own character had entailed the imprisonment, and perhaps the ruin, of a foolish clerk of works; and Cunliffe has had to pay smartly enough for learning that it is not always safe to asperse the reputation of others upon partial "evidence," which, when tested, amounts to nothing more than an uncharitable opinion.

THE balance to the credit of the net revenue account of The Gas-light and Coke Company will (subject to audit) enable the Directors to recommend the payment of a dividend for the past half year at the rate of 13 per cent. per annum; carrying forward to the next account a balance of £277,563.

WE are pleased to announce that M. Albert Ellissen, the immediate Past-President of the Société Technique du Gaz en France, has been nominated an officer of the Legion of Honour—a promotion from the rank of chevalier, which was conferred upon him in 1871. During the recent visit of the members of the Society to England, many of our readers had an opportunity of becoming personally acquainted with M. Ellissen, who, from the position formerly held by him as Engineer of the Paris Gas Company, and his connection with various Continental gas undertakings, has for some years taken a leading place in our industry. Apart from this, M. Ellissen is a member of the Council and Secretary of the Society for the Relief of Wounded Soldiers, and Vice-President of the Board of Directors of the *Petit Journal*. This is an instance in which English and French gas engineers will cordially unite in offering congratulations to a professional colleague on the distinction conferred upon him.

Water and Sanitary Affairs.

THE prosecution by the Southwark and Vauxhall Water-Works Company of a person named Linsey, reported in the last issue of the JOURNAL, raises some curious and very interesting considerations. The accused was charged with stealing a quantity of the Company's water; and his Counsel boldly contended that this act, even if proved, did not constitute a criminal offence. According to the learned gentleman's argument, a man can no more steal water than he can steal air. Each of these elements, he urged, is free to everybody. Assuredly this is a startling proposition in regard to water. We are not surprised that the Chairman of the Surrey Sessions (Mr. H. Yool) should have been sceptical as to its soundness; for, apart from the decision which was cited in support of the prosecution, common sense and common law should be strong enough to govern the case which was disclosed by the evidence. It may be conceded that, in some circumstances, water would not be the subject of larceny; but, under altered conditions, we cannot doubt that to steal, take, and carry away any quantity, small or great, will bring a man within the purview of the criminal law, in the same way as if he had wrongly appropriated any other description of property. An analogous case is not by any means difficult to find. Larceny cannot be committed of wild animals—in which there is no property—as hares in a forest, rooks in a rookery, or fish in an open pond or river. But where animals *feræ naturæ* have once been reclaimed, tamed, and confined, to take them from their lawful owner is to be guilty of larceny at common law. Thus, deer enclosed in a park, or fish in a trench or ornamental pond, cannot be taken with impunity; and, in like manner, water (which probably anyone might use or remove when found in an open river or lake) acquires the character of private property when reduced into possession by a company or an individual. It may then, as we submit, become the subject of larceny. It is beside the point to say that there are various statutory penalties to which a water company can have resort. Why should they be restricted to these remedies, which in some instances might be wholly inadequate? In other words, why should not water-works proprietors, in regard to their common property, possess the same rights, and enjoy the same protection, which the law affords to other companies and to individuals in every rank of life?

In connection with the case tried at the Surrey Sessions we do not desire to offer any opinion, although it would seem that the Chairman was not a little surprised at the verdict of "Not guilty" which the jury, in their wisdom, thought fit to return. It is with the general aspect of the question that we concern ourselves, in the belief that when water is stored by a water company, or pumped into their mains or pipes, it must be acknowledged to be the property of that company; so that a man can have no greater right to take the water without paying for it than he would have to appropriate the main or pipe itself. In the case which was cited during the recent prosecution, two of Her Majesty's Judges ruled that to obtain a supply of water surreptitiously constituted a misdemeanour. Notwithstanding this decision, Counsel for the defence at the Surrey Sessions argued that the offence alleged against his client was not indictable. It is true that in the prosecution in which the Judges considered the point, the prosecutors did not possess any statutory powers; whereas a company such as the Southwark and Vauxhall Company, incorporated by Act of Parliament, may recover specified penalties in a summary manner. But this, we conceive, can make no possible difference. Neither the Water-Works Clauses' Act, 1847, nor any other statute, professes to limit the general rights of property-owners or to exclude those common remedies which are prescribed by the general law of the land. As regards the technical proof of the taking and "carrying away" of water, we apprehend that very slight evidence should be sufficient. This, at any rate, is the case with regard to a theft of gas. In a reported case of a gas consumer charged with fraudulently obtaining a supply by fixing a communication pipe from the inlet to the outlet of the meter, so that a portion of the gas passed to the burners unregistered, it was held that the opening of the stop-cock thus letting gas pass into the communication pipe, was sufficient to constitute a legal *asportavit*, and that an act of larceny had been committed. A similar mode of reasoning would, it seems natural to suppose, be equally applicable where a man is charged with stealing a supply of water by means of a like device.

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(FOR STOCK AND SHARE LIST, see p. 177.)

DURING the past week there has been a slight reaction from the improving tendency which characterized the preceding week. Some of the chief markets have fluctuated from day to day, and close fractionally lower; foreigners being affected by a less easy feeling as to the meeting of the two Emperors. Business generally has been restricted; and some departments were very quiet. Money is harder, owing to the demand for gold. In the Gas Market there has been more activity than in any week for some time past. Gaslight "A" has naturally been well to the front. The announcement on Tuesday of a 13 per cent. dividend had been generally anticipated, and discounted in advance; but the stock rose a little more upon the actual certainty. The reduction of 3d. per 1000 cubic feet represents a loss of rental equal to about £100,000. The increase of the dividend absorbs about £20,000; and, in addition to this, the profit and loss balance is augmented by £47,000. The aggregate, £67,000, thus shows a recouping of at least 2d. per 1000 feet. The accounts will probably indicate that the bulk of the profit proceeds from improved residuals and economic expenditure, rather than from a largely increased sale of gas. All the preferred and maximum stocks, and some of the debentures of the same Company, have also advanced. South Metropolitan have all been dealt in at well-advanced prices. Commercial old has recovered 2 more. Brentfords are up, in view of the approaching payment of the dividend. Some of the foreign undertakings have been active—especially Imperial Continental and Continental Union. The former is in better demand, and closed firm at a rise of 3. European has declared a 13 per cent. dividend. This is 1 per cent. higher than it divided a year ago; and that was itself 1 higher than the previous rate. The Company have thus made a rapid advance. Business in the Water Department has been above the average, and prices continue to creep up by small degrees. The daily operations were: Monday's Gas transactions were moderate. Gaslight "A" was firm, without advancing. The 6 per cent. debentures and Imperial Continental improved 1 each. Water was quiet and unchanged. On Tuesday nothing was much dealt in but Gaslight "A," which was very brisk, and touched 262—a rise of 2. All the 10 per cents. rose 2; and the "H" and the 6 per cent. debentures, 1 each. South Metropolitan "A," Commercial ordinary, and both Brentfords also advanced 2. South Metropolitan "C" improved 5. European new gained $\frac{1}{2}$. Water was as before. Gas was very busy again on Wednesday. Gaslight "A" was done once at 263—the highest point reached; and buyers were 1 better. Bahia rose 1. In Water, Chelsea and Lambeth were frequently dealt in at good prices. On Thursday, Gaslight "A" was quieter and steady. Imperial Continental rose 1. Water was also quieter at a rise of 1 in Chelsea and Lambeth 10 per cents. Business in Gas was further restricted on Friday; but prices continued to rise. All Gaslight preferences and maximums gained from 1 to 2 each; and South Metropolitan "A" and "B," 1 each. Water was stronger; Grand Junction improving $1\frac{1}{2}$, and East London and Southwark ordinary, 1 each. Gas was very quiet on Saturday, except South Metropolitan. The "A" rose 1; and "B," $1\frac{1}{2}$. Imperial Continental were 1 higher. Water was quiet and unchanged.

ELECTRIC LIGHTING MEMORANDA.

THE JUDGMENT IN THE EDISON AND BRUSH LAWSUIT—THE AFFAIRS OF THE MAXIM-WESTON COMPANY—THE ELECTRIC LIGHT AT LEAMINGTON—RUMOURS OF FRESH ELECTRIC LIGHTING SPECULATIONS.

ON Monday last week a most important decision was delivered by Mr. Justice Kay upon the Edison incandescent lamp patents, the effect of which is apparently to destroy the Edison monopoly. It was a tremendous action—the Edison and Swan Company being plaintiffs, and the Brush Company the real defendants—and it occupied the attention of the Court for 21 days; every available professor of physical science and electrical expert being called on one side or the other. The costs must have been enormous; and the issue was of the gravest moment. The two patents upon which the action was fought are those of Edison of 1879, for an incandescent lamp, and Chesebrough of 1878, for "flashing" the carbon filaments of such lamps. They were the same patents that were maintained in the prior action of the plaintiffs against the firm of Messrs. Woodhouse and Rawson; and consequently the owners may have been pardoned for feeling some confidence in the result. The case was gone into very much more fully, however, on the last occasion; with the result that the judge pronounced against the Edison patent, with costs, and for the Chesebrough patent, also with costs. There was a good deal that was very remarkable about the trial, apart from the amplitude and cost of the hearing. The Judge had occasion to complain very strongly of the manner in which some of the highly-paid experts gave their testimony; the proverbial tendency of these gentry to swear according to their instructions being unusually conspicuous. It is not without a gleam of inward satisfaction that hard-working and practical men, who do not happen to have any practice in the Courts, can observe such an instance as this, when reproof and discomfiture were the portion of several most portentous personages—Fellows of the Royal Society, professors, and other great men of modern science. Mr. Justice Kay accused some of these luminaries of deliberately attempting to mislead the Court; and he had so little confidence in them that he directed several crucial experi-

ments to be made under independent supervision during the progress of the hearing, with a view to settling points upon which the expert evidence was contradictory. The judgment against Edison's patent went on the usual ground, that the process described in the specification had not been actually carried out, but that the lamp as made and sought to be protected under the patent was, in reality, something quite different. As for the Chesebrough patent, this now appears to be as strong as Edison's patent is weak; so that the "flashing" of incandescent lamp carbons in an atmosphere of hydrocarbon vapour, to equalize their thickness, remains a monopoly of the Edison and Swan Company. Of course, it is possible to make incandescent lamps without flashing; and thus the manufacture of these articles will be in a great measure free from the obligation to pay royalty to the Edison people, unless the judgment now in question is reversed on appeal.

The Maxim-Weston Company continue to hold extraordinary general meetings every few days, with a view to the settlement of the difficulties into which the concern has been plunged by the disputes between the Chairman, Mr. Hugh Watt, M.P., and the shareholders. The most recent of these took place on Thursday last, for the purpose of appointing additional Directors; and although the proceedings were not quite so riotous as on previous occasions of the same kind, they were anything but tame, as the business to be done was distinctly antagonistic to the Chairman. Five new Directors were added to the Board; and the Chairman accepted the situation with a tolerably good grace, considering all things. He amused the meeting with an oration upon the past, present, and future of electric lighting, according to which the prospects of the industry were never so bright as they are to-day. He declared that the Company are in negotiation with innumerable railway companies, steamship-owners, and shippers for installations on the Maxim-Weston system—all of which must, of course, be taken for what it is worth. It is usually a bad sign when the Chairman of an Electric Lighting Company tells the shareholders that inquiries are coming in from all quarters, and that the Company's works are in a position to meet all requirements.

There is a tremendous amount of assertion and contradiction in Leamington on the not very abstruse point as to whether the street lighting by the local Electric Lighting Company is a success or a failure. The Company, of course, contend that the service is very good; but some of the members of the Town Council entertain a contrary opinion. The real problem is of more than local interest, since it is nothing less than the question of the efficiency of incandescent electric lamps for the lighting of open spaces. These lamps have been tried on the Holborn Viaduct, and are at the present moment used at the Victoria and Waterloo Stations, and one or two other similar places in London. Experience shows that somehow these lamps do not give as much serviceable light under such conditions as gas; and accordingly, where anything like good lighting is required, two of them are used in place of one gas-lantern. In small interiors, even in Leamington, the incandescent lamps do very well; and as long as they are kept up with reasonable regularity of illuminating effect, people like them. They are comparatively inefficient out of doors, however, and for lighting large areas, not merely in Leamington but everywhere else. It may be unscientific to say so, but the fact remains that the lamps lack diffusive power, and their light seems to be smothered in a large dark space.

Rumours continue to spread of a considerable expansion of electric lighting speculation, following upon the recent alteration of the law governing the duration of Provisional Orders. It is stated in one quarter that a scheme is afoot for the extensive introduction of Westinghouse and other new American systems of electrical supply into this country; it being felt that something altogether fresh is desirable to arouse interest in the electric light business. The public mind has been clogged with Brush, Edison, and other promises, that have never been fulfilled in actual working; and it is imagined that greater credence may be extended to an altogether new comer. The idea is not a bad one; but it remains to be seen whether there is really anything in it.

TITLE AND INDEX TO VOL. LI.—Owing to the length to which it has of late been found necessary to extend our half-yearly index, it will not, for the future, be issued as part of the JOURNAL, as hitherto. A Title-page and Index to Vol. LI. (January to June, 1888), have been prepared, and will be ready next Thursday; and a copy will be forwarded post free by the Publisher on receipt of a post card.

AN ATTEMPT AT ELECTRIC LIGHTING AT MATLOCK.—The Directors of the Smedley Hydropathic Company, at Matlock, are introducing the electric light into the public rooms of their establishment. On the 28th ult. (but some considerable time after it was originally expected the installation would have been completed) the light was turned on for the first time. By way of giving suitable *éclat* to the event, a band of music was engaged for the occasion, and a number of persons were invited to be present. The engine was started in the afternoon, and was worked at a low pressure until about eight o'clock in the evening, when an order was sent to the driver to do his best. He obeyed; and in a few minutes afterwards there was a great smash. The two wheels of the countershaft broke—various fragments flying through the windows into the street, to the alarm of the passers by. The dynamo also broke; and, of course, the light suddenly went out. The despised gas had to be lighted, and is now in use again; and we understand is likely to be for some weeks to come.

THE QUESTION OF COKE.

THE recent inquiry of the JOURNAL respecting the cause or causes of the increased demand for coke that has marked the past year, has so far only elicited one response, which will be found in our "Correspondence" columns to-day. This letter is interesting as a reminder of the difference between the markets for coke in England and on the Continent; and it is possible also that it contains a partial solution of the mystery of improved coke sales in the United Kingdom, in the suggestion that consumers of fuel are at last beginning to appreciate the value of coke for general manufacturing purposes, and especially in connection with the production of fuel gas. It is impossible to say how much reason there may be in this observation; but it is at least possible to state that it is very apposite. It is a fact that fuel users in Great Britain have never yet given the full money value for coke; and it would be a very good thing if the complaint could be regarded as no longer called for. Unfortunately, we cannot flatter ourselves that such a sweeping change in the views and habits of English fuel consumers can have taken place within so brief a time as a single year. Movements of this kind are generally slower in their rate of progress through a whole nation; but, of course, we cannot say that nothing of the kind is in operation. That there is plenty of room for it is easily shown. In the number of the JOURNAL for December 18th last (p. 1058), there is a report of a trial of breeze and coke for steam raising at the Shoreditch station of The Gaslight and Coke Company, conducted under the auspices of Messrs. Bryan Donkin and Co., where it is recorded that 1 lb. of coke evaporated 11.03 lbs. of water from the temperature of the feed, which was 202° Fahr. The cost of the fuel was taken at 14s. 2d. per ton; and at this price the cost of evaporating 1000 gallons of water, for fuel only, was 5s. 8½d. A less favourable experiment at another station of the same Company gave an evaporative duty for coke of 9.5 lbs. per ton, and the cost of evaporating 1000 gallons of water then worked out to 7s. 0½d., with coke at 15s. per ton. This standard of comparison—the cost of evaporating 1000 gallons of water—is recommended by Messrs. Donkin as convenient for comparison; and it would be beneficial if fuel users would pay more attention to this point than they do. Without going any further, we may claim from these tests a very respectable evaporative duty for coke burnt under ordinary conditions, and do not hesitate to declare that it shows an economy of from 15 to 20 per cent. as compared with the steam coal ordinarily used in London.

It must be conceded that the more coke is sold out of the yard in the ordinary way, the dimmer becomes the prospect of gas companies taking to gasifying it and distributing the product. At one time, when the future of the coke market looked very black, and there did not appear to be any hope of the demand rising to the absorption of the increased supply resulting from the extended consumption of gas, we seriously discussed the question whether it would prove desirable for gas makers to convert their surplus coke into fuel gas. Circumstances have changed since that time; and the question of fuel gas from coke, to be made on the gas-works, has receded into the background. We do not think, moreover, that the increased demand for coke is due to any remarkable development of the use of fuel gas by manufacturers. Indeed, it would not be surprising if one should hear that the people interested in fuel gas processes and apparatus have reason to complain of poor business. It seems tolerably clear that the extension of the use of the weaker kind of fuel gas—generator gas—for manufacturing purposes is not very rapid just at present; and the drawback of the more powerful varieties of fuel gas is that the difference of cost between them and coal gas in most manufacturing centres of the United Kingdom is not so great as to render them very preferable to the latter as fuel. Cheap coal gas is undoubtedly forcing fuel gas into the background; and the retirement of fuel gas leaves the disappearance of coke heaps to be accounted for in other ways.

We fear there is nothing else for it but to fall back upon the old generality of improvement of trade. There has been more work done in the country of late; the coal market has been "hardening," and coke has been purchased largely. After all has been said, however, one feels that such commonplaces are unsatisfying, and that much would be given by any man of business for the key to the industrial movement of which the demand for coke has been only a symptom. The immediate question for coke producers to consider, however, is whether they are in a position to "rest and be thankful," in the knowledge that the true value of coke is at last appreciated by consumers, and that they will never have a glut of the product any more. The reply to this inquiry from a disinterested observer of the facts, notwithstanding the optimism of our Spanish correspondent, must be in the negative. These casual clearances of coke heaps must not cause any relaxation of the efforts that were undertaken some years ago to improve the demand for coke by breaking it for domestic and manufacturing purposes, and to bring its capabilities under the notice of steam users. Especially there is one point in connection with the burning of coke in steam-boilers that may profitably receive more attention than has hitherto been given to it. We allude to the application of forced draught to coke-burning furnaces. This is rather an important question, since the advantages of forced draught for marine and mill engine boilers has been recognized in so many instances. It is quite possible that the use of a blast, if only under a pressure of about ½ inch of water, may render coke a successful and economical fuel, where it has been tried and found wanting without such an aid to combustion. The precise conditions under which coke is capable of supplanting bituminous coal for steam raising require to be understood

before success can be depended upon. The importance of a good draught for burning coke economically is universally granted; but what we should like to be sure of is the extent to which artificial draught can be made to modify the steaming capacity of a boiler burning coke. Of all the experiments that have been made with forced-draught furnaces, not a single one, so far as we are aware, has been with coke, which is the fuel of all others that seems best qualified for such treatment. This is not the first time that the suggestion has been offered in these columns, of the desirability of experiments being instituted to establish the influence of forced draught upon coke furnaces; and we shall not lose sight of this matter.

The greater popularity of coke as fuel for household use on the Continent, at least in certain places, as compared with England, is easily accounted for. People who are accustomed to burn wood-charcoal for cooking purposes can be persuaded to consider the merits of mineral charcoal—that is to say, coke—when it is offered to them in a suitable condition for use. The general dearthness of fuel, especially coal, in most Continental countries is also a powerful inducement to the people to make the best of anything that will burn. These and other considerations, however, must not conceal from one the fact that those Continental gas companies which make most out of their coke are, as a rule, those who deserve it best by their efforts to create a market for this residual. It is true that they found a public accustomed to close charcoal stoves, who could consequently be more easily persuaded of the advantages of coke than the people of England, who are in the habit of cooking their food, and warming themselves, by the aid of ample, roaring, open coal fires. It is also true, however, that many of them studied the question thoroughly, and offered their customers not merely the fuel, but also the best stoves and grates in which to burn it, that had ever been seen. What English gas companies have done for gas-cooking stoves, foreign gas companies have done for coke. Debarred from much hope of selling gas for cooking and heating purposes, on account of the prices entailed by the concession system under which they exist, these gas companies have taken delight (as well as profit) in showing what they could do to create a demand for, and push the sale of coke. The Paris Gas Company are honourably distinguished in this respect; but there are others not far behind them. It may be too much to expect English gas companies to adopt a similar course; but at least let us not overlook the benefit that it has conferred upon both the producers and consumers of coke when it has been tried.

THE MANAGEMENT OF THE WARRINGTON GAS-WORKS.

As the result of the recent agitation in reference to the management of the gas-works and of the decision of the Town Council at its last meeting (see *ante*, p. 81), the Warrington Gas Committee will, it is stated, resign in a body. The Council did not, it will be remembered, boldly reject the Committee's proposals; but it so minimized and restricted them that the Committee are understood to consider the resolution as equivalent to a vote of censure. With one or two exceptions—who represent, it may be presumed, the dissentient minority—they are therefore determined to seek a position of greater freedom and less responsibility. Another rumour (given with an air of authority) is that Mr. James Paterson will also decline the somewhat doubtful honour which the Council sought to confer upon him by appointing him Consulting Engineer of the gas-works for one year only. If these statements are well founded, it is obvious that an important crisis, involving probably great changes of policy, is about to occur in the history of the Warrington Gas-Works. As to what will be its result, it would be idle to speculate. Those who have been chiefly instrumental in defeating the policy of the present Committee are as jubilant as if the millennium were at hand. It seems to be imagined that it is all the fault of what is called "a rather stereotyped system of managerial control" that the price of gas is not so low as in some other towns, and that the works do not yield immense profits. All this is now to be changed; and Warrington will have cause to rejoice that it has got rid of its old servants and their antiquated ways. Those who write and speak in this style never imagine that they are scarcely just, to say nothing of being generous, to the men who have served them faithfully and well in the past. Like many other works, those at Warrington are burdened with a heavy capital; and however capable the management may be, there will still be this incubus to be borne. The now Committee and the new Manager will be no better off than their predecessors in this respect, unless there should be an extraordinary increase in the consumption, such as would employ the works to their fullest capacity, and bring the capital charges to something like an average percentage on the quantity of gas made. A development of this kind, is of course, to be looked for; but it is much more likely to be of slow and steady growth than to come by leaps and bounds. There is, however, something particularly ungracious in these attempts to pit the old against the new Manager. Mr. Haddock, who is now in charge of the undertaking, has been a pupil of Mr. Paterson's, and has been for some years associated with him in the management of the works, and he will, no doubt, be amongst the first to acknowledge the very great ability of one whom all gas engineers are proud to look up to as one of the fathers of the profession.

The proposal of the Gas Committee which has excited so much feeling, and is to lead to those great changes, was, after all, a very modest affair. It certainly did not err on the side of extravagance. Mr. Paterson was desirous of retiring from the active management of the works—a position which his enfeebled health rendered some-

what irksome; and his resignation necessitating certain changes, the suggestion was made that the duties of Manager and Secretary should be divided, and the whole of the appointments rearranged. Direct oversight of the works was to be vested in Mr. Haddock; and the Committee wished to give him the assistance of the late Manager as Consulting Engineer. This office Mr. Paterson was willing to accept at the very modest remuneration of £100 per annum; and as, apart from this, the changes contemplated meant a saving of £200 a year, the Committee doubtless congratulated themselves on having done very well indeed. Somebody seems, however, to have seen in the scheme a means of raising a clamour; and the result was one of those tremendous "storms in a teacup" such as are wont to disturb the calm of provincial life. It is not the first time that an agitation of this kind has transcended in its effects the very small issue involved; for, indeed, it frequently happens that the noise made is in inverse ratio to the importance of the question to be decided. Gas became all at once a subject of absorbing interest to a large number of the inhabitants of Warrington; and the local papers are given up for the time to the discussion of the one topic. The Committee were suspected of harbouring a desire to pension off an old servant by finding him a sinecure post; and great numbers of people suddenly displayed immense anxiety to denounce the wickedness of this proceeding, and show how the gas-works should be managed. It was in vain that the Committee pointed out that they are to have from Mr. Paterson valuable services in return for their money, and that the outcome of their proposals would be a real saving. The commotion had its effect on the Council, and though the attempt to carry a resolution against the appointment of Mr. Paterson failed, the opponents of the change succeeded in binding the Committee to the necessity of reopening the whole question at the end of twelve months. Rather than do this, the Committee are to go out of office, and Mr. Paterson declines the offer so grudgingly made, and both, we quite think, do well. Their decision will, at all events, give the Corporation an opportunity of rescinding the resolution already passed, if on second thoughts it should discover that it has acted ungraciously and without consideration of the consequences of adopting a merely "penny wise" economy. Since the above was in type, we learn that it is the intention of the Committee to ask at the next Council meeting for a vote of confidence; and that, failing this, they will adhere to their resolve to resign.

DEATH OF MR. J. MATTHEW, OF DUNDEE.—We regret to record the death last Tuesday, in his 76th year, of Mr. James Matthew, the Treasurer of the Dundee Gas Commissioners. Mr. Matthew had been in failing health for about two years before his death, which appears to have been accelerated by the loss of his wife. The deceased gentleman was originally in business in Dundee as a spinner; but he left this to take the appointment of Accountant in the office of the Dundee and Perth Railway Company. This he relinquished in 1860 to enter the service, as Cashier, of the Dundee Gaslight Company; and when, in 1868, the gas-works were transferred to the Gas Commissioners, he was appointed Treasurer—a position which he held till the time of his death. He was a man of marked integrity; discharged his onerous and responsible duties with care, punctuality, and precision; and enjoyed the fullest confidence and respect of the Commissioners and the general public. At a special meeting of the Commissioners held on Wednesday, general regret was expressed at the loss they had sustained; ample testimony being at the same time paid to Mr. Matthew's excellent qualities. The meeting was called to appoint an interim Treasurer; and Mr. Strachan, who was for many years in the service of the Gas Company, and has long been the principal clerk in the office of the Commissioners, was selected.

THE HALIFAX GAS COAL CONTRACTS.—The Halifax Town Council were engaged *in camera*, on Monday evening last week, in dealing with the serious allegations which have lately been made in connection with the coal contracts of the Corporation. It will be remembered that when these charges were brought before the Council at their meeting on the 4th inst. (see *ante*, p. 79), it was decided that the whole of the correspondence, which was given in the issue of the *JOURNAL* for the 3rd inst., should be referred to a Sub-Committee, consisting of the Mayor, Alderman Ramsden, and the Town Clerk, with instructions to take Counsel's opinion thereon, and report. A case was accordingly drawn up, and submitted to Mr. R. S. Wright; and his opinion was read to the meeting. We learn from a local paper that, in substance, it was as follows:—(1) The letter of Mr. Ellis Lever was not considered to be libellous. (2) The letter of Mr. Fox was distinctly libellous, although it was doubtful whether any action could be founded upon it, as no persons were named. (3) The paragraph in the *Pall Mall Gazette* was also libellous; but, in this as in the previous case, there was the difficulty of fixing the libel, as no persons were mentioned by name. After some discussion, it was resolved to leave the matter in the hands of the Sub-Committee, with power to take such steps as they might consider expedient with the object of bringing about a satisfactory investigation of the charges. In the course of the discussion, it was stated that the person referred to in Mr. Fox's letter as receiving commission on the coal purchased for the gas-works was Mr. Emor G. Wrigley, the well-known agent. Since the meeting of the Council above referred to, the Sub-Committee have decided on accepting Mr. Fox's terms; and the Town Clerk has requested him to forward the indemnity he wished them to give before he would impart the information he professes to have in his possession.

GAS APPLIANCES AT THE BRUSSELS EXHIBITION.

Our readers are doubtless aware that there is at present open in Brussels an international scientific and industrial exhibition, the outcome of a movement set on foot by M. Léon Somzée, a well-known Civil Engineer of that city, who, if we remember rightly, furnished the plans in accordance with which the municipal gas-works were constructed. The scheme had the support of the Government; and M. Somzée was appointed President of the Executive Committee. The initiation of the project was briefly noticed in the JOURNAL early last year; it being at the same time stated that two classes of the exhibits would embrace appliances connected with the gas industry. The arrangements for the English Section were entrusted to the able hands of Mr. Lee-Bapty; and it is gratifying to record that this was the first portion of the exhibition ready for inspection—the Belgian and French Sections, curiously enough, being most in arrear. It was opened by His Majesty the King of the Belgians on the 7th ult., with a gold key presented to him by the English Commission, and bearing an appropriate inscription. After considerable delay, the other sections have been completed; and the exhibition is now in perfect working order. This fact was testified to by the Inspector-General (M. Cornely) at a banquet given last Tuesday evening to all the chiefs of departments. Our Brussels Correspondent has forwarded to us a few general notes on those exhibits with which our readers are especially concerned; and their substance is given below. He remarks that, although the collection is not very large, the articles shown deserve a passing notice.

Beginning with the English Section, the first thing to call for remark is the excellent collection of lamps shown by the Wenham Company. They are of all sizes and kinds, suitable for workshops, offices, &c.; some being of very elegant design. A particularly interesting exhibit by this Company is their ventilating lamp (very artistically fitted) for concert-rooms and similar places of entertainment. The Wenham lamp has made great headway in Brussels—in fact, all over Belgium; there being at present about 5000 of these appliances in use in the kingdom. The Fourness Company also have a good display of lamps constructed on their system. There is no specially novel feature in them to call for notice; but all the samples exhibited are well made and in a variety of designs. Mr. J. Greenall, of Manchester, shows the Marsh light; and, as being intimately connected with gas lighting, there is a stand of the Stott regulators, now so familiar at all exhibitions. Passing on to the use of gas for heating and cooking purposes, Messrs. C. Wilson and Sons, of Leeds, have a thoroughly representative display of appliances. One exhibit is specially attractive. It is a fireplace which at first sight appears to be constructed of beautiful black marble, but is, in reality, only cast iron, painted in imitation, and the colours subsequently burnt in, after the manner of pottery. The illusion is perfect. There is also to be seen a small appliance for heating the air of a room. It is readily attachable to an ordinary gas-bracket, and will warm an apartment without giving off any odour or smoke. The stoves constructed on the principle of Mr. Lewis W. Leeds, by which the heat is radiated downwards so as to warm the floor and lower parts of a room, are particularly interesting features of the collection. The radiation is effected by means of a slab of asbestos, perforated with very small holes, suspended above the row of gas-jets, the heat from which it absorbs and throws back, through the opening in the front of the stove, into the room; the downward course of the heat being facilitated by means of an inclined sheet of glass placed in front of the stove.* The mention of asbestos leads the mind to refractory materials generally, several samples of which are on view. Gas-retorts and fire-bricks of various kinds are shown by the Silica Fire-Brick Company, the Glenboig Union Fire-Clay Company, and the Lowood Ganister Brick Company.

In the Belgian Section, the house of Firmin Mignot, of Brussels, exhibit several gas-stoves on M. Wybauw's system. This gentleman (who until lately filled the position of Distributing Engineer in the Brussels Municipal Gas Department), it may be remembered, gained with this stove the prize of 6000 frs. in the competition of gas-heating appliances which took place in that city last year. The stove was described and illustrated in the JOURNAL for May 17, 1887 (p. 900). Like that of Mr. Leeds, it radiates the heat downwards by means of a reflector placed above the gas-flame; and although, at the time of lighting up, almost the whole of the heat is thrown into the chimney, the subsequent effect is the closing of an automatic valve whereby the products of combustion are made to traverse a number of pipes placed below the reflector, so that not more than 16 per cent. of the original heat goes into the chimney. Another stove which gained a prize at the above-mentioned competition was that of M. Wobbe. This appliance, which has lately come greatly into use in Brussels, is shown in various sizes by the maker, M. Blind. M. Vanderborcht has an excellent display of gas kitcheners, roasters, and bath-heaters. A gas-oven specially suitable for pastrycooks is shown by M. Van Leynsele, who has succeeded in constructing an appliance which works very efficiently, and utilizes a considerable portion of the heat produced. The oven consists of two parts, superposed. The lower part is heated by a central ring and two side rows of gas-jets. The products of combustion circulate in wrought-iron pipes, and heat the upper chamber of the oven before passing away into the chimney. M. Van Leynsele, who is himself a pastrycook, has his oven in operation at the exhibition.

* The stove was described by Mr. Leeds, and some particulars given as to its working, in the paper read by him at the recent meeting of The Gas Institute, and published in the JOURNAL last week.

The use of gas for motive power is illustrated by gas-engines exhibited by MM. Bruss, Sombart, et Cie., of Magdeburg; as well as by the Bentz, Otto, and Körting engines—all well-known motors. A Liège firm exhibit a double-cylinder Otto gas-engine of 25-horse power, which runs with remarkable steadiness. Mr. H. Wilford shows a Körting engine adapted to meet the case of the user being without a supply of gas. A small appliance attached to the side of the cylinder generates petroleum vapour which is employed instead of gas to drive the engine.

Among the other exhibits connected with the gas industry may be mentioned a few dry gas-meters on a new system, shown by M. Emile Haas, of Mayence; also a collection of meters (among them being samples of the meters in cast-iron cases supplied to the Rio de Janeiro Gas Company) by MM. Bienvenu et Serret, of Brussels. The General Gas-Meter Company of that city show an assortment of gas and water meters; among the former being several constructed on the double-index principle of M. Wybauw. The testing of the illuminating power of gas is illustrated by one of Herr Elster's photometers, fitted complete with standard candle, inclined mirror for measuring the intensity of inverted flames and electric lights, and all the necessary adjuncts. This instrument was described and illustrated in the JOURNAL for Aug. 30, 1887.

It only remains to say that the lighting of the building and grounds is partly by gas and partly by electricity—four Companies being engaged in the supply of the latter; and that the President of the Executive Committee has put up several gas-lamps on his system by way of competing with the electric lights.

LONDON WATER SUPPLY.*

MR. SCRATCHLEY has done well in reviving the excellent handbook in which the late Sir Francis Bolton described the system of the Metropolitan Water Supply. Published at an absurdly cheap price in connection with the International Health Exhibition of 1884, the book was immediately bought up, and practically disappeared from general circulation. We can readily believe the statement of the publishers that there has been a considerable demand for so useful and unique a treatise. The book being out of print, the opportunity has presented itself for remodelling the entire work, and giving it a more perfect development. It is to be regretted that Sir Francis Bolton has not lived to carry on the literary enterprise which he so happily commenced, and for which he was so specially adapted. But it cannot be said that the work has suffered by the transfer which death has rendered necessary. Mr. Scratchley, as it fortunately happens, was closely associated with Sir Francis in the preparation of the first edition; and he has therefore been able to gather up the broken thread with peculiar facility. A comparison with the former volume shows many improvements, both in the matter itself, and in the general arrangement. The basis remains; but the superstructure is enlarged, and rendered more symmetrical. The book is one-third larger than before—giving space for fresh materials; while the older portions have been in many cases so carefully re-written as to render them almost new. The excellent maps which characterized the first issue have been retained, and have received the necessary corrections, so as to show the extension of the supply and the spread of the constant service. Mr. Alfred Lass's elaborate tables re-appear, brought down to the latest available period, giving a complete view of the financial position with respect to the several undertakings.

The most distinctly novel feature in the present edition is to be found in that part which treats of the law relating to water companies. Mr. Scratchley's legal training here renders him signal service, and enables him to produce a really valuable compendium of the leading legal decisions affecting the relations between the Companies and the consumers. We might, perhaps, venture to differ a little from Mr. Scratchley when he states as a matter of fact that, after the final settlement of the Dobbs case, "water-rates were in numerous cases still assessed on a higher scale than that fixed by the House of Lords." His contention appears to be that "net annual value," as decided in the Dobbs dispute, was equivalent to "rateable value." It is certain that the Companies did not so understand it; and took enormous pains to calculate the annual value according to the terms laid down by the Law Lords. Afterwards came the Water-Rate Definition Act, which, in a most arbitrary and illogical manner, declared that one thing should henceforth mean another—viz., that "annual value" should mean "rateable value." Mr. Scratchley is perfectly right when he says that, "although the effect of the decision in the Dobbs case has been made statutory law by the Water-Rate Definition Act, 1885, the operation of that Act is limited to the area enclosed by the Valuation of Property (Metropolis) Act, 1869; and consequently Dobbs's case, and not the statute of 1885, governs all districts to which the Act of 1869 does not apply." We are disposed to think that there is a yet further distinction to be drawn between the decision in the Dobbs case and the law established by the Definition Act. But if the history of this question were traced back to the beginning, we believe it would be found that the London Water Companies were perfectly justified in their original mode of charge. We commend this research to Mr. Scratchley, though unfortunately the result would come too late to help the cause of the Water Companies, who suddenly found themselves damaged by the very authority on which they were supposed to rest.

* "London Water Supply." By the late Colonel Sir Francis Bolton, C.E. New Edition; revised and enlarged, by Philip A. Scratchley, M.A., of the Inner Temple, Barrister-at-Law, Assoc. Inst., C.E., &c. London: William Clowes and Sons; 1888.

Following his introductory observations on the state of the law, Mr. Scratchley gives a digest of the leading decisions of the Courts as affecting Water Companies generally. This is exceedingly well done; and the perspicuous manner in which the whole is arranged, renders it peculiarly easy for reference. We have here a number of notable cases, and others not so famous. Some of the decisions are curious; and others so highly technical as to surpass ordinary considerations. Among the oddities, though strictly just, we find that "a company is not responsible for an assault committed by a broker or his assistant when executing a distress-warrant to recover arrears of water-rate." This view of the law exonerated the West Middlesex Company when a broker's-man knocked a defaulting consumer through a glass door. There is also the luminous decision which declared, to the detriment of the Liskeard Water Company, that a workhouse was a "dwelling-house," and the inmates "one family." Whether a warehouse is a dwelling-house was not settled by the judgment in the appeal case of *Cooke, Sons, & Co. v. The New River Company*. Mr. Justice Kekewich, in the lower Court, held that the warehouse premises in this case were not a "dwelling-house;" but the judgment pronounced in the Court of Appeal was given irrespective of that point. The law which regulates the supply of water will doubtless continue to furnish fresh questions for magistrates as well as judges. Perhaps in due time, if the deep well which the Commissioners of Sewers are endeavouring to sink in Aldgate becomes an accomplished fact, litigation will arise as to the right of the Commissioners to supply water in the district of the New River Company. In respect to the Cooke case, should the County Council which is to rule over London obtain possession of the Metropolitan Water Supply, it will be interesting to observe how the successors of the Water Companies will deal with the assessment of colossal and highly-rented warehouses.

It would be a pleasant task to travel through some of the lighter chapters in Mr. Scratchley's book; but we must not omit to mention that towards the close of the work, the general statutes relating to water-works [companies are recited at great length, mostly *in extenso*. The historical portions of the book are very readable, and carry us back to times when the water supply of London existed under entirely different conditions from those which now prevail. The growth of the Metropolitan population, and the modern system of drainage, have necessitated changes in the system of supply for which our forefathers were utterly unprepared. In the reign of Henry II., Fitz-Stephen wrote, saying: "Round the City again, and towards the north, arise certain excellent springs at a small distance, whose waters are sweet, salubrious, and clear." Among these there is mention made of Holywell, Clerkenwell, and St. Clement's well, as held in special esteem, "being much the best frequented both by scholars from the schools and youth from the City, when on a summer's evening they are disposed to take an airing." But in the reign of Henry III. "the citizens," it is said, "were forced to seek sweet waters abroad," and for this purpose went as far as "the town of Tyburn," whence the water was conveyed by pipes of lead into the City. In course of time water companies were established, taking their supply from the tidal portion of the Thames, and sending the water to the consumer with scarcely any attempt at filtration. At length there arose a vigorous remonstrance concerning the impurity of the supply. This became particularly marked in 1827; but it was not until twenty years later that the Thames Companies began to remove their intakes up the stream, so as to reach the non-tidal portion. In 1852 came the first Metropolis Water Act, under which the Companies worked so loyally that the General Board of Health, in a report laid before Parliament in 1856, stated: "The new works have not in fact been limited to what a bare compliance with the Act of 1852 would have fulfilled; measures have been adopted for the general improvement of the supplies, which evince a proper anxiety on the part of the Companies in the discharge of the duties of their position towards the public." By that Act it was required that the intakes on the Thames should be above Teddington, and that every Company should "effectually filter all water supplied by them within the Metropolis for domestic use," before the same passed into the pipes for distribution. In 1871 came the present Metropolis Water Act, amending the Act of 1852, and requiring the appointment of a Water Examiner—a post occupied in the first instance by Sir Francis Bolton, at whose death the office was conferred on Major-General A. de Courcy Scott.

A complete history of the London Water Supply would fill volumes; but Mr. Scratchley has compressed into reasonable space an immense amount of information, both in reference to the past and the present, such as will render his book an exceedingly useful and acceptable guide to all who wish to know the leading facts connected with this important and much debated subject. The work is written impartially; and it is to be hoped it will be carefully read by all who seek to form an opinion on the important topic to which it relates. To shareholders and householders the book will be of value for many practical purposes. Should the work pass into another edition—an event which is sufficiently probable—no doubt Mr. Scratchley will still further improve it; but, taking it as it is, we can with justice commend it as an admirable and useful treatise.

The guarantee fund in connection with the proposed display of gas appliances at the Paris Exhibition next year, to which reference has already been made in our columns, now amounts to 249,195 frs. (49968).

Notes.

AN AMERICAN PHOTOMETRICAL STANDARD.

In a description of a photometer designed by the United Gas Improvement Company of America, and recently published in the *Progressive Age*, mention is made of the Edgerton or Mobile standard of light. This consists simply of a standard Sugg "D" Argand burner, with its chimney surrounded by a close-fitting opaque cylinder, usually of brass. In this shield is a horizontal slot, the position and dimensions of which are determined by experiment to coincide with the portion of the gas-flame which is least subject to variation. It is claimed that extensive experiment in this direction has failed to show any practical variation in the amount of light radiated through the slot, when the variation in the illuminating power of the gas did not exceed three candles. The ratio between the Edgerton standard and the standard candle is not stated; but it is apparently of considerably greater brilliancy, since it is advanced that "the object in using this standard is to avoid the extreme liability to err when the candles and gas are compared direct, on account of their large difference in luminosity, which forces the screen to the far end of the bar, where a small motion considerably affects the candle power." It is admitted that the principle of the Edgerton standard is identical with the Methven standard, which must have suggested it; but "the horizontal slot is believed to give more uniform results than the vertical slot of the Methven." No evidence is offered in support of this statement; so that the supposed superiority of the Edgerton or Mobile standard remains questionable. The rest of the photometer is merely a slight modification of the ordinary open-bar instrument familiar in England.

THE OSCILLATION OF CHIMNEYS.

The extent to which chimneys oscillate in gales of wind is always an interesting topic with constructors. In the Memoirs of the French Civil Engineers' Society particulars are published of the recorded oscillations of a chimney-stack 35 metres (115 feet) high, and 1.22 metres (4 feet) exterior diameter at the top, erected near Marseilles. During a great storm, it was ascertained, by observations of the shadow of the chimney, that it oscillated at times as much as half a metre. It was further remarked that, when once set in motion by a violent gust of wind, the chimney rocked backwards and forwards four or five times before coming to rest again. M. Burg observes that the overthrow of the chimney might be expected if the impact of any further impulse should coincide in direction and period with one of these oscillations. This would explain the destruction of many a chimney apparently erected in accordance with sound principles of stability. The *Oesterreichische Zeitschrift für Berg und Hüttenwesen* adds to this statement the qualification that, in the case of a chimney near Vienna, 50 metres (164 feet) high, and built in the concentric rings of brickwork with an inside diameter at the top of 2 metres, which stands in a very exposed situation, the oscillations during severe storms were most carefully and repeatedly measured with a theodolite, and found not to exceed 16 centimetres (6½ inches) in the whole length.

AN AQUA-AMMONIA MOTOR.

Professor George Forbes referred in a recent number of *Industries* to the Campbell aqua-ammonia engine, which he saw on his late visit to the United States. This invention is described as one of the latest attempts to utilize, in the production of motive energy, the vapour of a liquid more volatile than water. In this device an ordinary steam-boiler and engine are used; but ammonia is added to the water in the boiler, and is vaporized when heat is applied. The ammonia vapour is then superheated, and passed into the cylinder, where it works expansively. It then goes into the exhaust, and is afterwards condensed and reabsorbed by water and finally returned to the boiler. The details of the apparatus by means of which the principle is carried out, vary in different examples; but in the general way the process is conducted as follows:—The ammoniacal vapour, on leaving the boiler where it is generated, passes into a reservoir half filled with a weak solution of ammonia in water. The partial absorption of ammonia produces heat, which superheats the ammonia vapour as it passes into the engine cylinder. A pipe leads from the lower level of the boiler to the exhaust pipe, and throws a spray of water on the ammonia in the direction of the exhaust. The heat of this water has been partially used up for warming the feed water, and the spray is considerably cooled when it reaches the exhaust ammonia vapour, which it partially absorbs. This partial absorption, however, creates heat; and this again checks the process of absorption, and would create back pressure if means were not used to prevent it. Accordingly, the vapour and water pass together from the exhaust-pipe into a so-called absorber, which consists of a long horizontal vessel full of horizontal tubes; the rest of the space being occupied by circulating condensing water. The water passes through one-half of the tubes (those which are at the top of the vessel), and falls through the vapour partially cooled, absorbing more vapour; it then returns through the lower tubes, and again falling through the vapour absorbs some more. The vapour and water next pass through a pipe to the bottom of a condenser half full of liquid, and partially filled with tubes through which the circulating water passes. By the time the vapour has risen through this water it is completely absorbed. The solution is afterwards pumped into the boiler. Professor Forbes says that engines upon this principle work well

in practice. The leakage of ammonia from a 105-horse power engine is not appreciable. No lubrication for the cylinder is required. Professor Forbes made special tests for fuel economy with a 60-horse power engine, with and without ammonia. He found that the engine, which required a consumption of 6·2 lbs. of fuel per horse power when working with steam alone, did the same work with 2·6 lbs. of fuel when worked with ammonia. The saving was thus about 60 per cent.

Communicated Article.

OXYGEN PURIFICATION.

By H. LEICESTER GREVILLE, F.I.C., F.C.S.,
Chemist to the Commercial Gas Company.

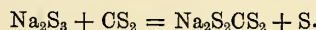
I read with much interest Mr. Valon's paper on "The Use of Oxygen in the Purification of Coal Gas," and regretted that circumstances prevented my being present at the time it was engaging the attention of the members of The Gas Institute at the recent meeting. There is, however, some consolation to be derived from the fact that more is probably to be learnt from the calm perusal of a paper, and its attendant discussion, in the quietude of one's own study, than in any other way. It is more or less difficult during the reading of a paper to thoroughly appreciate all its good points or to criticize all its omissions. The time for discussion is generally limited, and those who are the most fluent in speech and the readiest in debate secure the lead; and, however valuable the discussion may be, it is seldom sufficiently exhaustive. Any question of real importance and novelty merits more consideration than it usually receives on the mere reading of a paper; and I therefore send a few remarks to the JOURNAL, with a hope of contributing something useful to the elucidation of the special subject of the purification of coal gas by oxygen.

There is no doubt that the germ of this system is the old practice of the revivification of oxide *in situ* by the limited use of air—a practice which, abandoned for a time, has again been adopted more latterly in various places, but with varied opinions as to its success. Concerning the broad points of saving in labour and increased duty of material by the use of this method, there can be little doubt; but the debatable issue is the effect on the lighting power of the gas. Some experimenters who have used air (among whom is Mr. Valon) claim a *decrease* in light; others (as Mr. Septimus Penny) an *increase*. In the discussion on Mr. Valon's paper, no one claimed an increase of light consequent on the use of air. Messrs. Botley, Denny Lane, and Norton H. Humphrys stated that they did not find any depreciation of illuminating power consequent on its use; while Messrs. Newbigging, Anderson, and Frank Livesey inferred that the use of air would inevitably lead to deterioration in the lighting value of the gas. I believe I am correct in stating that Mr. Methven is still using air, and finds no depreciation in the illuminating value of the gas. The subject is therefore still a debatable one. My own impression is that the question can only be settled by experience, and that the diluent effect upon lighting power known to be exercised by the admixture of nitrogen with ordinary gas cannot be taken as a quantitative basis for estimating what would be the effect of introducing nitrogen in the ordinary process of gas manufacture. The lighting power of gas is, to a large extent, due to many substances—such as benzole vapour, naphthalene, &c.—which are partially retained by the gas, and partially separated with the tar during the process of condensation. Air introduced at a suitable point in the manufacture, where it would become more or less impregnated with a portion of the benzole and naphthalene, which would otherwise be retained by the tar, would not be likely theoretically to reduce the illuminating power of the gas to such an extent as the direct admixture of nitrogen with the purified gas. There is an additional point tending to mitigate the reduction in illuminating power which would theoretically attend the use of air, and concerning which I will quote from an article of mine, published in the JOURNAL for Nov. 1, 1887, on "The Revivification of Oxide *in Situ*:" "There is the question of heat developed in the purifier preventing the undue deposition of condensable hydrocarbons, and thereby mitigating the loss of illuminating value, which is a common experience of gas managers as a result of over-condensation. This point is of more especial importance in cases such as occur in local gas-works where the purifiers are generally in an exposed position, and where (especially in the winter months) the lowering of the temperature of the gas must be excessive."

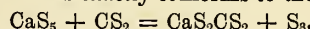
Referring to the actual details of Mr. Valon's paper, I notice in the first place that the area of the purifiers, in proportion to the make of gas, was (as pointed out by Mr. Frank Livesey) at least five times as great as is generally employed; and this, it is almost needless to state, would place the purification of the gas at a great advantage over the usual practical conditions in use at the majority of works. In the second place, although in the experiment on the use of oxide, details are given as to the initial light (14·67 candles), and the light with 0·1 per cent. by volume of oxygen per 100 grains of sulphuretted hydrogen per 100 cubic feet (15·46 candles), showing an increase of 0·79 candle, yet in the case of the use of lime no comparative results are given. We learn that, with the use of the same proportion of oxygen as before, the illuminating power of the gas was 16·5 candles. Now this apparent increase in illuminating value was not obtained merely by the use of oxygen; and as no

comparative figures are given as to the normal light which would be obtained where lime was used as a purifying agent in the absence of oxygen, a theoretical estimate must be made. The carbonic acid present at the inlet of the lime purifiers was 1·26. Taking as a minimum basis that 1 per cent. of carbonic acid reduces the light by 6 per cent. on an Argand burner, the 1·26 would be equal to 7·6 per cent.—say, roughly, 8 per cent. This would reduce the 16·5 to 15·2 candles. The initial light of the gas purified by oxide only was given at 14·67. The gain, therefore, due to the oxygen process where lime was employed, was 15·20 - 14·67 = 0·53 candle—less than that claimed for the use of oxide. I cannot understand this apparent discrepancy, and cannot offer even any theoretical explanation of it.

Turning to the action of the lime *quo ad* purification, the effect of the addition of oxygen is very remarkable; and the results obtained by Mr. Valon are of very great interest. Even allowing for the favourable effect of a large area of material in comparison to the make of gas, the recorded results are remarkable in two details—viz., (1) That the carbonic acid and sulphuretted hydrogen should have kept so much on a level with each other. (2) That it was possible to effect the complete purification of the gas, removing thoroughly carbonated lime, and yet keeping the sulphur compounds down to from 6 to 8 grains. I have not had the opportunity of examining any of the spent lime; and it is almost needless to say that, for the examination to be of real value, the sample should be fresh from the purifier, and shielded from the action of air prior to testing. It may, however, be of some value to speculate on the nature of the chemical actions at work during the use of lime and oxygen in purification, more especially as very little light was thrown on this branch of the subject when Mr. Valon's paper was read. The actions which take place may be, and doubtless are, more or less complex; but some clue to their nature may be gained by considering the various reactions as divided into separate stages. It is a well known fact that lime exposed to the action of sulphuretted hydrogen, in the presence of moisture, forms calcium sulphhydrate (CaSH_2S); and we may assume that this compound is actually formed in the purifiers when the sulphuretted hydrogen in the gas is absorbed by lime. It is also known that the ordinary product of the action of *cold gas* on *cold lime* does not form a product active in absorbing carbon disulphide. I have repeatedly made the following experiment:—Gas containing sulphuretted hydrogen, but free from carbonic acid, was passed into slaked lime in a small experimental purifier, until the sulphuretted hydrogen showed at the outlet. The product was absolutely inactive on sulphur compounds. The lime was now turned out of the vessel, and exposed to the air in a heap, when it heated, turned yellowish green in colour, and when replaced in the purifier was found to have developed a remarkable energy in absorbing carbon disulphide. Chemically, the raw sulphided product gave evidence of containing calcium sulphhydrate, as its solution in water gave a black precipitate with a soluble salt of lead. The partially oxidized product gave a totally different reaction—affording a yellow solution, and a red precipitate with a lead salt; giving, in fact, evidence that calcium sulphhydrate had disappeared, and had been replaced by one of the higher calcium sulphides—I have much reason to believe by calcium pentasulphide (CaS_5). The fact of the higher calcium sulphides uniting with carbon disulphide has not, to my knowledge, been brought before the notice of the gas community; but I had some time back observed the fact, and have recently found a record of its being known in 1875. In the abstract of the session of the French Academy for that year, the following occurs (I give a free translation):—"M. Gélis has observed that sodium bisulphide (Na_2S_2) unites directly, and with great evolution of heat, with carbon disulphide. The salt produced— $\text{Na}_2\text{S}_2\text{CS}_2$ —belongs to a new series of sulphocarbonates. It is comparatively soluble in water and alcohol, and yields no sulphur to carbon disulphide. The common sulphocarbonate— $\text{Na}_2\text{S}\cdot\text{CS}_2$ —as is known, is with difficulty soluble in alcohol. It can also be prepared by dissolving sulphur in the sulphocarbonate, $\text{Na}_2\text{S}\cdot\text{CS}_2$ which takes up exactly one atom of the sulphur. When carbon bisulphide acts on higher sulphides—sodium tria and penta sulphides—the above salt is produced, and the excess of sulphur is liberated in the free state."

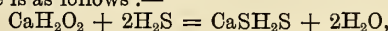


I can so far corroborate the statements of M. Gélis that, when experimenting on the subject some years back, I found, on agitating a solution of calcium pentasulphide with excess of carbon disulphide, the solution at first became turbid from separation of sulphur, and finally cleared from the solution of the sulphur in the liquid disulphide. Also, on evaporating the disulphide solution, I obtained free sulphur equal to three-fifths of the total amount originally present. This exactly conforms to the equation—

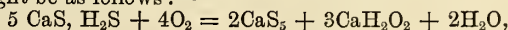


This is an analogous reaction to that shown by M. Gélis operating on sodium trisulphide. These facts undoubtedly bear on the question of the action of oxygen on lime in the presence of sulphuretted hydrogen, in reducing the sulphur compounds in the gas, and in explaining the presence of free sulphur in the spent lime.

Let us assume that the first action of the sulphuretted hydrogen upon the lime is as follows:—



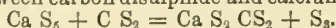
in which calcium sulphhydrate is formed. The action of oxygen on this might be as follows:—



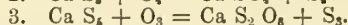
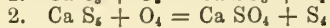
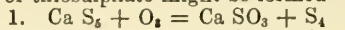
in which five molecules of calcium sulphhydrate become converted

into two molecules of calcium pentasulphide, and three of calcium hydrate.

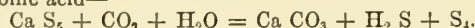
The practical effect of this would be: (1) That the product would develop a power of absorbing carbon disulphide. (2) That, owing to the fact that calcium hydrate would be formed, there would be an increased purifying capacity. The fact of the spent lime containing free sulphur might be accounted for in three ways. First, as a reaction between carbon disulphide and calcium pentasulphide:



Second, as a product of the continued action of oxygen on calcium pentasulphide, in which, by equation, 1, or 2, or 3, calcium sulphite, sulphate, or thiosulphate might be formed—

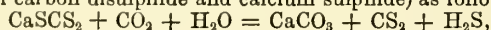


Third, as a product of the reaction between calcium pentasulphide and carbonic acid—



If the reactions I have shown as possible represent, in the main, what occurs when oxygen and sulphuretted hydrogen react on lime, it is not difficult to understand how the purification from sulphur compounds takes place, and also the presence of free sulphur in the spent material. The spent product should consist theoretically of calcium carbonate, sulphate, thiosulphate, and perhaps a little sulphite intermixed with more or less free sulphur. Such a mixture, subjected to heat in a closed vessel, would no doubt give off sulphur in a form in which it could be collected and utilized.

One point in connection with Mr. Valon's results on sulphur compounds has yet to be explained. It is well known that carbonic acid decomposes the ordinary combination of carbon disulphide and sulphided lime, driving the "sulphur" forward; and that in a rotation of lime vessels the "sulphur" at the outlet can only be kept down by changing at a period when the first or "A," vessel is incompletely carbonated. This is explained by the decomposition of the calcium sulphocarbonate (formed by the combination of carbon disulphide and calcium sulphide) as follows:—



in which the products are calcium carbonate, carbon disulphide, and sulphuretted hydrogen. As far as Mr. Valon's experiments on the oxygen system of lime purification extend, it appears that the lime in the "A" vessel was thoroughly carbonated, while the gas at the outlet of "B" was still low in "sulphur." If this really represents a normal action which would be maintained by a more extended trial, it must mean that the compound formed between the lime and the carbon disulphide must be capable of such active oxidation that even the combined bisulphide is oxidized, and retained in a fixed condition by the lime.

With regard to the cost of oxygen purification as compared with the ordinary system, and with that in which air is employed, that is a practical question of which gas engineers will no doubt be able to form a competent opinion; but I consider, before the subject can be really settled, we need to have a larger experience as to the effect of the use of air on the lighting power of the gas. Possibly Mr. Methven and others who have had experience in the matter, will give us the benefit of their conclusions.

GAS v. ELECTRIC LIGHTING IN BELGIUM.—We learn from our Brussels Correspondent that one of the most extensive cafés in Belgium—the Café du Phare at Liège—which since its opening has been illuminated by incandescent electric lamps, is now lighted by gas. The original installation was put in by M. M. Gerard et Cie, of Brussels; but the proprietor of the café found the lighting insufficient, and brought an action against the Société Electrique for damages. The whole of the original lighting plant has been removed, and is now for sale; a number of the Wenham Company's "Electric" gas-lamps being employed instead. This Company appear to be specially successful at café lighting; for their lamps have just been adopted in the Café des Trois Suisses in Antwerp, *vice* the abandoned electric lights supplied to this establishment by Messrs. Siemens and Halske.

CORPORATION TRADING.—In last Wednesday's *Money*, allusion was made to the subject of Corporation trading, in continuation of some observations made about a year ago in an article (reproduced in our columns) dealing with the manner in which corporations spend the enormous sums they borrow upon the security of the local rates. Our financial contemporary remarks: "So long as a corporation expends borrowed money in improving a town as a town, and in directions which distinctly tend to increase the rateable value, we can only discuss, as we did in our previous article upon this subject, the too often carelessness and extravagant manner in which the funds are frittered away. But when large sums are borrowed for the purpose of constructing docks or canals, the matter assumes a different aspect. At the same time it is not difficult to understand the process of reasoning by which worthy aldermen and town councillors justify their action in embarking in such enterprises. They evidently consider it to be their duty to spend money in any works which may ultimately bring trade to the town, and possibly make a great addition to its rateable value. But they entirely overlook an old proverb, which bids the shoe-maker never to go beyond his last; or, in other words, not to interfere in a business which he does not understand. Their business is to carry out sanitary and similar undertakings, leaving risky commercial enterprises to private individuals or to public companies."

Technical Record.

SOCIÉTÉ TECHNIQUE DU GAZ EN FRANCE.

THE PAPERS AT THE BOULOGNE CONGRESS.

In the JOURNAL for the 10th inst., we noticed briefly, from the abstracts in the *Journal des Usines à Gaz*, some of the papers read at the recent meeting of the Société Technique at Boulogne. We now deal with the remainder.

M. Salanson presented a communication on the subject of the regulation of pressure at the works, and on the flow of gas in pipes. He first of all laid down the following rule:—Given a certain condition of the orifices at which the consumption of gas takes place, the pressure at each point of a horizontal network of mains is proportionate to the pressure at which the gas is sent from the works. The author applied this rule in various ways before passing on to deal with the subject of the flow of gas in mains. Calling "the ratio of charge" at a given point in the canalization the ratio between the pressure existing at a particular moment at this spot, corrected by the difference in level as compared with the point of emission, and also with the initial pressure, the author established, under certain circumstances, the following principles:—(1) The "ratio of charge" at each point of the mains is constant for a like condition of the orifices at which consumption takes place. (2) For a given condition of these orifices, the ratio of consumption at each to the total consumption is constant. An examination of the conditions under which the first rule was applicable showed that for mains having a diameter of more than 16 inches, it could be applied strictly; but that for pipes of smaller calibre it could not, although it is sufficiently exact so long as the consumption is not doubled. In the case of lead pipes less than 2 inches in diameter, the loss of charge may be regarded as proportionate to the average rate of flow. In cast-iron pipes of from 2 to 20 inches in diameter, it is in proportion to M. Arson's two-term formula; while in those of larger diameters it is proportionate to the square of the speed. For the same pipe two definite speeds may be considered—viz., a higher speed, beyond which the loss of head is proportionate to its square; and a lower speed, beyond which the loss is in proportion to the simple speed. Between these limits, M. Arson's formula must be employed. Except, however, in the case of pipes of large size (say, from 52 inches upwards in diameter), the limits considered are not generally met with in connection with gas supply.

In a paper on the subject of detecting leakages from gas-mains, M. Schauflier described some experiments with the system introduced by Dr. Bunte of testing with chloride of palladium, which was noticed in the JOURNAL for Jan. 12, 1886 (p. 69). Before putting the plan in operation on a rather extensive scale, M. Schauflier was led to make a few experiments in the laboratory, with the view of ascertaining the best proportions of the constituent elements of the testing liquid to employ, so as to attain the highest degree of sensitiveness. He decided upon the following formula:—Chloride of palladium, 3.75 grammes; chloride of gold, 1.25 grammes; dissolved in a litre of distilled water. Test-papers steeped in this liquid were placed in tubes about 3 feet high fixed over a length of three miles of main—something like 2500 tests being made. The result was the discovery of leakage to the extent of 33.6 cubic metres (about 1200 cubic feet) per 24 hours; or for a year, 12,264 cubic metres (433,000 cubic feet). Reckoning this at 10c. per cubic metre, the loss was put at 1226 frs. The expense of testing being about 250 frs., the net benefit resulting in the first year was 976 frs., or close upon £40. It may be added that a pint of the liquid prepared according to the formula costs about 9s., and will steep enough filter-paper for 8000 to 11,000 tests.

M. Melon, in an interesting communication, indicated the various purposes for which gas-engines may be employed in gas-works; submitting a number of figures showing the advantages to be gained by utilizing gas as the motive power for driving the exhausters, scrubbers, pumps, coke-breakers, &c. He took two works where the production of gas is about equal, but where steam-engines are used in one, and gas-engines in the other. In the former, the cost was 3 fr. 84c., and in the latter 3 fr. 90c. per 1000 cubic metres of gas made; being equal to 1.03d. and 1.05d. per 1000 cubic feet. In the works where steam was employed, breeze was the only fuel used, and its cost was put at about 1d. per bushel; the gas consumed in the gas-engines being reckoned at 1s. 1½d. per 1000 cubic feet. The difference is not very considerable; and therefore the author left his hearers to draw from his figures whatever conclusions they considered to be applicable to the special conditions of their own works.

In a short paper by M. Weil-Goetz, the important subject of the treatment of spent purifying materials, for the recovery therefrom of sulphate of ammonia, was dealt with. The process described by the author is based on the two following principles:—(1) In systematic lixiviation, the solvent liquid increases in weight in proportion as it becomes charged with salt in solution; (2) in two vessels in communication, a column of liquid of low density is capable of balancing, and even of displacing, a shorter column of a liquid of higher density. The lixiviating apparatus is composed of a series of four vats, each furnished with a false bottom of wicker-work covered with canvas such as is used for packing, on which the material to be dealt with is placed. The vats are connected by pipes provided with taps and plugs, so that a systematic circulation of pure water can be kept up until the material has been thoroughly exhausted. Each ton of spent material produces from 20 to 24 cwt. of lye of the strength of 12° Beaumé (17° Twaddell),

containing rather more than 2 per cent. of ammonia. The process is by no means expensive. The treatment of 10 tons of spent material required 56 hours' labour, the cost of which was 16 fr. 80c., or 1 fr. 68c. (say 1s. 4d.) per ton. In the past year, with a make of 176½ million cubic feet of gas, the author produced 60 tons of spent material, the treatment of which yielded about 30 cwt. of ammonia, worth £40 a ton, at a cost of £4—leaving a net profit of £36. After lixiviation, the stuff is sold to a manufacturer, who extracts therefrom Prussian blue; paying at the rate of £20 per ton of blue obtained. This yielded a return of £100; bringing up the total receipts to £156—being at the rate of about 18s. per million feet of gas made, and 2½d. per ton of coal carbonized.

M. de Lachomette introduced to the notice of the members a new process for the manufacture of sulphate of ammonia. This paper was regarded as one of the most important submitted to the meeting. The author has devised a simple and economical method for the direct production of sulphate of ammonia by means of the constituent elements of the coal itself. The spent purifying material is roasted in a Michel-Perret oven, which causes it to yield sulphurous acid. This is led into a vat filled with water, into which at the same time is introduced a current of ammonia. The result is the formation of sulphite of ammonia, and, if there is an excess of sulphurous acid, bisulphite of ammonia, which is much more soluble than the preceding. With an excess of ammonia, the bisulphite is afterwards reduced to the state of sulphite, which, being deprived of one of its equivalents of water, is readily transformed into sulphate by simple exposure to the air. In the discussion upon the paper, some doubt was thrown on the statement that the sulphur from the spent material would yield sufficient sulphuric acid to saturate the whole of the ammonia; in other words it was questioned whether sulphur and nitrogen would exist in the coal in suitable proportions to furnish, of themselves, sulphate of ammonia. Opinions will differ on this point, according to the nature of the coal employed. But it may be pointed out that the advantage of the process consists in dispensing with the purchase of sulphuric acid, and in the facility afforded of producing sulphate directly by roasting crude sulphur. In this way all the annoyance caused by the employment of sulphuric acid, which is not always perfectly concentrated, may be avoided.

Several interesting questions were brought before the meeting by M. Chevalet. First of all, he referred to an improved form of the Leroy-Chevalet coke-breaker, by means of which it is claimed that two men are able easily to break from 27½ to 33 bushels of large coke per hour. He next alluded to an apparatus for the production of volatile alkali. He begins by saturating the ammoniacal liquor with lime, in order to decompose the whole of the ammonia; and afterwards distills the decanted liquor. The alkali, on leaving the stills, flows into a cooler; and the dry ammoniacal gas is freed of its empyreumatic oils by being passed into linseed oil or into charcoal filters, before being dissolved in water placed in vats of sheet iron, lead, or stoneware. Another matter, bearing upon the treatment of residuals, was the utilization of ammoniacal liquor for the manufacture of manure. M. Chevalet concentrates his liquor to about 22° Beaumè (say, 56-oz. strength), and then brings it into connection with ordinary commercial superphosphate of lime. The proportions of the two ingredients are regulated by the smell. The manufactured manure should not have the odour of ammonia. The stuff is exposed to the air for about 24 hours, at the end of which period it may be put up in bags or warehoused. Referring to the subject of the value of spent purifying material, M. Chevalet indicated how it might be increased by augmenting the content of nitrogen. He recommended the use of material prepared with sulphite of iron and lime, or Laming material, with white wood sawdust. The last matter touched upon by M. Chevalet was gas analysis. He described a burette which appears to have been constructed on the principle, if it is not actually a reproduction of that of M. Coquillion, which was described and illustrated in the JOURNAL for Jan. 31 last (p. 195).

A communication on the subject of the presence of cyanogen and its compounds in the products of the distillation of coal was presented by M. Pendrié. The author inquired into the reason of the generation of cyanogen and its various combinations in the carbonization of coal; defined the exact quantity and form in which they are met with in the various periods of the gas-manufacturing process; and described, from a practical point of view, the means of transforming them, at trifling cost, into articles of commerce. The conclusions he arrived at may be thus shortly stated: (1) In the process of the distillation of coal there is always formed, at the expense of the ammonia, a certain quantity of cyanogen, which is found in the distillation products in the form of cyanide and sulphocyanide of ammonium. (2) It is in the liquor contained in the hydraulic main that the larger proportion of the cyanide of ammonium is dissolved; and it is there that this compound is found in the greatest state of purity. (3) Only a comparatively small quantity of cyanogen is met with in the purifying material, and then principally in the form of sulphocyanide; in other words, in a very unsuitable form for the preparation of ferro-cyanides. (4) The transformation of the cyanides into ferro-cyanides is effected at small cost. Analyses show that, in order to attain this object, it is advisable to draw off and treat separately the liquor from the hydraulic main, in which there is scarcely any sulphuretted hydrogen, by which means the cost of transport would be diminished, and a purer product be obtainable. (5) Theory shows that it is possible to transform half the nitrogen liberated from coal in the form of ammonia, first into hydro-cyanide, and then into ferro-

cyanide of ammonia—a product of greater value than ammonia for an equal weight of nitrogen. It remains to be ascertained whether or not the practical result of this transformation is such as to allow of the system being profitably worked on a commercial scale.

The last matters to be noticed in connection with the congress relate to the consumption of gas. M. Bouvier presented a short communication on the subject of the light-giving capacity of gas-burners. The author gave, in tabular form, the results of his own experiments, and indicated the best burners and globes to use in order to utilize gas to the best advantage. M. Giroud exhibited the latest model of the Guibout burner, which has already been described in the JOURNAL (*ante*, p. 27). Several of these burners have been fitted up in the new waiting-room at the Western of France Railway Terminus in Paris. He also showed an arrangement of the Delmas burner with flat flame, for the lighting of railway carriages by means of oil gas. M. Pottier sent a "Note" on a new high-power burner, called the "Industrial," which it was stated would give the light of 9·5 candles with a consumption of 1·2 or 1·5 cubic feet of gas, according as the hourly consumption is 15 or 26 cubic feet. There is a certain similarity between the Delmas burner and the Siemens flat-flame burner; also between the "Industrial" and the Schulke. This resemblance did not escape the observation of the members.

In the foregoing abstracts we have merely endeavoured to indicate the nature of the principal communications presented at the congress; reserving for subsequent issues any fuller notice of them that may be considered desirable.

WESTERN (U.S.A.) GAS ASSOCIATION.

To-day we conclude our abstract of the "Official Report," as given in the *American Gaslight Journal*, of the proceedings at the annual meeting of the above Association.

Mr. W. M'DONALD, of Albany, N.Y., contributed a paper bearing the title "The Maximum Service that should be Required from the Various Standard Sizes of Meters." The author directed his remarks more particularly to dry meters. He observed that the real question was not how many lights were to be supplied from the meter, but the speed at which it was to be worked and the quality and temperature of the gas passing through it. A burner may use any quantity from 2 up to 10 cubic feet of gas per hour. He considered the maximum quantity a meter would safely pass was its nominal capacity multiplied by 10, as shown in the following table:—

Size.	Cubic Feet Per Hour.	Revolutions Per Hour.	One Year's Working.	Total Gas.
3 Light . .	30	240	2,102,400	262,800
5 " . .	50	300	2,628,000	438,000
10 " . .	100	400	3,504,000	876,000
20 " . .	200	400	3,504,000	1,752,000
30 " . .	300	360	3,163,000	2,628,000
45 " . .	450	360	3,163,000	3,942,000
60 " . .	600	360	3,163,000	5,256,000
80 " . .	800	350	3,066,000	7,008,000
100 " . .	1000	350	3,066,000	8,760,000

In addition to the quantity of gas passed, he added the number of revolutions per hour, also the number of revolutions and the total gas measured if the meter worked continuously for a year, which he thought gave a fair idea of the durability, or the duty that might be expected to be done before the machine was worn out. He was assuming that the meters would be subjected to no other deteriorating influence than actual wear. This table applied more to the larger sizes than to 3 and 5 light meters. It would be seen that these were figured to work rather slower than the others; but really, on account of the lightness of the work and the shortness of travel, they would bear a considerable increase. If a dry meter was not overworked, he thought it would comfortably bear a pressure as high as a pound per square inch (27 or 28 inches of water). He unhesitatingly asserted that meters were practically accurate, if allowed a fair chance. The three chief things meters had to contend with were impurity in the gas, condensation, and especially temperature. Given a gas free from condensable vapours and sulphurous or acid impurities, kept at a moderate uniform temperature, almost absolute accuracy could be insured. It was not always possible to control all these conditions, but if they received more consideration, meters would work better and last longer.

Replying to questions, Mr. M'Donald said the best locality in a building for the meter was the cellar. The temperature should not fall below 50° or rise above 70°. The effect of cold was to stiffen the moving parts, and he did not object to the use of alcohol for thawing a meter, if properly applied. If the rates per hour quoted in the table were exceeded, no great harm would follow until some of the machinery broke, when the meter would either fail to pass gas, or let it through without being registered. While well-made water gas was not prejudicial to a meter, he had observed that if a meter which had been used for water gas, was taken out and permitted to stand, the diaphragm always hardened, and anything that tended to harden the diaphragm would lead to fast registration.

Mr. H. PRATT, of Chicago, Ill., next read a paper on "Inclined Retorts." After noticing some early endeavours in this direction, he described the system patented by M. Coze, of Rheims, France;*

* See JOURNAL, Vol. XLVII, p. 25.

and then proceeded to give details of a system of inclined retorts designed and erected by himself—the retorts being set at an angle of about 30°. He had constructed a bed of six retorts over a common furnace, each retort being 12 feet long, 13 in. by 24 in. at the upper, and 13 in. by 28 in. at the lower end. Inside the lower end was a stop to keep the coal from slipping down into the cool part close to the mouthpiece. There was no difficulty in getting the charge in fairly level, and if well worked off, it would fall out, on opening the lower lid and removing the stop. If not completely coked, a little assistance with a small iron rod was all that was necessary. The retorts were readily cleaned by loosening both lids, the current of air being adjusted by the bottom lid. The charging apparatus consisted of a travelling-hopper, supported on overhead rails, above the level of the top row of mouthpieces, and having shoots for delivering the coal into each retort as desired. For a series of such benches, a line of rails to carry the hopper could be supported between two rows, and would serve for both. It could be driven by any suitable power, and an elevator used to replenish the hopper.

At the conclusion of the paper, Mr. Walsh remarked that he had visited Rheims, and had seen the system of M. Coze applied to a setting of nine retorts. He was so pleased with it that a similar set for five retorts had been ordered for St. Louis, and had just been completed and started. Mr. Taylor said that the bench mentioned by Mr. Walsh had been at work for seven days when he left. In twenty-four hours it carbonized 9600 lbs. of Youghiogeny gas coal, yielding 48,864 cubic feet of 16 to 20 candle gas, or 5'09 cubic feet per pound. The coke produced was 157 bushels (35 lbs. per bushel), of which quantity 74 bushels, about 47 per cent, were burned in the furnace. This was with 400-lb. charges; but he thought that when in proper operation the bench would take 500-lb. charges. They remained in the retort for five hours; but he expected to be able to work shorter charges. This bench was erected in a separate building, away from the other retorts; and therefore the fuel account was higher. The retorts were 11 ft. by 15 in. by 26 in. He had tried various sizes of coal, and found that egg coal spread best in the retorts. There was a saving in labour, and also in leakage, because the charge was in and the lid closed in two seconds.

Mr. E. LINDSLEY, of Cleveland, Ohio, contributed a paper on "Incandescent Gas-Burners." The incandescent gas-burner had been called into existence, the writer remarked, by the desire to use, if possible, cheap heating gas as an illuminant also. A description of the Welsbach and of the Fahnejelm burner was given; and the author quoted some experiments made by Mr. A. C. Humphreys, of the Welsbach Incandescent Gas Light Company. The following is a summary of the results.

Gas per Hour, Cubic Feet.			Candle Power per Cubic Foot of Gas Used.					
			Burner No. 1.	2.	3.	4.	5.	6.
2.9	..	After 20 Hours' use	10.0	8.0	4.5	9.7	11.7	11.0
3.0	..	" 50 "	8.7	6.0	3.3	6.7	8.0	8.7
3.3	..	" 160 "	7.6	5.7	1.8	7.3	7.3	8.2
3.2	..	" 250 "	6.0	4.7	1.9	6.7	6.0	6.7
3.0	..	" 400 "	6.0	3.3	2.0	5.7	3.0	6.0
3.0	..	" 600 "	6.0	5.1	2.3	5.7	5.0	7.0

The gas consumed for the last test was 20 candle; but the value of that used in the other tests is not given. Burners Nos. 1, 4, and 6 were fitted with the larger mantles, which were said to be of the American type. Nos. 2, 3, and 5 were the smaller mantles of the European type. The former were used with straight chimneys, and the latter with tall ones contracted near the base. No. 3, which gave by far the worst results, is of the variety which yield a white light, and it was selected as the best by several observers. The "European" burners appeared to depreciate by the destruction of the horizontal threads in the mantle at the point of contraction. No. 2 showed a disposition to disintegrate by the force of the explosion that frequently occurs in attempting to light this kind of burner, and during the latter half of the time, it had two or three large holes in it. The American burners would stand reasonable usage without breaking. The practical question was whether the increased duty obtained would offset the additional care required and the increased cost of the burners.

In the course of the subsequent discussion, the President remarked that the experiments quoted had been continued up to 1056 hours' use, at which period the results were as follows:—No. 1, 4 candles; No. 2, 3 candles; No. 3, broken; No. 4, 4.9 candles; No. 5, 3.3 candles; and No. 6, 6.6 candles. It would be seen that the American types were more durable than the foreign. Of course, it would not pay in practice to run the burners beyond the 600 hours. The form of chimney used with the European burner was unsuitable, because it was almost impossible to light it from the top. With the ordinary straight chimney, 7 to 10 inches high, as used with the American burners, there was no difficulty of this kind. There was as much difference between the European and American types of Welsbach burner as between an oil-lamp and a gas-burner. Mr. Egner said he had tested a Fahnejelm burner, and found that 3 cubic feet of coal gas used in an Argand gave as much light as 5 feet of uncarburetted water gas in the Fahnejelm. He was told that this burner would not do for illuminating gas; but he had since seen a much better result with this burner, and the magnesia comb was very cheap—only 14d. Mr. Lindsley said that the difficulty in lighting the Welsbach burner had been partly and perhaps wholly removed.

Mr. J. D. THOMPSON, of St. Louis, Mo., read a paper on "Gas Companies Accounts." He called attention to the importance of knowing exactly what the gas cost in the holder, and also the

cost of each item of expenditure per 1000 cubic feet of gas made and sold. Especially was it necessary, in these days when the patent gas man is about, to know exactly what the manufacturing charges were, and to keep them distinct from the management and other expenses. It was also desirable to observe a strict distinction between revenue expenses for the repair of existing plant, and the cost of new and additional machinery, which was properly chargeable to capital. He was in the habit of working out statistics as above suggested each month; and he exhibited a leaf from his account-book, showing the manner in which the several items were separated. The reason for working out the cost of gas made, and also of that sold was that he considered the difference between these two columns showed the actual loss by leakage in a more comprehensive manner than the usual plan of stating the percentage of unaccounted-for gas. He had now kept these accounts for ten or twelve years; and the value of being able to compare his working each month with corresponding periods was very great, and often led to the detection of weak places that would otherwise pass unheeded. In regard to the keeping of the consumers' ledgers, the system he recommended was a separate ledger account for each customer, appearing in the book in the alphabetical order of streets and house numbers; and each ledger contained space for 1000 accounts—two on each page. With monthly accounts, it would last for a period of three years. A system of journals and cash books is used in connection with the ledgers.

The discussion was opened by Mr. King, who proposed the appointment of a Committee, with Mr. Thompson as Chairman, to report upon and recommend a suitable system of accounts, for use as a standard of comparisons, at the next meeting. The system should be applicable to large and small undertakings alike. This proposition was subsequently adopted and a Committee appointed. In reply to questions, Mr. Thompson said his plan was to compare the make of gas with the actual cash received. Outstanding accounts, as a rule, were not carried forward at all, except in the case of large payments from the city or large consumers. Even the smallest undertaking could well afford the cost of keeping accounts on his system; and where one man had charge of the whole, it was proper to apportion his salary—part to the manufacturing, part to the distribution, and so on. In the case of small pipes replaced by larger, the additional cost only of the latter should be charged to capital account. He did not trouble about the stock of gas in the holders at the end of each month, as it varied but little. The stock of coal was carefully estimated. Mr. Barker said the plan proposed by Mr. Thompson was similar to that adopted by the Massachusetts Gas Commission.

Mr. F. BIERCE, of Memphis, Tenn., read a paper on "Half-Depth Generator Furnaces," a full abstract of which appeared in the JOURNAL for July 17, p. 122, with a summary of the subsequent discussion.

Professor MENDENHALL, President of the Rose Polytechnic Institute, Terre Haute, Ind., delivered a lecture on "Photometrical Standards." Having noticed the present confusion existing on this subject, he proceeded to consider the nature and requisites of a standard—that it should be unrestricted both in respect to time and place, convenient, and readily accessible to all. It was also desirable that the standard should be of the same kind as the thing to be measured. In measuring light, the standard should be a light; but he was beginning to have serious doubts as to the possibility of establishing a standard light, and thought it would be necessary to resort to indirect measurement. Directing attention to the various units of light already proposed, he said that the principal objection to the platinum unit was the great difficulty attending its production—a difficulty so great that it had probably been only produced by one or two men. It not only needed careful manipulation, but was very expensive; and it could not be reduced to terms of other standards at present in use. A table from Wagner's "Chemical Technology"—showing the comparative value of the Carcel, the platinum, the French stearine candle, the Munich stearine candle, the German union candle, and the English sperm candle—was exhibited; and it was pointed out that the various figures did not fit in together within 20 or 25 per cent. Several particulars of these proposed standards, and also of the Hefner-Altenack lamp, were given. Some of the difficulties peculiar to photometrical operations were next reviewed. The article to be measured is uncertain in character and composition, not constant in quantity, and not of any known or definite character. It might be compared to an attempt to measure a sheet of elastic rubber subjected to varying degrees of tension, by means of a yard stick of similar material. One of the first steps towards reliable photometry would be an accurate definition of what light is, and the kind of light to be tested. Referring to the energy of various kinds of illuminants, the Professor stated that if all the heat produced by a stearine candle in the act of burning could be converted into work, 8.77 of such candles would be equivalent to 1-horse power. The spermaceti candle gave a rather lower result—viz., 8.97 of this kind were equal to 1-horse power. A jet of gas consuming 5 cubic feet per hour yielded in that time the equivalent of 1.2-horse power. So while a sperm candle gave 9-candle light per horse power, the gas from an ordinary burner gave 13 candles per horse power. With regard to electricity, it was known that 150 candles per horse power could be realized with the incandescent, and ten times that quantity with the arc light. The object in each case was to obtain as much of the available energy as possible in the form of light. Attention was then directed to a chart illustrating the energy of vision, prepared by Professor Langley, which showed that a very small proportion

indeed was required for that purpose, and that light produced at a point between the yellow and the green in the spectrum produced more than one million times the effect upon the eye than if put in the red or the violet. The lecturer concluded by stating that the problem to be considered by producers of artificial light was firstly to determine what species of radiant energy was most desirable; and then to find out how to produce that particular species to the exclusion of all others. The next thing would be to determine how to measure accurately this energy when put into the form of radiation.

Mr. King called the Professor's attention to the subject of candle power *versus* illumination, which had frequently been discussed at previous meetings of the Association, and which had been exemplified at the meeting by the fact that a Welsbach burner which gave very inferior photometrical results had been selected by several persons as giving the best light. Professor Mendenhall said he thought the resolution of this problem lay along the lines he had indicated—viz., the determination of just what spectrum compounds or wave lengths are desirable in a light. He might mention that Professor Langley used a sheet of printed paper having rather small characters, covered with a piece of white paper having a hole one inch square in it, as a photometer.

The meeting concluded with the usual routine business and votes of thanks, in the course of which Mr. G. Shepard Page was authorized to present the hearty wishes of the Association for the success of The Gas Institute meeting in London. As most of our readers know, this gentleman has already worthily discharged his mission.

ARTESIAN WELL-BORING AT ALDERSHOT.—The Aldershot Water Company have just had two more 6-inch artesian tube-wells added to the system of couple tube-wells by Messrs. Le Grand and Sutcliffe, of London. These wells have been put down to meet the additional requirements of the Government for the Camp; and though the work has been done by hand labour, they were each completed to the depth of 280 feet within the space of five weeks.

PRESENTATION TO MR. L. CLAYTON, OF HUNSLET.—On Thursday, the 12th inst., the *employés* in the firm of Messrs. Clayton, Son, and Co., Limited, of Hunslet, near Leeds, testified their high regard for the Managing Director of the firm, Mr. Lawrence Clayton, by asking his acceptance, on behalf of himself and Mrs. Clayton, of a silver tea-urn, suitably inscribed, on the occasion of the twenty-fifth anniversary of their wedding. The testimonial was subscribed for by whole of the workpeople—nearly 200 in number—and was offered as an evidence of their appreciation of the services rendered by Mr. Clayton in having, for a period extending over a quarter of a century, developed and built up an industry—the manufacture of gasholders, gas plant, &c.—which has benefited the township of Hunslet to a very material extent. The presentation was made by Mr. C. Barrett, who said it was the spontaneous offering of the *employés*, and it afforded evidence of the kindly feelings entertained by the donors towards the recipients. He believed that this feeling was reciprocated on their part; and he trusted that the harmonious relations hitherto existing between employer and employed at the works would not only continue but increase. He heartily wished that Mr. and Mrs. Clayton might long enjoy the gift bestowed upon them in commemoration of their silver wedding, and that the future career of the firm would be signalized by increased trade and prosperity. Mr. L. Clayton, on behalf of himself and Mrs. Clayton, acknowledged the gift in appropriate and felicitous terms.

PRESENTATION TO MR. L. T. WRIGHT.—On Monday last week, the seven principal officials of the Nottingham Corporation Gas Department waited upon Mr. L. T. Wright, Assoc. M. Inst. C.E., F.C.S., at his office, for the purpose of asking his acceptance of a diamond ring, as a small memento of the pleasant relations which had subsisted between them since his occupancy of the position of General Manager of the department—a position he is about to relinquish in order to undertake the duties of Engineer and General Manager of the Buenos Ayres (New) Gas Company, as already announced in our columns. The presentation was made by Mr. S. Tagg, Superintendent of the Radford station, who expressed his regret (in which all his colleagues joined) at the approaching severance of their connection. Mr. Wright had, he said, by his straightforward and gentlemanly bearing, won the hearts of all with whom he had come in contact; and this would often be borne in mind when he was thousands of miles away. He pointed out that the ring could not by any means be taken as adequately representing the good wishes of the staff Mr. Wright would leave behind him. Whilst all deeply regretted the loss, they could not help congratulating Mr. Wright on his appointment to such an influential position as that which he had just accepted; and said he was sure all those, not only in the room, but in the various departments of the undertaking, would join in wishing Mr. and Mrs. Wright and their family a pleasant voyage, a prosperous sojourn in Buenos Ayres, and a safe return to England. Mr. Wright, in responding, stated how regretfully, for many reasons, he was leaving them; for a better staff of chief officials no man need wish to have. He remarked that the gas undertaking, being now one of great magnitude, with extensive ramifications, needed watching with a very keen eye by the various heads of departments; no one better than the principal knowing the great care that was necessarily daily required. He again heartily thanked them for their kind words and good wishes.

Register of Patents.

GAS PRODUCERS.—Bull and Co., H. C., of Poultry, E.C. No. 10,205; July 21, 1887. [8d.]

This invention relates to the generation of water gas, made by passing superheated steam through a body of coal or coke previously raised to a state of incandescence.

The apparatus is of the double chambered type—one of which chambers constitutes the steam superheater, and the other one the chamber in which coal is firstly distilled of its volatile constituents, and then the coke thus made in it is converted into gases. The process of gas making is an alternating one; that is, the coke in the fuel vessel is first raised to a state of incandescence by forcing air through it, and the gases resulting therefrom are burned in the superheating chamber, by which it is also raised to incandescence. The flow is then cut off; and steam is passed in an opposite direction, first through the superheater and then through the fuel vessel. In the first operation—the blowing and heating up—coke is preferably used as the fuel; and the air used is preferably previously heated. In passing through the coke, oxygen of the air uniting with the carbon of the fuel becomes converted into carbonic acid first, and subsequently into carbonic oxide of a high temperature. This, together with the nitrogen, passes up and around the retort, and over into the superheater, where it is supplied with air. Combustion of a high temperature takes place here, and the products of combustion are passed over the brickwork surfaces, by which a great portion of the heat of the gases is taken up and stored. The gases are then led from the superheater into a chimney or other place of disposal. After the apparatus has been subjected to this operation for a certain time, the air is cut off, and steam is passed through the apparatus in the reverse direction—first passing up and over the heated brickwork, whereby it becomes very much superheated, and then through the fuel in the gas-making vessel. The retort of the gas-making vessel, previously to the turning on of the steam, is filled with briquettes of coal, and the highly heated steam surrounding the retort, before it enters the fuel at a lower level, causes the distillation of the illuminating and other volatile gases of the coal, and converts it into coke. In passing through the incandescent coke, the steam is converted ultimately into carbonic oxide and hydrogen; and the gases thus made are led into a suitable main.

The illuminating gas may, after being freed from tar and ammonia, be re-admitted to the apparatus with the steam, and sent through the incandescent fuel and delivered into the gas-main.

Between the processes of reviving and gas making, steam is admitted to drive out any air or gas that may have accumulated on the producer side of the gas and air valves of the gas-making chamber, thereby rendering the apparatus free from explosions.

The particular form of apparatus preferred for carrying out this invention is constructed substantially as follows. The gas producer consists, as already stated, of two chambers preferably round, lined with fire brick or other refractory substance, connected together by a pipe near their upper parts, which is also lined. One of the cylinders has, on the inside, a conical retort, made of fire-brick or other suitable material, occupying a certain amount of its length from the top, and being (say) about half the diameter of the inner lining wall of the cylinder. The other has inside a central cylinder of brickwork, communicating with an air-valve at its bottom; and is surrounded by diverging or radiating walls forming large heating and regenerating surfaces. The first or gas-producing cylinder is provided with three valves—one for the admission of hot air for the purpose of reviving the fire, another for the outflow of gas to the gas-main, and the third (a steam-valve) which is used to clear the pipes first of gas and afterwards of air. The second or regenerating chamber is also provided with three valves—one for the admission of air through the central brick cylinder into the combustion chamber at the top, another communicating with a culvert leading to a chimney, and the third (a steam-valve) connected with a steam-main leading from the steam generators. The top of the conical retort in the gas-making chamber is fitted with a lid which can be readily opened or closed, and provided with a pipe to convey the volatile gases to an ordinary hydraulic main. For a continuous production of gas, two or more producers are used in battery; some being revived by the admission of hot air, while one is producing gas by the admission of steam.

REGENERATIVE GAS-LAMPS.—Körber, J. W., and Streuth, J. W., of Düsseldorf, Germany. No. 7386; May 18, 1888. [8d.]

This invention relates chiefly to the supply of air to the bottom of a gas-lamp, by an arrangement of tubes; to the peculiar construction of the regenerator; and to the arrangement for enabling the ignition of the lamp to be effected from the outside of the glass shade.

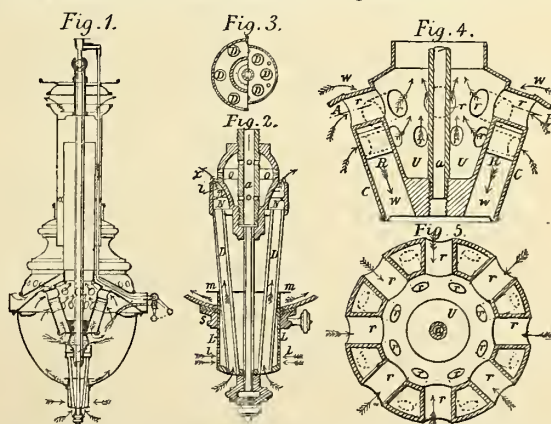


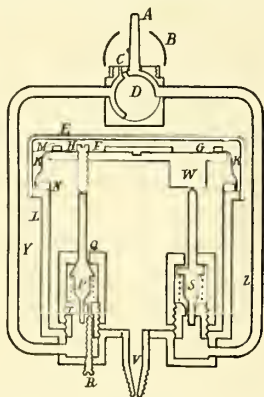
Fig. 1 is a longitudinal section of the whole lamp; and figs. 2 and 3 are a vertical section of the burner (with the bottom prolongation for air

supply) and a horizontal section of it. Figs. 4 and 5 are a vertical and a horizontal section of the regenerator.

The lamp consists of certain parts not novel. Gas is supplied through the tube *a* to an angular Argand burner *o*, which is in communication with the bottom part formed by tubes *D* arranged in the form of a ring for the supply of air from underneath. They are in communication at the bottom with the casing *L*, and at top with an air chamber *N*; the latter having inside a projecting edge, and also a strainer placed within it for the purpose of distributing and balancing the supply of air flowing out against the lower surface of the flame. The casing is provided laterally with a number of perforations *l*, serving to conduct air to the inner surface of the glass shade. Over the casing a deflecting disc *m* is slid on to the tubes *D*, and serves to deflect the air flowing in through the perforations from its course to the burner, and to direct it past the inner surface of the glass shade whereby this latter is kept cool, and any unsteadiness of the flame prevented. The greater portion of the air necessary for the thorough combustion of the gas, and for producing an intense white flame, is supplied through the regenerator *C* to the upper surface of the flame. This regenerator has both inside and outside the form of an inverted truncated cone, with double wall or periphery forming an annular air passage *R* and collecting chamber for the escaping products of combustion. Across the air-passage are fixed a number of nozzles *r*, zigzag underneath each other, through which the products of combustion must pass in their course towards the discharge-tube, and so heat the surface of the nozzles as well as that of the truncated cone to a red heat. The conical form of the regenerator and the direction of the nozzles is said to cause the products of combustion to impinge against its surface in a more or less normal direction, thus communicating to it a greater heat than in the case of cylindrical regenerators. The requisite air supply takes its course to the flame in the direction of the arrows *w*; but it cannot arrive there in a direct line, as it must impinge against and around the surface of the zigzag nozzles in a winding direction, and over a relatively large heating surface, thus attaining a far higher temperature than if it had a direct course.

AUTOMATICALLY LIGHTING STREET LAMPS.—Kincaird, S. B., of Guildford. No. 5126; April 6, 1888. [6d.]

This invention relates to the construction of a self-lighting gas-burner by causing a small increase of pressure of the gas supply, by acting on a moveable diaphragm, to augment disproportionately the supply to the burner, and at the same time to operate an auxiliary igniting burner, thus enabling any one or more gas-lamps on a main or service to be lighted up and extinguished simultaneously from a distance.



In the engraving the gas-burner *A* gets its supply of gas from the pipe *Z*, through the valve *S*; the cock *D* regulating the supply, while always, by the extent of the grooves in the plug, leaving the way open from the pipe *Y* to the igniting burner *C*. *B* is a screen, with ventilating holes (as shown) at the bottom, to protect the igniting flame from draughts. *L* is the body of the apparatus, attached by *V* to the gas-pipe in place of an ordinary burner. The plate *G* is hinged to this body, and connected by the diaphragm *K* (of oiled leather or other suitable material) secured by the screwed-down rings *M* and *N* to *L*. *F* is a weight or adjustable spring, according with the pressures for which the contrivance is required to act. *S* is the main valve, which on an increase of pressure of the gas in *L* raises *G*, and the block *W* is thus forced open by the spiral spring shown by the dots—thus supplying gas to *A*. The screw *H* is so adjusted that the piston *P* rises at the same time by the action of its spiral spring; thus first letting gas by its lower valve *T* to *C*, hitherto supplied only through the bye-pass regulated by the screw *R*, and next, when this has kindled *A*, closing the opening *Q*, and extinguishing the flash-burner. On a reduction of the pressure, the weight *F* causes *G* to fall; *Q* is opened, and *C* lights up; then *S* and *P* are both forced home; *A* is extinguished; and *C* (now fed only through its bye-pass) burns at its minimum. *E* is a cover with perforations to admit air.

APPLICATIONS FOR LETTERS PATENT.

10,186.—CAMPBELL, A., and BOYD, W., "Improvements in purifying or treating coal gas and other gaseous or liquid products of destructive distillation, and in part applicable in the alkali manufacture." July 13.

10,242.—SUGG, W. T., "Improvements in gas regulators or governors." July 14.

10,307.—KENT, W. G., and PRICE, H. S., "Improvements in liquid meters and motors." July 16.

10,321.—LEE, G., "Improved apparatus for heating greenhouses and other buildings with gas." July 17.

10,322.—HARGREAVES, J., "Improvements in the treatment of sulphuretted hydrogen to obtain sulphur, and in apparatus employed therein." July 17.

10,336.—M'DOUGALL, A., "Improvements in the manufacture of gas from oils and other liquid hydrocarbons." July 17.

10,350.—NARR, L. H., "Improvements in gas-engines and method of operating the same." July 17.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

MR. HUNT'S CRITICISMS ON MR. CARPENTER'S PAPER.

SIR,—I do not propose to encourage the "circular-of-inquiry" style of "Your Occasional Correspondent, A. B.," whoever he may be, but should just like to point out to him how little he, or the cause he champions, benefits by his fuel comparison.

Of the yield of coke at Birmingham, 23 per cent. is used as fuel, equalling 9·6 bushels per ton of coal carbonized; while the South Metropolitan Company uses 20 per cent. of the yield, or nearly 10 bushels per ton of coal carbonized, being about 4·10ths of a bushel more than at Birmingham. Moreover, "A. B." has omitted all mention of the tar used for fuel by the South Metropolitan Company, over and above this consumption of coke; and it is strange if this omission be accidental, since the fact is expressly noted in "Field." According to the half-yearly reports of the Company, the total quantity of tar thus consumed during the year 1887 amounted to 2,282,961 gallons, equal (see Mr. G. Livesey's letter to the JOURNAL for Sept. 19, 1886) to 32,614 chaldrons of coke. Multiplying these by 36, and dividing by the total coal carbonized we get an additional fuel consumption equivalent to 2·1 bushels of coke per ton of coal carbonized. The comparison thus becomes about 2½ bushels per ton in favour of Birmingham.

Or, taking the value of this fuel-tar as stated in the South Metropolitan Company's report dated Aug. 5, 1887, at 1½d. per gallon, its total value is £11,890 8s. 5½d., or 5½d., per ton of coal carbonized, the whole, and more than the whole, of which, appears to be saved in Birmingham.

According to "A. B.," I am entitled to appeal to this as testimony in favour of my proposition; and it may appear to be the more remarkable because I am free to admit, in response to his questioning, that it was the South Metropolitan Company which first essayed to set the fashion of regenerative firing in this country. But he is quite wrong in supposing that I saw in London the first workable regenerative furnace used in England; the fact being that I have never seen any such in London. Some attempts have, I believe, been made in this direction; but nothing seems to have come of them—absolutely nothing, I might have said, but for fear of again wounding the susceptibilities of "A. B."

Birmingham, July 21, 1888.

CHAS. HUNT.

THE PHOTOMETER QUESTION AT THE GAS INSTITUTE MEETING.

SIR,—In your issue of the 17th inst., Mr. W. Sugg, in his own kindly way, criticizes my paper on "Photometers," read at the recent Gas Institute meeting. He remarks that the "portable" photometer has never received the sanction of the Standards Department of the Board of Trade, and appears to argue therefrom that its indications are unreliable. As a matter of fact, not one of the photometers at the 17 Metropolitan gas-testing stations has received such sanction, as it is not required. The only authority concerned is that of the Gas Referees, who had the "portable" photometer in their possession some time back, and returned it, with an intimation that they were perfectly satisfied that it was a good and correct instrument.

Mr. Sugg then proceeds to criticize the tables, and says that on the third day (Table No. 3, photometer No. 1) the "pairs of readings agree again, practically; the difference being that the Evans photometer read 0·1 candle lower than the open bar." If Mr. Sugg had said that the first pair of tests so agreed, he would have been correct; but he infers that they all agreed. The following are the figures; and I do not think that a difference of two candles (see third pair) can be called an agreement:—

Evans.		Open Bar.	
17·2	Greatest difference, 2 candles.	17·3	Greatest difference, 1·3 candles.
16·8		16·0	
18·0		16·0	
17·6		16·6	
16·0		16·5	

Average 17·1

Average 16·5

The fourth day shows an average agreement in the first pair of tests, as is not uncommon with the Evans photometer—the first test generally being fairly satisfactory; but in the second pair of tests, the difference is 1·3 candles. The readings on the fifth day give an average of 16·6 for the Evans, and 15·7 for the open bar, or a difference of 0·9 candle. On the sixth day we have 17·5 for the Evans, and 17·2 for the open bar—not a great difference truly! But how obtained? I submit, by sheer accident. These are the figures:—

Evans.		Open Bar.	
17·3	Greatest difference, 1·9 candles.	17·3	Greatest difference, 0·2 candle.
18·5		17·1	
16·6		17·1	

And yet Mr. Sugg calmly says: "And so on every day I find pairs of readings, sometimes agreeing completely, and sometimes with very slight divergencies one way or the other, until the ninth day, when we have the 'corruption of good manners' by an 'old converted' Evans," as Mr. Sugg neatly puts it. Now, while I candidly admit that the "old converted" photometer is a bad example of a bad class, I shall be pleased to introduce Mr. Sugg to one of the very latest pattern Evans, which persistently returns 16·5 candles as the value of a 2½-inch flame—a result impossible of attainment by fair means on an open-bar photometer. Mr. Sugg asks why results as concordant as the above should not always be obtained. I reply that they are always obtained; and that they are so contradictory and confusing that I have frequently had an examiner, who has been accustomed to accurate work in other branches of science, look at the instrument in wonder, and seriously ask, "What is the good of using it?"

My contention that the Evans photometer is a mistake is upheld by such experienced authorities as Mr. Heiseh and the late Dr. Letheby; and I can see no reason whatever for its retention. It must be distinctly understood, however, that in this I do not attach any sort of blame to the makers. They have had a difficult task to make a faulty thing workable at all; and the excellent work turned out by them is a guarantee of their care and skill. Formerly all the faults of the Evans

photometer were ascribed to the candles. But it is now demonstrated that it is the instrument that is the greater sinner of the two; and I submit that it should be removed from all testing-rooms at once.

I may say, in reference to Mr. Sugg's remark anent the Gas Referees, that I have no desire to interfere with their discretion or their duties; but, as I have found certain facts, I deem it my duty to put them forward for the information of all concerned. A dispassionate consideration of these facts, and the daily experience obtainable, will result in the establishment of the arguments contained in my paper. Instead of the few figures given, I could have multiplied them a hundredfold. As it is, they are merely illustrative of a state of things existing in daily work, which should not be allowed to continue now that the true cause is known.

I confess that I am not now prepared to resume a discussion on the bending of the wicks of candles, &c., as re-started by Mr. Young. Candles have been heartily abused by being used in unsuitable instruments, and as often, it is true, in unsuitable rooms; but I cannot see any advantage in rediscussing a threadbare subject. Our efforts will be more profitably devoted to the speedy introduction of one of the new and reliable standards, and thus to the attainment of more serious and accurate work. The comedy of "The Candles in an Evans Photometer" has been played long enough, and should be brought to a close as speedily as possible.

Spring Gardens, S.W., July 18, 1888.

W. J. DIEBEN.

SIR,—As Mr. Young, in his letter to the JOURNAL for the 17th inst., refers to tests made by me at this office, I think it right to inform you that his conclusion, that those tests (which are taken daily, not occasionally, as might be inferred) confirmed the testings on the Evans photometer in Jewin Street, is not correct as regards the observations in the foggy weather to which he refers; but, not being official, they cannot be published.

City Gas Examiner's Office, Mark Lane, E.C.,
July 23, 1888.

CHAS. HEISCH,
F.C.S., F.I.C., &c.

THE INCREASED DEMAND FOR COKE.

SIR,—I do not know whether or not your invitation to your readers to give an explanation of the increased demand for coke in England is to be considered to have been extended to your foreign subscribers; especially to those who, like myself, write English imperfectly. But, at any rate, I venture to submit an explanation, rather for the sake of what I can learn than for the information I am able to give to others. Perhaps one fact connected with my country of residence (Spain) may facilitate my hitting on the true explanation. It has always been a puzzle to my mind to understand the low price that gas coke fetches in England, as compared with what I understand is its intrinsic value, rationally estimated, in relation to other fuels. Merely considered in its absolute value as a heat-producing material, without thinking of any special application, I consider that gas coke is equivalent in value to large steam coals, with an addition to such price of 12 per cent. But, besides this, gas coke has merits of its own for certain purposes, which enhance its value (say) to about 25 per cent. on the price ruling for large steam coal. Gas coke is such a fuel as can be used in heating-stoves of the Chuvinsky type, and the like, without producing smoke and avoiding the great waste of heat experienced with open fires. Next to this, cooking-ranges heated by coke are very convenient and economical; even when paying for coke double the price usually paid for coals used for cooking in ordinary appliances in England. Not to cite a great number of cases, let me say that, gas coke being the material preferable, after anthracite, for producing Dowson gas and water gas, its value must be considered far superior to an equal weight of such coal as would do similar service to that obtaining from coke applied to such purposes.

Is it prejudice and habit that have been the cause in England of gas coke, instead of fetching a price equal to 25 or 30 per cent. above the average of large coal, being sold at a considerable discount on this price, and even then not easily and generally? Although I am acquainted with English habits and customs, I could not give a positive answer to this question; but I am inclined to believe that there is no sound reason why such coke in England should be so depreciated from its intrinsic value. My impression is that in my own country, as also in France, the value of gas coke is exaggerated. It is generally 50 per cent. more than the cost of gas coal on the spot. So that where this kind of coal costs 14s. a ton, it is almost certain that coke will find a market at 21s., or even more. Of course, this may depend on the small quantity of coal carbonized in each gas-works; but this is no doubt compensated by its restricted employment for industrial purposes, as well as by the limited use of machinery and apparatus in which coke could be consumed in Spain. But as to England, where there is no limit to the quantity of coke that ought to be saleable for use in existing machinery and apparatus—if for no other purpose, to be converted into producer and water gas—I could understand coke being sold at its intrinsic value as fuel, after any transformation that may be required; but in no case can I see why it is sold below that value. This is so clear to my mind that I really believe it must be so to every one else's; and most likely a movement is going on in England to use gas coke for domestic heating and cooking, and for producing industrial gases, though such movement has not yet been sufficient to bring the price to its proper level, as will be the case when the change has become general. But, in the meantime, it may have already advanced sufficiently to add quietly to its former applications such others as may be causing that increased demand which will, in the course of time, cause the present underrated value of coke to disappear, and perhaps even make it (as is the case in Spain) worth 50 per cent. more than large coal, ton for ton, not on account of its intrinsic value, but of its additional convenience.

I have often thought that, after the practical demonstrations made by Messrs. Crossley Bros., Limited, and the Dowson Gas-Producer Company of the quantity of gas coke they consume to obtain 1-horse power, the electric light in England ought to be produced in the cheapest way, in most cases, with Dowson gas used in "Otto" gas-engines, until there is a change in the prices. In Spain, on the contrary, I know of a case in which the equivalent heat of 30,000 tons of coal could be obtained without any cost, by selling gas coke (at the current price of the market) at more than double the cost of the coals.

In conclusion, I may say that, in my opinion, the present demand for gas coke in England depends on the fact that it is sold at less than its intrinsic value. I have before me the "Analysis of the Accounts of Gas Companies and Corporations for 1886;" and I notice that most of them only realize 30 per cent. of the cost of their coal by the sale of their coke. But I think it will not be until they make 60 per cent. by it that they will be selling it at its real value.

Madrid, July 11, 1888.

A SPANISH GAS MANAGER.

MECHANICAL v. HAND STOKING AT THE MANCHESTER CORPORATION GAS-WORKS.—In the final paragraph (on p. 126) of Mr. West's letter on the above subject in the JOURNAL last week, the saving effected at the Rochdale Road works, where Mr. West's machinery is in operation, was, by a typographical error, printed as 1-646d., instead of 8-646d. per ton.

THE ISSUE OF STAMPED SHARE CERTIFICATES.—A Country Secretary writes: "I shall feel obliged if you will kindly inform me whether statutory gas companies are required to issue their share certificates under a penny embossed stamp; and likewise if this provision of the Stamp Acts is obligatory on all limited liability companies."

Parliamentary Intelligence.

HOUSE OF LORDS.

MONDAY, JULY 16.

The Nelson Local Board Bill was read the third time, with the amendments; further amendments made; Bill passed, and sent to the Commons. The Electric Lighting Order Confirmation Bill (South Metropolitan Order) was read a second time.

TUESDAY, JULY 17.

The Lancaster Corporation Bill was reported, with amendments.

FRIDAY, JULY 20.

The Hexham Local Board Bill was read the third time, with the amendments; further amendments made; Bill passed, and sent to the Commons. The Bristol Water Bill and the Lancaster Corporation Bill were read the third time, with the amendments, passed, and sent to the Commons.

HOUSE OF COMMONS.

MONDAY, JULY 16.

BRIBERY OF OFFICIALS OF PUBLIC BODIES.

A Bill for the more effectual prevention and punishment of bribery and corruption of and by members, officers, or servants of corporations, councils, boards, commissions, or other public bodies, was ordered to be brought in by Lord Randolph Churchill, Sir R. N. Fowler, Mr. Jennings, Mr. Whitbread, Sir H. James, and Mr. R. Power. This was subsequently done, and the Bill read the first time.

WEDNESDAY, JULY 18.

The London Sea Water Supply Bill (Lords) was read the third time and passed.

THURSDAY, JULY 19.

THE LOCAL GOVERNMENT (ENGLAND AND WALES) BILL AND THE LONDON GAS AND WATER UNDERTAKINGS.

In the course of the consideration, in Committee, of the Local Government (England and Wales) Bill,

Mr. FIRTH moved the following clause:—"A County Council shall have the same powers of promoting and opposing Bills in Parliament, and otherwise acting for the promotion and protection of the interests of the inhabitants of the county, as if the County Council were a governing body within the meaning of the Act of the session of the 35th and 36th years of the reign of Her present Majesty, cap. 91, intituled, 'An Act to authorize the application of funds of municipal corporations and other governing bodies in certain cases,' and as if the county were the district in which such governing body had jurisdiction: Provided that so much of section 4 of the said Act as requires any consent of owners and ratepayers shall not apply to any expense incurred by a County Council; and provided further that nothing in section 2 of the said Act shall prevent the London County Council from promoting any Bill for the purchase or regulation of the undertakings at present supplying water and gas to any part of London, or any of them, or for the provision of a new supply of water, gas, or light to London or any part thereof." He said he thought it was most desirable that this power should be given; and he hoped the Government would accept the clause.

Mr. RITCHIE said the powers possessed by the Metropolitan Board and the Courts of Quarter Sessions in this respect were handed over to the County Councils; but, not satisfied with this, the honourable member had proposed to apply the Borough Funds Act. He thought the Committee ought to be very careful as to removing restrictions without putting anything in their place. There was another argument he would venture to press on the Committee. The whole question of Private Bill Legislation had been undergoing examination. None of them, he thought, were satisfied with the present condition of things; and, under the circumstances, he should ask the Committee not to accept the clause.

Sir W. HARCOURT said that when the Select Committee of 1880 considered the subject of the water supply of London, they specially pointed to the necessity and the advantage of some body representing the Metropolis having the power to supply water; and, there being no general body representing London which could undertake this duty, they recommended the constitution of a special body for the purpose. Under the Bill now before the House, they were creating a general representative body for London; and they ought not to launch this body under a prohibition which would perpetuate a monopoly in the hands of the Water Companies. It therefore appeared to him that the concluding part of the amendment was deserving of the consideration of the Committee.

Mr. LAWSON regretted the refusal of the President of the Local Government Board to accept the amendment. The people of London were, he said, placed at a great disadvantage by not having the municipal powers that were possessed by the other great towns of the country. If the right honourable gentleman would hold out any hope of the clause being accepted, might it not be possible to strike out the part of it which referred to the new supply of water or gas for London, because there were arguments against it which were not applicable to the other part? The ratepayers of London felt strongly the necessity of possessing the municipal powers included in the clause.

Mr. ISAACS believed that if the honourable member for Dundee (Mr. Firth) would consent to some modification of the clause, he would find himself supported by Metropolitan members on both sides of the House. It was felt that there would be danger in a municipal body being entrusted

with powers which would give them the opportunity of setting up rival schemes for supplying water and gas; and therefore he would suggest that the honourable member should make the concluding paragraph read to the effect that nothing in section 2 of the Borough Funds Act should prevent the London County Council from promoting any Bill for the purchase of undertakings which were at present supplying water or gas to London or any part thereof.

Mr. WOODALL trusted the President of the Local Government Board would respond to the appeals so generally made to give to the county authorities the powers proposed in the clause, limited by the provision that they should not have power to set up competing works.

Mr. RITCHIE asked the honourable member for Dundee whether he would be satisfied if the Government, recognizing the force of the arguments addressed to them, consented to some amendment being introduced at another time and place, giving to the County Council for London power to promote Bills for the purchase of the water undertakings.

Mr. FIRTH regretted that he was unable to answer in the affirmative, because the very strong Committee which sat in 1880 were unanimously of opinion that there ought to be given to any central authority power to initiate a new supply or to purchase or regulate existing undertakings. He could not consent to any settlement which would abate one jot of the powers which that Committee declared a London central authority ought to possess—viz., initiation, regulation, or purchase.

Sir W. HARCOURT remarked that the Committee in 1880 pointed out that the power to purchase was utterly worthless without the power of competition. He was informed that a new supply could be established at less than half the sum asked for the London water-works in 1880. Of course the power to purchase at a reasonable rate entirely depended upon the purchasers being able in the alternative to furnish a supply themselves. This was the key to the whole matter. He could not understand why the great public bodies to be created by the Bill should be refused the power to compete with existing companies.

Mr. RITCHIE said the right honourable gentleman did not seem to be aware that this was a power which was not possessed by any municipal corporation in the kingdom.

Sir W. HARCOURT observed that he was perfectly aware of it. He was speaking of London only; and he said that the Committee of 1880, in a unanimous report, recommended that London should have this power. They pointed out that the right to compete was the basis of the whole thing; and if they refused it a reasonable purchase could not be made.

Mr. CHILDERS said that, having very carefully watched Private Bill Legislation for some time, he had come to the conclusion that, although with respect to the small boroughs and district councils it might not be prudent to grant the unrestricted power proposed, it was the essence of such local government as they were trying to establish, that the County Councils and great boroughs should have the power both of promoting and of opposing Bills. The absence of such power, or the restraint put upon local authorities in this matter, had hampered these bodies. They ought to have confidence in the authorities they were about to create, and pass this clause.

Mr. RITCHIE thought the fact of the right honourable gentleman (Mr. Childers) only having arrived at a conclusion after very long and anxious consideration was an argument why the Government should not ask the Committee and the House to come to any settled determination to insert in the General Bill before them a proposal such as had now been made. The Government had never pretended, in setting up these new authorities, that they were arming them with all the powers which at some other time they might give them, or even with those which they now thought the Councils ought to possess. They had felt that if they were to embark on so large a field of discussion it would be doubtful, to say the least, whether they would be able to pass the Bill in the course of one session. At present all gas or water companies were specially protected against any public body presenting a Bill to Parliament for the purpose of setting up a competing supply. If the Government had proposed to do away with this restriction, he thought that such opposition would have arisen that it would have been perhaps impossible to get the Bill through at all. The course the Government had adopted was one which would have commended itself to right honourable gentlemen opposite if they had had to carry through Parliament in one session so great and comprehensive a measure as the one before them.

After some further conversation, the Committee divided; the numbers being: For the clause, 107; against it, 115—majority, 8.

Mr. FIRTH subsequently moved to insert new clauses giving power to the London County Council, as soon as possible, to submit to Parliament a Bill for the re-arrangement of municipal government and administration within the area of the county of London; and also one "for the purchase or regulation of the undertakings at present supplying respectively water and gas to any part of London, or any of them, or for the provision of a new supply of water, gas, or light to London or any part thereof." He said the question raised by his amendment was this: Should the new London Council be authorized to deal by way of a Bill (to be afterwards submitted, of course, to Parliament) with the important and difficult question of internal administration? It was admitted on all hands that the interior administration of London required re-arrangement; and he submitted that the clause he proposed afforded a solution of a most difficult question which must arise hereafter.

Mr. RITCHIE said it would not be in accordance with his view of the duty of the Executive Government to shift on to the shoulders of the new County Council the duty which the honourable member sought to impose on them. He did not say that in dealing with this matter they might not place a great deal in the hands of the London County Council; but it would not be prudent to overload it with matters of this kind before they had had time to attend to their simpler duties. He quite recognized the importance of the question; and, while he should be glad if it could be left to the London County Council, he did not feel that this would be the proper course to take.

Mr. FIRTH then withdrew the clause referring to the Municipal Government of London, and moved the one dealing with the purchase or regulation of the gas and water undertakings of the Metropolis. Combined with it was a provision for the regulation and inspection of hackney carriages.

After some conversation, a division was taken on the portion of the clause relating to gas and water supply, when the numbers were: For, 106; against, 146—majority, 40. It was therefore lost.

BRIBERY (PUBLIC BODIES) PREVENTION BILL.

On the order for the second reading of this Bill, an objection was raised by the honourable member for Camberne (Mr. Conybeare); whereupon Lord Randolph Churchill, who had charge of the Bill, withdrew it.

The East Stroud and District Electric Light and Power Company, Limited, has recently been registered with a capital of £5000, in £5 shares; and the City of Westminster Electrical Syndicate, Limited, with a capital of £10,000, in £1 shares.

Legal Intelligence.

DURHAM SUMMER ASSIZES.—MONDAY, JULY 16.
(Before Mr. Justice CAVE.)

THE CHARGE OF LIBELLING MR. WARNER.

To-day Richard Cunliffe was charged with unlawfully and maliciously publishing, at South Shields, on April 14 last, a certain defamatory libel concerning William John Warner, Manager of the South Shields Gas Company. The case was heard by the Magistrates at the South Shields Police Court on April 25, as reported in the Journal for May 1 (p. 783); the result being that the accused was committed for trial.

Mr. T. MILVAIN, Q.C., M.P., and Mr. JOEL appeared for the prosecution; Mr. WALTON for the defence.

Mr. MILVAIN, in opening the case, said the prisoner was charged with publishing a libel on Mr. W. J. Warner, who for many years had been the Manager of the South Shields Gas Company. In 1886 there was certain work to be done on behalf of the Company; and advertisements were issued. The work consisted of the construction of a gasholder tank; and the defendant was appointed to the inspectorship of the work, at wages of 50s. a week. He continued in the employment of the Company till the work was completed, and for some short time longer. In February of the present year the engagement terminated. He then made a claim for overtime, which was looked into, and not entertained. The defendant, apparently by reason of this, felt some resentment against Mr. Warner, whom he blamed for his time allowance not being granted. He had also been endeavouring to obtain further employment from the Company; but this was not forthcoming. On the 16th of April he wrote to one of the Directors (Mr. Hall) a letter which contained the charges complained of. [The learned Counsel read the letter, the full text of which was given in the number of the JOURNAL above referred to. In it he stated that the Directors were unaware of the "deceitful and unscrupulous way" in which the Company's affairs were managed by Mr. Warner, through whose "blundering" the tank had cost "over £2000 more than it ought," and was not then finished. He added: "The proofs of what I say are in my possession; and I have determined to issue them to the shareholders, so as to let them know how their Manager fulfils the trust reposed in him. These are only a part of the charges which can be brought against him and substantiated without much trouble." Such a letter, continued the learned Counsel, was calculated to injure Mr. Warner very seriously, casting imputations, as it did, on his honesty; and he at once took steps to institute criminal proceedings against the defendant. The prosecutor had no desire to seek pecuniary damages from the prisoner or to obtain costs from him; nor had he any vindictive feeling against him or desire to imprison him. All he wished was to vindicate his own character; and if the prisoner was prepared to withdraw the allegations, and apologize, the prosecutor had no wish that he should suffer any penalty whatever.]

Mr. WALTON (after consulting for some time with the accused) said: I have spoken to my client, and, after my learned friend's statement; I have suggested to him that he ought in this case to withdraw the plea which he has placed upon the indictment, and make his statement of the circumstances under which the letter was written, which, I think, will satisfy my friend after the way in which he has opened the case. The letter to which reference is made is addressed to Mr. Hall, and was written to Mr. Hall under circumstances which Mr. Cunliffe regarded as of a confidential character. Mr. Hall was a great friend of his own; and Mr. Cunliffe, leaving the situation with a grievance, was induced to communicate to Mr. Hall what that grievance was, as well as certain matters which had been discussed between them. He now feels that he used language which was exaggerated, and which in calmer moments the facts would not entitle him to use. The matters to which he made reference have been examined; and now, taking a thorough view of them, they did not justify the statement. I am instructed to say that it was never Mr. Cunliffe's intention to charge dishonesty, especially as to what he says as to certain wages having been charged to capital instead of revenue account. He admits now that there was no adequate ground for making the charge, and begs to withdraw it; and as his statement was not justified, it is his duty to Mr. Warner to withdraw it. Through me he says it was from a sense of grievance he was led to use the language he employed in the letter. Under all these circumstances, and after the way in which my learned friend has introduced this case, I hope that your Lordship will accept the expression of regret, and that the prosecution will allow the case to be withdrawn.

Justice CAVE: Very well; that will be done.

The CLERK of ASSIZE (to prisoner): Do you withdraw your plea?

Prisoner assented.

Justice CAVE: You have pleaded guilty to publishing this libel. It is a libel which concerns the prosecutor, and him alone. I do not think the public are concerned in it in any way; and therefore I see no reason why the prosecutor may not settle it in this way. I therefore order you to be discharged.

The prisoner then left the dock.

LANCASHIRE WATER SUPPLIES.—The recent rains have considerably increased the quantity of water in store in the reservoirs of several of the Lancashire Corporations. Liverpool, which was on the very verge of a water famine of the most acute kind, added no less than 300 million gallons to its store in the Rivington reservoirs; and the danger of the suspension of the supply is now averted. The Wigan reservoirs have not benefited to the same or a corresponding extent; but the supply is reported to be equal to about four months' requirements at the present rate of consumption. At Bolton there has been a very substantial increase in the quantity of water in store; but it said that the danger of a curtailment of the supply is not yet entirely passed.

THE GAS RESIDUALS PRODUCTS COMPANY.—In the Court of Session (First Division) last Tuesday, the petition presented by the Gas Residuals Products Company, asking for an order to confirm a resolution come to by them to reduce their capital, was before the Court. The Company are chemical manufacturers and distillers of tar and ammoniacal liquor in Glasgow. When they commenced business, they took over various contracts entered into by their predecessors. By the fall in the price of chemicals, losses arose, and were continued until the contracts expired. The capital of the Company has, in consequence, been diminished; and in June a resolution was adopted reducing the capital from £60,000 in 6000 shares of £10 each, to £42,000 in 6000 shares of £7 each—the reduction to be effected by writing off a sum of £3 per share. The Company wished to have this resolution confirmed. The petition was remitted to Mr. C. B. Logan, who recommended that the minute to be recorded should be as follows:—"The nominal capital of the Company is £42,000, divided into 6000 shares of £7 each. At the time of the registration of this minute, 3579 of the shares have been issued, upon which the sum of £5 10s. per share has been, and shall be deemed to have been paid up. The remaining 2421 shares have not been issued." The petition was granted.

Miscellaneous News.

THE MANUFACTURE OF COAL GAS.

LECTURES AT THE CITY AND GUILDS OF LONDON INSTITUTE.

At the City and Guilds of London Institute, Exhibition Road, South Kensington, last Tuesday, Mr. LEWIS T. WRIGHT, Assoc. M. Inst. C.E., F.C.S., delivered the first of a series of four lectures to students, on "Gas Manufacture," the syllabus of which was given in the JOURNAL for the 10th inst. The lectures are on the same lines as those delivered by Mr. Wright last year; and the following is an abstract of the first.

Mr. Wright commenced by saying that it would be impossible to take those present through the practice of gas manufacture; and the utmost he could do was to introduce them to some of the theory that bore on the subject—to show them behind things, as it were. The manufacture of gas, conducted merely as a mechanical operation, was very simple; but directly they began to look behind the operations, and to study the theory, they found it became an exceedingly complicated business. The basis of operations was, of course, coal; and it curiously happened that in this country all the material employed in gas manufacture was coal, and that, too, coming from the same geological formation. The seams which yielded the various descriptions of coal used in gas manufacture contained, as it were, many different kinds; or, in other words, the same seam might give not only a cannel coal, but a caking coal, and gas coals, and even coal that was only suitable for steam purposes. The coal that a gas manager required was, first of all, a coal that gave him a considerable volume of gas of tolerably good, or very good illuminating power. The range of carbon in caking coal was not very great, but still this range, small as it might be, considerably altered the character of the coal. If they took a great run of gas coal, 1½ per cent. of nitrogen was the usual thing. Ash was very variable. Oxygen was an element that should receive some attention; for those coals which contained a large quantity were not the best for the use of the gas maker. The lecturer then referred in detail to a large table he had prepared, giving the composition of various coals; drawing special attention to South Yorkshire, Derbyshire Silkstone, and Nottinghamshire coals. They would see how greatly the coal altered the further they went north of Sheffield. The candle power, it would be noticed, was progressive; and the coke at the same time increased in quantity. It generally happened that the worst gas coals were those which contained the most sulphur; and as they went south they lost almost in everything—they lost in illuminating power and volume, and increased in impurity. Regarding the composition of the South Yorkshire Silkstone and Derbyshire Silkstone coals, there was a vast difference. Looking at the analysis at certain points, they would at once see that they had to deal with a better coal in the South Yorkshire than in the others. Oxygen, moisture, ash, and sulphur would get high as they went south. South Yorkshire yielded the finest gas coal known; but when they came down to Nottinghamshire, they had a bad gas coal—one which, in fact, was not used for gas making. In the case of Newcastle coal the carbon was high. It was very difficult for him to give the yields of gas per ton on exactly the same basis, as the temperature and the manner in which the coal was distilled affected this very considerably. Taking them as nearly as his judgment would tell him would be similar conditions, in practice they would get 10,500 or 10,300 cubic feet out of a ton of Newcastle coal; and working at a similar temperature, 9800 cubic feet out of Nottinghamshire coal. The distinction between the typical Midland coal (South Yorkshire) and the typical Newcastle coal would be that they would get more gas perhaps out of the South Yorkshire, and that of a slightly higher illuminating power. Against this, however, they obtained from the Newcastle coal a higher yield of coke (which perhaps was indicated by the larger proportion of carbon they found in the coal); but the tar was distinctly lower in quantity. The sulphur from South Yorkshire coal was lower than that from Newcastle coal. In the case of the latter, the crude gas very often contained not less than 45 grains of sulphur; whereas from South Yorkshire they perhaps had not half this, when distilled at the same temperature. Therefore these coals were very much prized, because of their richness as regards gas, and their freedom from sulphur impurities.

Referring to cannel coals, the lecturer said they were often found in the same seams and in contact with caking coals; and they occurred, as it were, accidentally—being found in the hollows of the main seam of coal. So that in mining these seams, they often came across these basins, so to speak, of cannel coal. When they did meet with them, if they were to strike them in the centre they would run thinner and thinner until they came down perhaps to only ½ inch thick, and then would reappear again. The same seam, therefore, that contained the caking coals also contained coals of a totally different character. He might say that, having carefully studied the formation of these coals, as far as observation and analyses would enable him to carry out the investigations, he had come to the conclusion that all the materials forming the different sorts of coal had been deposited by aqueous agency—the materials that formed the coals had been carried by water and placed *in situ*; and if they examined any caking coal the thing that would most strike them would be the laminated character of the coal. The "silk" coal was fibrous vegetable matter—trees, and things of that kind, that had been submitted to the action of fire, and had had their volatile products very largely distilled away from them. It would be obvious to them that the best of timber that had been burned would have a different specific gravity to that of timber that had not been burned; and water in running would, according to its velocity, have the power of sorting out materials of different gravities. From South Yorkshire to Nottinghamshire, they found, as they went South, that the "soot" coal increased rapidly; and as it increased, the coal became less valuable to them as gas makers. In practice they generally called any hard coal, that did not show any prominent signs of lamination, cannel; whereas if they took any piece of caking coal, the signs of lamination were immediately prominent, so that it could be easily split up. The cannel coals, as a matter of fact, were laminar, although they could not see the laminæ. The laminations were not observable unless the coal was burnt away, and the ash examined; and when this was done they could always notice the laminar structure of the cannels. These cannels, which were found in the same seams with other coal, sprang really from the same material as that coal; but the material had been sorted, as it were, by the carrying action of the water. He then called attention to the richest cannel coal he knew of—Australian cannel, from which could be obtained about 16,000 cubic feet of 50-candle gas.

Considering the distillation of coal as a mechanical operation, the lecturer again remarked that it was a very simple matter; but directly they began to regard it as a chemical operation, it became an altogether different thing. The results of the distillation of coal would depend entirely upon the temperature employed. The question that would perhaps be most interesting to them would be at what temperature the bituminous portion of the coal became converted into gas. They might take it roughly that if they were to submit their coal to a temperature of 1000° Fahr., they would get out of it all the volatile matter. However,

in practice this was an exceedingly low temperature, and distillation would proceed very slowly at it, and they would procure a small quantity of illuminating gas and a large amount of tar. Of course, if they maintained the temperature of the retort higher than this, fresh conditions would set in. Supposing they kept it at 1500° Fahr., the coal would, as soon as it reached a temperature of 1000°, lose its volatile matters; and in coming into contact with the sides of the retorts, these volatile matters altered chemically—altered very largely in their character—new bodies being formed. Supposing they had a temperature of 1500° Fahr., so long as volatile matters were largely coming off the coal, they could not raise the temperature of the coal to more than 1000°; so that if they were to charge a retort that was heated to 1500° outside, they would find that for an hour or two the coal would not materially rise beyond 1000° Fahr.

The lecturer then showed how differently coal behaves at various temperatures, by referring to the results of experiments given in the following tables, which he said had not yet been published:—

TABLE I.—Elementary Composition of the Distillation Products from 100 Parts by Weight of Derbyshire Silkstone Gas Coal Distilled at Low Temperature.*

Products.	Carbon.	Hydrogen.	Sulphur.	Nitrogen.	Oxygen.	Ash.	Totals.
Coke . . .	57.38	1.24	1.05	1.06	1.28	2.96	64.97
Tar . . .	6.11	0.46	0.05	0.06	0.60	—	7.28
Liquor . . .	0.08	1.06	0.12	0.22	8.30	—	9.78
Gas . . .	7.56	2.85	Trace	0.36	1.46	—	12.23
Purifiers . .	0.22	0.02	0.39	0.01	0.56	—	1.20
Totals . . .	71.35	5.63	1.61	1.71	12.20	2.96	95.46

Yield per ton: Coke, 12.94 cwt. Tar, 14.38 gallons, of 14.35 sp. gr. Gas, 7582 cubic feet, of 18-candle illuminating power.

* The temperatures, Mr. Wright incidentally remarked, at which these experiments were carried out were lower than they would work at in practice.

TABLE II.—Elementary Composition of the Distillation Products from 100 Parts by Weight of Derbyshire Silkstone Gas Coal Distilled at High Temperature.

Products.	Carbon.	Hydrogen.	Sulphur.	Nitrogen.	Oxygen.	Ash.	Total.
Coke . . .	57.95	0.70	0.77	0.47	1.24	2.97	64.10
Tar . . .	4.78	0.38	0.06	0.05	1.18	—	6.47
Liquor . . .	0.08	1.06	0.13	0.21	8.30	—	9.78
Gas . . .	8.53	3.42	Trace	0.86	2.30	—	15.11
Purifiers . .	0.38	0.04	0.74	0.02	0.93	—	2.11
Totals . . .	71.73	5.61	1.70	1.61	13.95	—	97.57
Coal . . .	75.71	6.27	1.72	1.72	11.59	—	100.00
Error and loss	- 3.98	- 0.66	- 0.02	- 0.11	+ 2.36	- 0.02	- 2.43

Yield per Ton: Coke, 12.82 cwt. Tar, 12.01 gallons. Liquor, 21.6 gallons, of 1.207 sp. gr. Gas, 11,189 feet, of 15.3-candle power. Candles per ton, 34,238.

Alluding to Table II., Mr. Wright said that he had no record of the temperatures, as it was exceedingly difficult to get one of such high heats. In this table, the temperature of the outside walls of the retorts might have been approaching 2000° Fahr.; and in Table I., it might not have been more than 1500°. He directed special attention to the differences exhibited. If they looked at the production of gas, they would see that they obtained more carbon and hydrogen in the gas by increasing the temperature; so that it simply amounted to this—that at a low temperature the products they made were products which would, on the cooling of the gas, condense into oils; and if these products were submitted to a high temperature, they in their turn became destroyed and would produce illuminating gas. In the case of the low-temperature experiments, they obtained gas of 18-candle power; while in the high-temperature experiments they had 15½ candles. The difference of illuminating power was not in practice so great as was shown in these particular experiments. In regard to tar, they had a volume of 14½ gallons of tar of very low specific gravity in Table I., and possibly the tar contained 15 per cent. of free carbon. In Table II., they had 12.01 gallons, which would contain from 25 to perhaps 30 per cent. of its weight of free carbon. He specially wanted his hearers to remember some points by which they could detect whether the coal was being distilled at a low or a high temperature. Nothing could be more suggestive than the character of the tar. When they distilled the coal, if they found that they had a gravity, with the caking coal, as low as in Table I., they would know at once that the coal had been distilled at a low temperature; and if they found a low percentage of free carbon, this would be an indication also that it had been distilled at a low temperature. Reverse remarks would apply to high temperatures. There was a general idea that if the temperature of distillation was increased, the ammonia would be destroyed; but he thought that in the range of practice they need not fear this. They might take it that a high distillation temperature, especially in combination with a thin layer of coal in the retort, was not conducive to the best gas coke. The finest gas coke seemed to be produced at a lower temperature.

The lecturer next dealt with the "turns" in the quality of the gas at various periods of the charge. That was to say, they charged a retort; and at the time they charged it the retort might have an internal as well as an external temperature of 2000° Fahr. Silver, perhaps, would melt in the retort. The coal was put in; but they could not get the coal beyond 1000° Fahr. However, when the retort was first charged, they got off a large volume of gas. But the greatest quantity did not appear to come off precisely at the first charging of the retort, but generally in the second quarter of an hour. After this the quantity of the gas was continually diminishing. At the same time that the yield of gas was naturally diminishing, the quality of that which was coming off was also falling away. What he had to say in this connection was quite novel, and had never been published. If they took these quarter-of-an-hour periods, they would find the quality of the gas approximately as follows:—The first quarter-of-an-hour, 21 candles; the second, 18; the third, 15½; the fourth, 14; then 13, 8½, 7, 6, and so on. He might tell them that in practice the actual illuminating power of the bulk of the gas was higher, and considerably higher, than the results that they would expect to get from these subsidiary analyses. This led him to something else interesting. While the yield of gas was going from a high rate down to nothing at all, the candle power was at the same time going down to nothing, so that there would be times when they would be having gas entering the hydraulic main of high, and at other times of

low luminosity. Now supposing two retorts placed side by side were being charged together in such a manner that they would be worked off at one time; then the gas obtained for these would be varying from 21 down to (say) 7 or 6 candles. Supposing now one retort only was charged, and then the other one when the bad gas had come off the first one. Let them suppose that if he (the lecturer) charged a retort on this system with a ton of coal, he might get 10,500 cubic feet of 16½-candle gas. But supposing when this was half burnt off, he charged another retort so as to let the gas mix with that which was coming off the other, he would get a different result; he would get the same volume of 17-candle gas in the same way that he had previously explained. In other words, if they were to collect the gas coming off in the retorts every quarter of an hour, certain results would be obtained which would lead them to believe they would get a certain result from the whole quantity of gas; but the result was really higher as a matter of fact. This was confirmed by practice and by experiment. If they allowed the gas from partially burnt-off charges to mix with gas coming from coal at a very early stage, they would get a better result than if all the retorts were charged at one time. This was because the low-quality gas was able to carry a much higher complement of hydrocarbons; it was a question of the carrying power of the gas. This matter which he had been speaking upon, would be interesting in the testing of coal. When they tested coal, especially when they tested it in the laboratory, they tested a single charge. They would say that the coal yielded a certain amount of gas of a definite illuminating power. Now, this same coal might, in practice, yield even more than they found in the laboratory test. If they thought this out, they would see why it was. If they were to begin mixing, at an early stage in the manufacture, the poor gas with rich gas coming from fresh charges, they would get a higher illuminating power than if they burnt off single charges alone. He would like to warn them of the common practice of considering coal as being a certain definite invariable sort of article.

In conclusion the lecturer drew attention to some experiments made with a piece of cannel coal 6 inches thick, which was tested for volatile matter down through every inch. The first inch produced 78.8 per cent. of volatile matter; the second, 76.6; the third, 79.4; the fourth, 76.3; the fifth, 69.5; and the sixth, 61.7 per cent.

The second lecture was given on Thursday, when Mr. Wright dealt mainly with the apparatus employed in gas making. He first described the retort setting; dwelling at some length on the combustion of the fuel in the furnace. If they required a useful rule as to the quantity of retort-heating surface that would be necessary to carbouize a certain quantity of coal, they might take it that when the retorts were working at a temperature of 2200° Fahr., they would produce 154 cubic feet of gas per superficial foot of internal heating surface. Of course, if the temperature was lower, a smaller quantity would be produced. In this country the average was 140 or 150 cubic feet of gas per ton per superficial foot of internal heating surface. Speaking of cracked retorts, he said it might seem curious at first that gas could be generated in such retorts. They always had some free carbon in the breaking down of the hydrocarbons; and this free carbon gradually built up a kind of scale which made a surface inside, and filled up the cracks. A retort so covered with carbon would probably lose, through any accidental cracks that there might be, or through the pores, 5 or 6 cubic feet of gas per day per foot of internal heating surface; so that a retort that was well covered with this carbon would, under a pressure of $\frac{1}{4}$ or $\frac{1}{2}$ inch, lose perhaps 5 per cent. of the total quantity of gas produced. When this carbon became objectionable, and was removed, so that the cracks were exposed, the retort might then lose daily 40 or 50 cubic feet of gas per foot of internal surface; in fact, they might lose an almost unlimited quantity of gas according to the pressure. In the normal way of operation, a retort that would produce 10,500 cubic feet when covered with carbon, if recently scaled, might not produce more than 8000 cubic feet out of the same coal at the same temperature. It was usually considered that the carbon formed inside the retort was a great loss to the gas maker; but it really was hardly so. They already had in the tar perhaps 55 per cent. of free solid carbon; and this might just as well be on the sides of the retorts, stopping up the cracks, as anywhere else. In setting retorts, of course, care had to be taken that the heated products of combustion from the coke or other fuel used should come as nearly as possible into contact with the sides of the retorts. Having directed attention to the ascension-pipes, and the great source of trouble they always were from stoppages, he alluded to the cooling of the gas. The gas passed into a collecting-box, or what was known as the hydraulic main; and in a box of this kind, unless the temperature were less than the boiling point of any of the products present in the gas, they would have no condensation, because the temperature would be higher than that at which they would become liquefied. Generally speaking, the temperature of the hydraulic main was less than the boiling point of water; and consequently they brought the products there into a liquid form. The quantity of cooling surface required for a ton of coal varied entirely with the nature of the coal. They could quite understand that a coal that would yield 20 gallons of water per ton would require more cooling than a coal that yielded only 10 gallons per ton. In the case of Newcastle coal, which yielded a comparatively small quantity of water—perhaps 12 gallons to the ton—it might happen that an atmospheric cooling surface of 5 superficial feet per 1000 feet of gas made per day would be sufficient. Derbyshire coal would yield 26 gallons of water per ton of coal; so that gas from this coal would require a larger amount of cooling. In fact, it would need 10 superficial feet of cooling surface per 1000 cubic feet of gas made. Before one could deal with any chemical purification process, the gas had to be treated mechanically, so as to remove as much as possible of the tarry "fog" it contained. Amongst the products that became prominent on the distillation of coal was ammonia, which existed to a considerable extent—to perhaps $\frac{1}{2}$, $\frac{3}{4}$, or 8 lbs. per ton of coal. This ammonia, though valuable in itself, if left in the gas would be a source of considerable nuisance, as it would tend to destroy any brass fittings with which it might afterwards be brought in contact. The ammonia was removed by absorbing it in water. In speaking of the removal of ammonia he wished his hearers to consider the combination between ammonia and water as of an exceedingly feeble character. At a temperature of 112°, it would be hardly possible for minute quantities of ammonia to remain in solution. The question of temperature in connection with the scrubbing of gas had hardly, he thought, received sufficient attention. The lecturer then described the scrubbers and the mode of operation. Supposing they were washing (with water) coal gas containing ammonia, the water at the top of the scrubber would be perfectly free from ammonia; but it would become increasingly charged downwards, until at the bottom 2½ per cent. of ammonia would be found. At this strength of solution of ammonia any gas that stood over it, or was in contact with it, must necessarily contain a certain amount of ammonia; so that it might happen that at a temperature of 50° Fahr. at the bottom of the scrubber, the theoretical conditions would be that they must have not less, perhaps, than 25 grains of ammonia per 100 cubic feet of gas. It was, therefore, evident that if they wished to remove all the ammonia from the gas it could only be done by gradual and persistent

washing, by bringing the gas into contact with clean water—water which did not contain any ammonia. This brought him to the rotary washers, the action of which he explained. Referring to ammoniacal liquor, he said that in the ordinary strength of liquor obtainable on gas-works they had from 20 to 25 per cent. of acids in combination with the ammonia as sulphuretted hydrogen, and the balance as carbonic acid. It would be obvious to them that if by any means they could take the gas liquor and deprive it of its acids, so as to yield a solution of free ammonia, they could again present this liquor to the gas, and take out a further quantity of these acids. In this connection, the lecturer called attention to the Clans process; but remarked that he could not say whether or not it would be a success.

In the third lecture, which was given last night, Mr. Wright dealt further with the subject of purification, as effected in the ordinary way by oxide of iron and lime. Abstracts of this and the fourth lecture (to be delivered this evening) will appear next week.

EUROPEAN GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held on Monday last week, at the London Offices, No. 11, Austin Friars, E.C.—Mr. H. McLAUCHLAN BACKLER in the chair.

The SECRETARY (Mr. W. Williams) read the notice convening the meeting, and also the following report of the Directors:—

The Directors have to report with deep regret the death, on the 21st of April last, of Mr. William White, the late Chairman of the Company; and they feel that they cannot do better than register, as part of the proceedings of this meeting, the resolution passed by the Board, on being informed of the mournful occurrence. It is as follows:—"The Board desire to express their deep sense of the loss suffered by the Company, and by all the Directors individually, through this lamentable event; also of their high appreciation of his services for nearly 40 years, as a Director, during 20 of which he held the chief office in the Company as Chairman. They wish further to place on record the great regard in which he was held personally, and to convey to the members of his family the sympathy they feel with them under this sad visitation."

Being certain that the shareholders generally will now associate themselves with the Directors in this resolution, they pass on to state that the financial year offers little of importance for comment, with the exception of the success of negotiations which had been in progress for some time, for an extension of the concession at Bolbec. This has now been secured for a period of 20 years; so that the treaty will not expire until the 30th of April, 1926. The Directors have good reason to expect that the new contract thus entered into will greatly tend to the development of the consumption of gas in this industrial locality.

The aggregate increase in the sale of gas at the seven stations is at the rate of a little over 4 per cent. for the year, although there has been but a slight revival from the depression of trade which has so long prevailed.

The cost of coals shows an increase of about £1650, owing principally to octroi duties imposed at Nantes; but this has been more than counterbalanced by the additional price realized for coke at that and other stations during the long winter to which all have been exposed.

The yield from tar was somewhat less than last year; but, on the other hand, the amount realized for ammoniacal products more than compensated for the loss.

Outlay has been kept within reasonable limits; but the demand for additional mains and apparatus required on the works is continuous and must be met, as in all other prosperous gas undertakings. Economy in expenditure does, however, prevail at all the stations; and the amount of capital employed is, therefore, but small.

Under the operation of these circumstances, the Directors are pleased to report that the results of the past financial year have proved favourable, and that they are able to recommend a dividend of 26s. per paid-up share, and in the same proportion on the other two series, payable free of income-tax, on the 1st August next, less the interim dividend of 10s. per share, paid on the 1st of February last.

Provision having been made for this increased dividend, a balance of £1773 19s. 4d. will remain to be added to the reserve, which, the shareholders will remark, is now in great part invested in substantial securities. £10,600 of debentures were paid off, at maturity, during the year; and the amount still outstanding has thereby been reduced to £52,550 repayable within the next four years.

The Board have appointed as their Chairman Mr. Henry McLauchlan Backler, who will also continue to manage the business of the Company generally; and they have filled up the vacancy in the direction by nominating thereto Mr. Henry Chaloner Smith, the largest shareholder in the Company, and otherwise well qualified for the position. The nomination will be proposed for confirmation at the present meeting.

Notice has also been given that two Directors (Henry McLauchlan Backler, Esq., and Henry John Baddeley, Esq.), and both Auditors (F. J. Roan, Esq., and J. Reeson, Esq.) retire from office at this meeting; all, being eligible, will be proposed for re-election.

The CHAIRMAN said he must in the first place express the deep regret he felt at the death of his old friend Mr. White, who was his predecessor in the chair. He had been associated with Mr. White for about 33 years in the affairs of the Company; and he appreciated most thoroughly the qualities which enabled him to be of such vast service to the Company during his long career of 40 years in the offices he held connected with it; and so deeply was his interest centred in the affairs of the Company, that, until the very last, he attended in that room, although he (the Chairman) feared his state of health was not equal to the duties which he voluntarily performed. To within a short time of his death, he was there attending the Board meetings, and that seemed to render his loss more poignant to his colleagues than if he had left them—as there was no doubt he should have done—some time previously. He would now pass on to the affairs of the Company from the business point of view; and, as the report stated, there were not many events for him to mention—the principal being the extension of the Bolbec concession. They had at Bolbec a concession of 18 years to run; and they had obtained 20 years' extension of this—taking it up to 1926. Perhaps it might strike many minds that it was a little early to begin to think about the renewing of a concession which had so long a time before it. This, however, had never been his opinion since he had had any voice in the management of the Company. He had endeavoured, to the best of his ability, to extend the concessions while they had something to give up to the consumers, because if they were to leave it, for (say) two or three years before they commenced negotiations, these two or three years would offer them only a small amount to give up; and consequently they would not obtain any very large concession in return. But when they could give up advantages secured to them for 18 years, then they were entitled to go to the Municipalities and say: "We are now willing to reduce the price of gas for the 18 years which are secured to us. What will you give us in return?" They, of course, said: "What do you want?" We replied: "We want an extension of our concession." These negotiations, like all others, went from point to point. They started from one point, and then proceeded a little further, each giving up something; and in the end they arrived at terms satisfactory to all parties—at all events this was the result of his experience in that Company; and he thought the policy he had always advocated at the Board had proved to be successful for their best interests. Well, they had had a very fair year. As the report stated, the gas-rental had increased by the amount of £9246, which was a little more than 4 per cent. As regarded coals, they had a considerable increase in the cost, owing to the municipal dues at Nantes being imposed upon them—he thought somewhat unfairly; but he did not like to be too hard upon those who were hostile to the Company, because they acted from their point of

view just as they (the Company) acted from theirs. But he did say this—that in the course of the operations of the Company, no unfair dealing of any kind entered into their conduct with others. However, they had paid these duties under protest; and they might consider it advisable to take further proceedings. That, at all events, was in embryo at present. Fortunately, the Municipality, by raising the duty—or rather by imposing it, because there was not any duty on coal previous to that—enabled the Company to sell their coke very much better. This raised the price of coal not only to the Company, but to all the inhabitants of Nantes. The moment the duty was imposed, the Board raised the price of coke, and so recovered the greater portion of what had been taken for Municipal dues on coal. At the other stations they had done very well with regard to coke; and the stocks were almost exhausted at the date of the accounts, March 31. He might say that, within his long experience of the Company, it had several times occurred that stocks had been exhausted in this way; and when such had been the case, and the time of trial had passed away, he had observed in several instances that the increased price had been maintained sometimes for several years. The reason was this—that circumstances which enabled them to raise the price of coals operated some time after the trying season had passed away—that was to say, people grew accustomed to the use of coke as fuel, and they continued to use it when the price was no longer a temptation compared with other fuel. So they had done very well with coke, and this had enabled them to bear the extra cost of the coal. With regard to tar, there was a slight diminution. They had not realized quite so much as they did in the previous year; but they had obtained more from their ammoniacal products. The result was that on these four items of coal, coke, tar, and ammoniacal liquor, there had been a small advantage to the Company during the year. With regard to the increase of profits on which the dividend was now recommended, they arose from the development of business primarily—that was, £2246 of increased rental; and also from economy in expenses, especially on the wear and tear account. Now, he might say truly that, although they had economized very considerably in their charges for wear and tear, they had not done this at the expense of efficiency. The works were kept up as well as they ever had been; and it was the great object of his care that they should continue to be so. He (the Chairman) and Mr. Edward White visited all the stations of the Company in the month of May; and he thought he could speak for Mr. White as well as for himself, and say that they were perfectly satisfied with everything they saw. In former years, he (the Chairman) went round the stations sometimes three or four times a year. They had now, however, got a system of such efficient inspection that he did not think it necessary for him to make more than one visit in the year; and this he intended to continue as long as his strength enabled him to do so. With regard to the dividends, the shareholders would recollect that last year an interim dividend was paid in February of 8s.; and the final dividend of 14s. in August, with a bonus of 2s.—making altogether 24s. during the twelve months. This year they paid in February an interim dividend of 10s.; and the Board now recommended a dividend of 16s.—that was 26s. per fully-paid share, and, of course, in proportion on shares which were only partially paid. This was an increase of 2s. per share, or 1 cent. In addition to this they were able to place a sum—not an unimportant one—to the reserve fund, raising it to a considerable amount. In regard to the debentures, as stated in the report, these were £52,000 odd; and they had been reduced to £47,500 by the repayment at maturity of £5050 on the 1st of this month. Although these debentures would be repayable in the course of the next four years, he could say that he and all the Directors would be very happy if those who held them would claim the money before that. In fact, if they chose to claim it to-morrow for the whole £47,000, the Board would be happy to pay it off; for they had the means to do so. He had very little more to say; but he would mention this—that the position of the Company appeared to be excellent. They had an average of 31 years of their concessions yet to run. There were some, of course, for a much longer period—for 41 years, and the shortest was 18 years; and he hoped this would shortly be increased. With this position and an average tenure of 31 years, their business increasing as they had seen it do during the last year, and with he might say the good will, generally speaking, of the Municipalities—although their nationality was sometimes rather against them—all these features being in their favour, he thought the future of the Company was most promising; and he believed that the system of administration in which their late Chairman evinced such deep interest, and in which he (Mr. Backler) took such a pleasure in seconding him, being continued, as it would be, under the present management, afforded them not only the hope, but a certainty that this prosperity would be continued and increased in the future, notwithstanding any disadvantages they might have to encounter. He concluded by moving—“That the report of the Directors and the statement of accounts now read be received and adopted.”

Mr. H. SOLOMON seconded the motion.

Mr. BEARD said that one of the Company's stations produced a very small amount—that was Boulogne. It yielded only £167. It seemed to him a ridiculous amount compared with the other stations. He also expressed the deep regret he felt, in common, he was sure, with all the shareholders, at the loss of Mr. White. He (Mr. Beard) had been a shareholder for 30 years; and he had always found him a true, sound, and solid friend to the Company. He was glad to see Mr. White's son among the Directors. He had been brought up in a good school; and he believed he would, and did walk in the footsteps of his father. It was quite unnecessary for him to remark upon the pleasure the shareholders experienced in having Mr. Backler to preside over them.

The CHAIRMAN, in reply, said Mr. White explained last year that the Board had been very much disappointed with Boulogne. The sum mentioned was the amount of profit, as was then explained—in excess of 5 per cent., which was credited in the interest account. The Board were disappointed in this way at Boulogne—a fund was voted for a new port, and considerable works were carried on there. The French Government, however, felt the “shoe pinch” them very much; and they were obliged to withdraw the support they had given to the Chamber of Commerce for the erection of these works. At the present time they were stopped entirely. Meanwhile, the Directors were advised that the opening of the new port would lead to a vast amount of business at Boulogne; and they prepared for it accordingly, as they always did—in fact, they would consider it highly imprudent to be left with the possibility of a large consumption overtaking them without the power of supplying it. Therefore the Board constructed works on a larger scale than they needed to have done. This was the fact; and it was not the Board's fault. He had explained the circumstances exactly as they were. There now appeared to be some chance of these works being resumed, as he saw that one of the Ministers had gone to Boulogne a few days ago to look into the matter. If the port was proceeded with, the Directors would hope to find the use of the expenditure they had made on the works; and he believed they would then see a very great difference in their results. He might add that they had changed their Manager at this station; and he thought

they might place more confidence in the present Manager than in his predecessor.

The resolution was then agreed to.

On the motion of the CHAIRMAN, seconded by Mr. SOLOMON, the dividend recommended by the Directors was declared.

The retiring Directors (Mr. Backler and Mr. H. J. Baddeley) were re-elected.

The CHAIRMAN, in thanking the shareholders for his re-election, mentioned that during the 54 years the Company had been in existence, there had been three Chairmen only; and he found this a very encouraging feature; because it gave him an average of 18 years. (Laughter.)

The election of Mr. H. Chaloner Smith to the vacancy in the direction (as notified in the report) was next confirmed.

On the motion of Mr. W. O. DONGSON, seconded by Mr. BEARD, the Auditors (Messrs. F. J. Roan and J. Reeson) were re-elected.

The CHAIRMAN proposed that a vote of thanks be given to the officers.

Mr. SOLOMON, in seconding the motion, observed that he had had an opportunity of judging of their officers' capabilities and industry, and the Shareholders were justified in thanking them for much of the prosperity of the Company.

The CHAIRMAN remarked that he thought the officers were highly worthy of such a recognition of their services. The Board recognized their ability, and valued their integrity. It might, perhaps, be interesting to the shareholders just to mention the fact that the Congress of the French Society of Gas Engineers took place at one of their stations (Boulogne) last month; and great numbers of engineers from all parts of France and elsewhere attended it. It was very successful. Of course, the European Gas Company extended the usual hospitality to them; but at his (the Chairman's) suggestion, The Gas Institute invited all these gentlemen over to England; and a very pleasant time, he believed, they spent, judging from what he was able to hear from them. There were great manifestations of good feeling on all sides. All their own Managers from the European stations attended; and the Board manifested to them the esteem in which they held them, which they could only do by correspondence generally, but which they were able to do personally on this exceptional occasion. The three Anglo-Continental Gas Companies—the European, the Imperial Continental, and the Continental Union—associated with the Union des Gaz, entertained all these gentlemen at the Crystal Palace; and he must say it was as pleasant an evening as they could possibly have desired. He believed the outcome of this would be to promote much good feeling amongst them, and would be beneficial to them as foreigners amongst the French, and would enable them to maintain amicable relations, which otherwise it might have been rather difficult to promote. Therefore he thought this circumstance was a highly favourable one for them and all concerned, whether French or English, or whatever their nationality might be. His own opinion had ever been that the more they could identify themselves with the country in which they carried on their business, the better; and to such an extent had it taken place, that he thought it right to state that there was at present only one Englishman in the service of the Company on the Continent. He thought the French understood thoroughly that the desire of the Board was to express sympathy towards them in every way, placing themselves in an equal position with them; and to employ, as far as they could, people of their own nationality. This had been a very successful policy.

The motion was adopted.

Mr. E. WHITE thanked the shareholders for the kind way in which his father had been referred to, and for the expressions of sympathy which he had received on behalf of the family.

The SECRETARY briefly acknowledged the vote of thanks accorded to the officers; and a vote of thanks to the Board terminated the proceedings.

RIO DE JANEIRO GAS COMPANY, LIMITED.

An Extraordinary General Meeting of this Company was held at the Cannon Street Hotel, last Friday—Mr. LEWIS HOWARD in the chair.

The notice convening the meeting having been taken as read,

The CHAIRMAN said the meeting was not summoned, as the shareholders were aware, by invitation of the Liquidators; but it was simply held in compliance with the Act of Parliament. The stage had now been reached, according to their Solicitor's opinion, for having a meeting to close the liquidation. The Liquidators had no balance-sheet to present later than the final one of Dec. 31, 1887, which was sent out with their circular of the 10th of January last; for their operations since then could be summed up in a few words. The Liquidators had then a cash balance reserved of £520 12s. 2d., which was now reduced to £345 1s. 5d. by the necessary demands for rent, firing, &c., of a small office which they still occupied, and for the salary of a clerk up to last Midsummer, when he left, and by the demand of £75 in settlement of a claim for £236 14s. made upon them by their successors in Rio, which had not been, and indeed could not have been foreseen by the Liquidators. The claim was of a vexatious character, but had some plausibility; and in view of the delay and expenses of the law proceedings, the Liquidators, by the recommendation of their Solicitor, compromised the demand for about one-third of the sum claimed. The whole of the warrants for the return of the share capital—£750,000—were now paid. Of the further and final return warrants, there only remained unpaid £229 17s. 6d. The present cash balance of £345 1s. 5d. would be required for general expenditure to be still incurred. By the direction of the Company's Solicitor, the Liquidators had transferred this sum, together with the £229 17s. 6d.—the amount of the returned warrants still unpaid—to a new account at the London and Westminster Bank, in the joint names of the Liquidators, thereby closing the Liquidators' accounts at that Bank, as necessary according to law. He moved that the report and balance-sheet submitted on the 10th of January be received and adopted.

Mr. J. H. JAMES seconded the motion, which was at once agreed to.

The CHAIRMAN then moved—“That the remaining books, accounts, and documents of the Company and of the Liquidators be destroyed at the end of two years from the date of the meeting.”

Mr. JAMES seconded the motion, which, after a brief discussion, was also carried.

A vote of thanks to the Liquidators concluded the business.

In the course of their report to which the Chairman alluded in his remarks, the Liquidators (Messrs. Howard, J. H. James, G. A. Northover, and W. Baily) state that the Company was placed in liquidation by special resolutions passed and confirmed at general meetings held on Oct. 19 and Nov. 10, 1886, respectively. Since then the following distributions of the Company's assets have been made:—(1) On Dec. 10, 1886, £20 per share; (2) March 22, 1887, £4 5s.; (3, and final) on Dec. 12, 1887, £1 4s. 6d.—making the total distribution £25 9s. 6d. per £20 share. In the final distribution, the gratification, at the rate of 5s. 4d. per share, to the late officers of the Company, on the loss of their appointments, was deducted from the amount of the warrants paid to those shareholders only (the large majority) who kindly authorized the Liquidators to make such deduction; and this has been paid to the ex-officers.

THE TRANSFER OF THE EDINBURGH AND LEITH GAS-WORKS TO THE CORPORATIONS.

At the Meeting of the Edinburgh Town Council last Tuesday—the Lord Provost (Sir J. Clark) presiding—the Town Clerk announced that the Edinburgh and Leith Corporations' Gas Bill had passed both Houses of Parliament, and was now only waiting the Royal Assent. Mr. Colston said he was sure it would be gratifying to the Council generally that this matter had been brought to so satisfactory a conclusion, and that in a few days the gas supply of the city would be vested in a body of public Commissioners, appointed by the Town Councils of Edinburgh and Leith respectively. This result had not been attained without a great amount of labour, forethought, anxiety, deliberate consideration, and consultation, and in some instances firm resolve on the part of those with whom was entrusted the carrying through of this most important measure. It was a great satisfaction to those who were engaged in it that, while the battle raged long and long, not only in Edinburgh, but at Westminster, the ultimate stage was reached on all hands with the most perfect peace, equanimity, and every other good virtue of which human nature could boast. The Town Council was already well acquainted with the nature of the bargain made with the Edinburgh Company, the terms of which the Corporations of Edinburgh and Leith approved. The agreement with the Leith Company, on the other hand, was of a more difficult nature; and while some people, who were imperfectly informed, might hold that as good terms or better might have been obtained at an earlier stage, those who had charge of the business knew better. They knew the difficulties on both sides—on the part of the Directors, who had the interest of their shareholders at heart, on the one hand; and the members of the Corporation, whose sole motive was the interest of the public at large, on the other. Two courses were eventually before them—viz., agreement or arbitration. At the eleventh hour measures were taken to bring the two parties together, to see if an agreement could be arrived at; and he thought it but fair to the Directors of the Leith Company to state that they quite recognized and appreciated the position and responsibility of the representatives of the public when they permitted that it should be a condition of negotiation for settlement that any terms mutually agreed upon should be made subject to the opinion of Mr. Alfred Lass, F.C.A., and Mr. Geo. Livesey, C.E., who were to advise the Joint Committee of the Corporations as to whether or not the terms of purchase were fair and reasonable as between the parties. With this view, it was agreed that when a basis of settlement was arrived at, Mr. Lass should be allowed access to the books and Mr. Livesey to the works of the Company. This eventually took place; and the result was eminently satisfactory. The terms of agreement had already been published. The Joint Committee had the satisfaction of receiving from Mr. Lass and Mr. Livesey a most favourable report, stating that, from an examination of the books, extending over a considerable number of years, and from a thorough inspection of the works, the terms of agreement were fair and reasonable. Both of these gentlemen had sent in written reports—Mr. Lass giving a most elaborate view of the financial part; and so important did the Joint Committee consider these reports, that they on the previous day ordered them to be printed for the information of the Town Councils. Mr. G. W. Stevenson, C.E., in a letter to Mr. Beveridge, the Parliamentary Agent, congratulated the Corporations on having carried through in this session such a Bill—the Gas Bill of the session. "Although," the letter continued, "the terms of purchase of the Leith Company are not so good as those of the Edinburgh Company, they are yet good in themselves; and but for the exceptionally favourable terms on which the Edinburgh Company was bought, not a word could have been said against the terms of the Leith purchase. It was simply not possible to get two such extraordinary bargains as the Edinburgh purchase." Mr. Colston concluded by moving that the Council request the Lord Provost to summon an extraordinary meeting of Council so soon as the Bill obtained Her Majesty's approval, with the view of appointing the Statutory Commissioners under the Act. The Dean of Guild seconded the motion. The Lord Provost, after intimating his readiness to comply with the request, proposed a vote of thanks to Mr. Colston and the Joint Committee for their services in carrying through the negotiations. Mr. Smith Clark disclaimed any acquiescence in the statements made by Mr. Colston as to the goodness of the bargain. (Laughter.) Mr. Colston thanked his Lordship for the motion, and at the same time acknowledged the support which he had received from the members of the Committee.

THE BOLTON CORPORATION AND THE GAS INSTITUTE MEETING.

EXPENSES OF THE CORPORATION GAS OFFICIALS.

At the last Meeting of the Bolton Town Council, exception was taken to an item of £18 18s. 6d. which appeared in the Gas Committee's accounts as "deputation expenses." Mr. Tootill, who was the mouthpiece of the opposition, charged the Chairman of the Gas Committee and the Gas Engineer (Mr. W. Smith) with "displaying a great and grave want of good taste," and a want of consideration for the state of the borough finances, by asking the Committee to send them to the meeting of the Gas Institute, "where many assembled for the express purpose of passing friendly greetings and exchanging opinions one with another." He challenged members of the Council to show that any tangible good had resulted to the borough from such meetings; and asserted that the information acquired at them was simply used for private purposes. Mr. Broughton said he could give many instances in which benefit had accrued to the town from deputations; and one was the excellent purifying house possessed by the Corporation, which was the result of a deputation to the Sheffield meeting. Mr. Haslam said the deputation in question was appointed in accordance with the ordinary custom; and the accounts were brought before the Committee in the same manner. Mr. Greenhalgh altogether took exception to the word "deputation." They were simply representatives of the Gas Committee. Mr. Holt said the Institute was almost exclusively an association of gas engineers; and it was time these deputations, which, in his opinion were useless, were stopped. The Mayor (Alderman Moscrop) said, as Chairman of the Gas Committee for a number of years, he had devoted a great deal of time and attention to the interests of the gas undertaking; but had never gone on any deputation without proper sanction and authority, and then it was for the profit of the Committee and not himself. After the remarks which had been made that morning, neither love nor money would induce him to attend another Gas Institute meeting. Alderman Miles said he was surprised at the kind of encouragement which had that morning been held out to himself, as Chairman of the Committee, and the Gas Engineer. It was a gross libel to make use of the remarks to which Mr. Tootill had given expression. They had simply acted upon a principle which had been adopted for the past twelve years without a single word of exception having been taken. The question had been asked what benefit was derived from the deputations. In answer to that he pointed to the splendid profit which had been made by the gas-works during the past twelve months, and asked if this showed a total want of consideration or watchfulness on the part of the Committee. Instead of having benefited by his visit to the conference, he was out of pocket. The benefits to the town

were incalculable. They had a splendid profit, with gas at a low price and of good quality. He did not wonder at the observations which had been made by the Mayor, and if the Council were not satisfied with what he had done, any one of them was quite welcome to his (Alderman Miles's) position. It was rather singular that, in his first year of chairmanship of the Gas Committee he should be submitted to so much examination; but he did not care that much [snapping his fingers], for anyone who would take a sensible view of the question would see that he had acted in the interests of the town. The proceedings of the Committee were confirmed. In reference to the remark of Mr. Broughton, as to the direct benefit which accrued to the borough from a visit to one of the meetings of The Gas Institute, Alderman Moscrop has since published a statement in which he says that, in attending the meeting at Sheffield, he saw the plan adopted in the erection of a purifying-house there; and when, in the following year, a new house had to be built at the Bolton works, the same design was adopted there. The ground space was limited; and, in accordance with the Sheffield plan, an additional storey was added to the building. They were thereby put in possession of a spacious, lofty, well-ventilated room, containing 980 square yards, which, if treated on a ground-rent at 4d. per yard, 20 years' purchase would represent £326 13s. 4d. The room being so highly elevated above the ground, accomplished its purpose very successfully, and what was more, without being an annoyance to the neighbourhood. Alderman Moscrop, as a further justification for the policy of the Committee, also calls attention to his report summarizing the business done at the meeting at Sheffield; the final paragraph of which contains these remarks *à propos* of the question in dispute:—"Were the present occasion an opportune one, I might refer to other questions brought forward of more general interest, all tending to show that any personal inconvenience or discomfort arising from the visit is compensated by being present at a gathering where to some extent are concentrated the experience and intellectual talent of the gas industries of Great Britain. Incidentally, I may perhaps be allowed to observe further that, besides other places of interest, I visited the chemical works of the Sheffield Gas Company. While there I raised the question how best to convey sulphuric acid from one chamber to another one on a higher level. As the result, and also as an appropriation of the answer, I may confidently, and without egotism, advance the statement that, by a few minor alterations in our gas-works at the Lum Street and Gas Street stations, the purchase of certain appliances may be entirely superseded, and thereby a saving of £100 or thereabouts effected in this small matter alone."

THE MANCHESTER CORPORATION AND THEIR SUBURBAN GAS CONSUMERS.

As was stated in the JOURNAL a few weeks ago, an agitation has been set on foot by some of the Local Boards in the immediate vicinity of Manchester, with a view of obtaining a reduction in the price of gas supplied to their districts by the Corporation of the City. The movement originated with the Gorton Local Board, who invited the neighbouring authorities to a conference. Several of them responded to the invitation; and the meeting recently took place at the offices of the Gorton Board. The other authorities represented were those of Openshaw, Moss Side, Levenshulme, Newton Heath, Withington, and Newton Detached.

Mr. BUCKLEY, of the Gorton Board, who presided, said that for a long time the Board of which he was a member had felt that they were paying too much for the gas supplied for the public lamps and to the ratepayers; and it was thought that if some united pressure were brought to bear upon the Corporation, they might be able to obtain some reduction. All the Boards invited to the conference were present, with the exception of Crumpsall, and they had sent a note cordially agreeing with the object of the meeting.

Mr. HIGGINBOTTOM (Gorton) said, considering the profit made by the Corporation, they ought to treat the out-townships generously; but they were charged 6d. per 1000 cubic feet more than the citizens. It was admitted that the Corporation were making a handsome profit out of the gas undertaking; and it was a question whether they had any right to make such a profit, and whether they ought not to reduce the price of gas in accordance with the profit made, and not dispose of the surplus in other directions. He did not see why any extra rate should be charged in Gorton. The township was contiguous to Manchester, and supplied from the same mains, so that the plea that it cost more to supply gas to Gorton was a fallacy.

Mr. SHARP (Openshaw) asked whether any information could be given as to what the powers of the Corporation were. He was inclined to think the Corporation would treat the matter much in the same way as they had done the sewage question, and make it a leverage for incorporation. Unless the Corporation were exceeding the limit of percentage allowed, he did not think the outside districts would get any reduction.

Mr. PAINTER (Openshaw) considered that the gas question was a byway to the incorporation scheme; and, speaking for his firm (Sir J. Whitworth and Co.), he said they at present paid about £1500 a year for gas, and if incorporated with Manchester they would save money by the reduction in the prices, notwithstanding the fact that the rates would be raised.

Mr. CROFTON (Moss Side) said he knew a firm in Crumpsall who were beginning to make their own gas in consequence of the high price charged by the Corporation.

After a long discussion, it was resolved that a Committee be formed, consisting of one member and the Clerk of each Board represented, with a view of obtaining information as to the power of the Corporation, and to ask for an interview to discuss the matter.

In reference to the position of the Crumpsall Local Board in regard to the matter, it may be mentioned that, when the invitation to the conference was read at a recent meeting, the Chairman (Mr. Prescott) remarked that there was no reason why Manchester should charge the out-townships a differential rate, and pointed to the examples of Salford and Stockport, which do not make an extra charge to suburban consumers. It was decided not to send a representative to the conference, because Gorton, where it was held, was not central and easily accessible.

At a meeting of the Moss Side Local Board held yesterday week, the Clerk submitted a report embodying the result of his investigation of the legal powers of the Manchester Corporation, in regard to the manufacture and supply of gas. Shortly put, the report was to the effect that the Corporation have no statutory monopoly of gas supply, nor have they any statutory authority for making an extra charge for the gas supplied to consumers outside the city. The price is a matter of agreement between producer and consumer, whether in the city or outside it. The Corporation are not limited as to the amount of profit they may make.

NELSON LOCAL BOARD GAS SUPPLY.—The extension of the main from the limits of the Nelson Local Board district to the recently-acquired gas-works at Brierfield was commenced last week. It is understood that the plant at the Bradley Lane works will be sufficient to manufacture gas for the consumption of the whole district; and that the Brierfield works will simply be used for storage purposes.

PAISLEY CORPORATION GAS SUPPLY. THE PRICE OF GAS REDUCED.

The statement of accounts of the Paisley Corporation gas undertaking for the year ending May 28, 1888, has just been brought under the consideration of the Gas Commissioners. In the capital account the gas-works are set down at the value of £102,001 10s. 7d., as at May, 1887. Up to the date of the last balance, there had been borrowed as loans on mortgage, the sum of £58,340; and out of the sinking fund there was paid during the year, £500. The annuities stock amounted to £40,000—the amount redeemed being £39,987 10s.; leaving the small balance of £12 10s. The mortgages redeemed from the sinking fund amounted to £1200, which added to the annuities redeemed, gave a total of £41,187 10s.; and this with the loans on mortgage, &c., made a total of £99,040—thus showing a balance for the year of £296 10s. 7d. Under the head of revenue account, the statement showed that the past year's outlay for gas coal, wages, purifying materials, Manager's salary, &c., amounted to £15,725 4s. 2d. For distribution of gas, including repairs, maintenance, and renewal of pipes, and salaries, there was expended £2090 5s. 10d. The rents, rates, and taxes, amounted to £1987 2s. 6d. For management salaries and general charges there was expended £922 13s. 3d. These, together with various other items, made up a total outlay of £20,731 17s. 10d., which was increased to a grand total of £29,321 16s. 8d. by the balance to profit and loss account of £8589 18s. 9d. From sales of gas supplied by meter there was an income of £24,940 16s. 9d.; and the income from private and public lamps (with £210 15s. written off as irrecoverable) brought up the revenue from this source to £26,100 14s. 3d. The meter-rents and hire of gas-stoves amounted to £319 1s. 9d.; residual products yielded £2400 2s.; and the fee fund £1 18s. 8d.—making in all £29,321 16s. 8d.

At a Special Meeting of the Town Council held on Thursday, the Gas Committee's minutes were submitted, which stated that it had been agreed to devote the net surplus of £5413 17s. 6d., after laying aside sums for the contingent and sinking funds, to certain improvements in the burgh; £200 being voted to the Free Library and Museum, and £200 to the Parks' Committee. The adoption of the accounts, together with these minutes, was formally agreed to. The Commissioners then took up the consideration of the price of gas for the year 1888-9, as a matter which had also been discussed in the Gas Committee.

Mr. WILSON moved that the price be fixed at 2s. 6d. per 1000 cubic feet—a proposal which he had made at the Committee meeting. He said he thought it was reasonable that the gas consumers should know what could be said on both sides as to the policy of fixing the price of gas so as to give a 20 per cent. profit when all expenses had been paid, after the sinking fund, according to the Act of Parliament, and the contingent account, as agreed to by the Commissioners, were provided for; leaving a clear surplus of upwards of £5000 per annum to be spent on public improvements. Several reasons had been given for fixing the price of gas so as to yield large surplus profits; and these he pointed out. He had not the least doubt that their ability to supply such cheap gas was owing to the careful and economical management of the last 18 years, not only by their permanent officials, but by the various gas managers who had taken an interest in it during that time, conducting it on sound business principles—year by year laying aside a sinking fund, year by year extending their operations, and paying their extensions out of revenue. They were now in the position of doing double the business they had in 1870, and while doing so, paying less interest on capital than they then did. They were now doing the largest business with the least charge on capital account of any gas-works in Scotland, so far as his investigations went. The question then came, would it not be wiser to show that they were not behind in everything as a town? They paid far more for road money than any other of the important towns; they paid far higher improvement rates, and far more for drainage than any of them, principally, he believed, because they were much longer in going in for such improvements. He hoped that they would at least beat the whole of those towns in manufacturing good and cheap gas. The price he was asking them to charge would give them a margin of upwards of £1000. If they made it 2s. 9d. per 1000 cubic feet, they would have a profit of £3000; and if they charged 2s. 11d. (which had been agreed to by a majority of the Gas Committee) they would have a profit of £4800, or probably £5000. He was firmly convinced that as they were a commercial community, depending upon public works for their continued prosperity, their wisest policy was to supply both water and gas at the lowest possible price, consistent with keeping both departments in the highest state of efficiency as to plant and everything else connected with the works.

Ex-Bailie MACFARLANE seconded the motion. He held that it was unjust to the gas consumer that the price of gas should be fixed so high that a large surplus might be made, to be voted away to the interest of persons who did not contribute a penny towards making it. The Corporation of Paisley kept up the price of gas at such a figure that a large surplus was bound to be made to vote away for town improvements which had no earthly connection with the Gas Trust. The Provost had said that the result of such a procedure was that the gas consumer whose rental was above £10 suffered most; but he (the speaker) did not admit the statement. If the Provost had given the rateable value of the property held by those gas consumers above £10 rental, and had shown what portion was landlord's and what portion was tenant's, they might have been able to form an opinion; for it was only by comparison that such an opinion could be formed. He then proceeded to lay before the Council some figures which he thought would convince them as to what section of the community suffered most by comparison; and he eventually came to the conclusion that the tenant paid 100 per cent. more by taking the gas surplus to improve the town, than he would require to pay if the improvement rate was a direct tax. This showed, he said, that it was not the largest consumer who suffered most, the real sufferer was the tenant, whether his rental was above or under £10. He further remarked that it seemed to him to be manifestly unjust to make the gas consumer pay more for improving the town than those persons who did not burn any gas—taxing the very persons on whom they depended for the success of the gas-works. Such an idea was so absurd that he was unable to understand how a body of intelligent gentlemen, such as the members of the Town Council, could for a moment entertain it.

Treasurer M'GOWAN moved, as an amendment, that the price be 2s. 10d. per 1000 cubic feet; speaking at some considerable length in favour of his proposal.

Ex-Bailie WEIR seconded the amendment, remarking that gas surpluses in Manchester, Glasgow, and Greenock, were regularly taken for town improvements.

Bailie PATON proposed another amendment, to the effect that the price be 2s. 9d.

Bailie M'KENZIE supported Mr. Wilson's motion; remarking that by disposing of the gas surpluses in the way they did in Paisley, they were putting on the town an additional tax of 4d. to 5d. per £1 of rental.

The ultimate result of the voting was that the price was fixed at 2s. 10d. per 1000 cubic feet, by ten votes against five members who voted for 2s. 6d. per 1000 cubic feet.

THE SOWERBY BRIDGE LOCAL BOARD OF HEALTH AND THEIR LUDDENDEN FOOT GAS-WORKS.

An extraordinary dispute has arisen between the Sowerby Bridge Local Board and Messrs. Whitworth and Co., from whom the Board recently purchased the gas-works situated at Luddenden Foot. Messrs. Whitworth, it appears, decline to pay the price demanded by the Board for gas supplied in the Luddenden Foot district, on the ground that the understanding, when they sold the works, was that the charge should be the same as at Sowerby Bridge. They threaten to resume the manufacture of gas for their own mills if their demand is not complied with; and it is stated that they are already seeking tenders for the works. The matter was referred to at the last meeting of the Board. Mr. Baxendale said the allegations now put forth by Messrs. Whitworth were completely at variance with what really took place. It was distinctly understood that the Luddenden Foot works would be carried on as a separate concern. When the question was opened, Messrs. Whitworth were charging the large consumers 4s. 6d. per 1000 cubic feet, and the general public 5s. (the price had been as high as 6s.). If they found it necessary to charge so much, what reason had they for now wanting their gas at 2s. 4d., for this was what their demand amounted to? They would be sorry to lose them as customers; and if Messrs. Whitworth carried out their threat of withdrawal, it would be in direct opposition to the arrangement made when their works were purchased by the Board. The latter agreed to give the high price put upon the works, on the understanding that they would thus retain Messrs. Whitworth as customers. The Board had lowered the charge, and done all they could, consistently with their reasonable desire that the works should not entail loss, to encourage large consumers. Messrs. Whitworth, who had forfeited all claim to discount on the account due, said they were to be charged Sowerby Bridge price. The nearest approach to any attempt to fix a price by reference to other consumers was when the Chairman of the Board said they should be put on an equal footing with Ripponden. The Clerk said it was certainly never stipulated that Messrs. Whitworth should be charged the same as Sowerby Bridge. £8000 was a lot of money for the works, and Messrs. Whitworth got the best of the bargain. Mr. Baxendale said if Messrs. Whitworth were going to deprive them of their custom, the Board would have to increase the price of gas in the Luddenden Foot district 5d. or perhaps 10d. per 1000 cubic feet, for the works would have to pay their way. The Chairman (Mr. Greenwood) recalled the circumstances under which the extension into the Luddenden Foot district was made, and said certainly the Board were influenced in the purchase of the gas-works by the presumption that Messrs. Whitworth would be good customers. The Board had done all they possibly could to meet them fairly, and must have the money that was due to them. The Clerk was instructed to take steps to recover the amount due.

THE PROCEEDINGS OF THE BOARD OF TRADE UNDER THE ELECTRIC LIGHTING ACT, 1882, IN THE PAST YEAR.

The Board of Trade have lately presented to Parliament a report on their proceedings under the Electric Lighting Act, 1882, during the past year. It states that the only application received by the Board for a Provisional Order was from the South Metropolitan Electric Supply Company, Limited, who proposed to light the whole or portions of the following districts:—The parishes of St. James, Westminster; St. Martin-in-the-Fields; St. George, Hanover Square; and Lambeth; the City of London; the districts of the Strand Board of Works, the St. Giles Board of Works, and the Westminster Board of Works; with certain extra-parochial places. Several of the local authorities of districts comprised within the proposed area of supply objected to the grant of the Order; and, after considering their objections, the Board of Trade eventually decided to restrict the Order to the parishes of St. James, Westminster, and St. Martin-in-the-Fields, with Waterloo Bridge and a small portion of the Victoria Embankment. The application for a further extension of time for the deposit of capital in respect of the Fulham District Electric Lighting Order, 1884, referred to in the previous report (see JOURNAL for July 12, 1887) was not proceeded with. Applications for Licences were received from the Liverpool Electric Supply Company, Limited, for lighting portions of the city of Liverpool; the Kensington Court Electric Lighting Company, Limited, for lighting a portion of the parish of St. Margaret, Westminster; the Corporation of Dublin, for the public lighting of the city; the Wimbledon Local Board, for lighting their district; and the St. James's and Pall Mall Electric Light Company, Limited, for lighting the parish of St. James, Westminster. Of these applications, that relating to Liverpool was granted. The remainder are still under consideration. The Licence to the Kensington Court Electric Lighting Company, Limited, referred to in the previous report, was issued by the Board on Oct. 11, 1887.

THE DUBLIN CORPORATION AND ELECTRIC LIGHTING.

At the Meeting of the Dublin Corporation on Monday last week, Mr. Henley asked the Chairman of the Committee on Electric Lighting what progress had been made; the dates when orders were given to apply for a Licence; if that Licence had been obtained; and, if not, to explain the cause of the delay. He suggested that as the Committee had been sitting from time to time since May 2, 1887, it would be advisable to throw more energy into the matter. Mr. Robinson said that on the date named a Committee was appointed to investigate whether the water power at Island Bridge was sufficient to provide motive force for the electric lighting of thoroughfares; and they were authorized to employ an expert. In October, 1887, a report of the Committee was adopted, that application should be made for a Licence; and this was confirmed by a resolution of the Council on Dec. 12, 1887. On Dec. 28 the Committee instructed the Borough Surveyor to reconsider the specification; and on Feb. 18 last the application was forwarded to the Board of Trade. A meeting had taken place in London between representatives of the Alliance Gas Company and of the Corporation, and a practical agreement had been come to on the matter. Subsequently, a letter was read from the Board of Trade, intimating their intention to proceed with the consideration of the Licence subject to the following remarks:—"As, in deference to the wishes of the Gas Company, the Corporation have agreed to a limit of time being fixed within which the contemplated works should be completed, the Board of Trade will not object to the proposed limit of two years and six months being inserted in the Licence. They are also prepared, as power is sought to supply electricity for public purposes only, to omit the power of transfer now contained in the draft Licence as agreed to by the Corporation. The question of compensation to the Gas Company for public lighting plant thrown out of use by the introduction of electricity is a matter with which the Board of Trade are of opinion they have no power to deal in a Licence; and they are, therefore, unable to insert any provisions for this purpose. With regard to the remaining question in dispute—viz., the area of supply—the Board of Trade do not consider that the reasons advanced by the Gas Company are sufficient to justify the Department in restricting the powers sought by the Corporation for lighting the public streets with electricity to streets

specially named." It was added that, on hearing that the Corporation agreed to the foregoing proposals, the Board of Trade would at once refer the draft Licence to Counsel to settle. Mr. Robinson moved that the assent of the Corporation should be at once notified to the Board of Trade. Mr. Sheehy seconded the motion. Mr. Dennehy (who threatened an application to the Queen's Bench) moved that the matter should be referred to the Finance and Leases Committee, to see whether any expense was incurred. Mr. Doran seconded the amendment. A rather warm discussion followed, in which Mr. Robinson several times moved that the question be put; and it was contended that Mr. Dennehy's motion was not a proper amendment. Eventually it was pointed out that there was not a quorum of members present; and the matter was adjourned.

METROPOLIS WATER SUPPLY.

In the course of their report to the Official Water Examiner for the Metropolis (General A. De Courcy Scott, R.A.) on the composition and quality of daily samples of water supplied to London last month, Messrs. Crookes, Odling, and Tidy say: "During the past month a considerable proportion of the daily samples drawn from the East London Company's mains have been found, when examined by transmitted light, to be slightly turbid, from the presence of finely diffused, suspended mineral matter, attributable to the considerable disturbance of the Company's mains by the provision now being made of a number of new hydrants. With this exception, the character of the entire supply of water to the Metropolis by the seven Companies dependent on the Thames and the Lea has been thoroughly satisfactory. Attention has been called from time to time to the, for the most part, minute seasonal differences in the composition of filtered river water as it is supplied to London. Such a difference is noticeable when comparison is made of the mean results of the examinations conducted during the past month of June, with the closely agreeing mean results of the examinations made in the previous months of April and May. Thus the mean numbers expressing the organic carbon, the oxygen absorbed, and the degree of colour tint of the Thames-derived water supplied during the months of April and May being 0.157, 0.046, and 16.2 respectively; the corresponding numbers for the month of June were found to be 0.147, 0.038, and 11.6 respectively. Moreover, the maximum amount of organic carbon in any one sample examined in April and May being 0.183 part in 100,000 parts of the water, the maximum amount found in any one sample examined during last month was only 0.157 part—a proportion but little removed from the mean, or 0.147 part in 100,000 parts of the water." They add: "During the past quarter of the year we have examined 532 samples of the water furnished by the seven London Companies drawing their supplies from the Thames and the Lea. Notice has been taken of the recent deficiency in clearness of many samples of the East London Company's water. Throughout the quarter, however, the whole of the samples taken from the other six Companies' supplies of water were found to be well-filtered, clear, and bright."

THE WATER ORDERS OF THE PRESENT SESSION.

The Board of Trade have recently issued a memorandum stating the nature of the proposals contained in the Provisional Orders included in the Water Provisional Orders Confirmation Bill—viz., the Herne Bay, Kettering, Mid-Kent, and Wotton Estate Water Orders. The first-named Order is to empower the Herne Bay Water-Works Company to raise £8000 additional capital by shares or stock, and £2000 by loan. The Kettering Order is to empower the Kettering Water-Works Company, Limited, to construct new and additional works in the parish of Kettering. The Mid-Kent Water Order is to give authority to the Mid-Kent Water Company, Limited, to construct and maintain works, and to supply water in the parishes of Snodland, West Malling, Halling, Birling, Ditton, Addington, Leybourne, and Ryarsh, all in Kent; to fix the capital at £18,000 by shares, and £4500 by loan; and to supply water in bulk by agreement within and without the limits of supply. The Wotton Estate Water Order is to empower the Duke of Buckingham and Chandos to construct and maintain water-works, and to supply water in the parishes of Ludgershall, Kingswood, and Woodham, and part of the parish of Brill, all in Buckinghamshire; to fix the capital at £7000, and the amount to be borrowed at £1750; and to authorize the supply of water in bulk by agreement within and without the limits of supply. In the Mid-Kent and Wotton Estate Orders, the rates authorized to be charged for the supply of water for domestic purposes are to be based upon the rateable value of the houses as ascertained by the valuation list; and the usual clauses as to regulations for preventing waste, misuse, or contamination of water, supply of water by measure, and the quantity of land to be taken by agreement, &c., have been inserted; and the Water-Works Clauses Acts, 1847 and 1863, have been incorporated. In the Herne Bay Order the additional capital authorized is required to be offered for sale by auction or tender.

GLASGOW CORPORATION WATER SUPPLY.

The Thirty-third Annual Report of the Glasgow Corporation Water Commissioners has lately been issued, and was adopted at the last meeting of the Council. It first deals with the financial affairs of the Water Trust for the year ended the 31st of May last, and states that the following were the rates assessed and levied during the year:—The domestic water-rates within the city and Royal Burgh of Glasgow, being the limits of compulsory supply, 7d. per £1 of rental, and the public water-rate, within the limits, 1d. per £1 of rental; while the domestic water-rate levied beyond the limits of compulsory supply was the same as that of the previous year, 11d. per £1 of rental. The rates and charges for supplies of water for other than domestic purposes were according to the terms of a table approved of in the spring of last year. From the abstract statement and accounts appended to the report, it is shown that the revenue for the year, including £2416 9s. 3d. from the river supply works, amounted to £163,923 18s. 7d.; in addition to which there was a balance of £6091 6s. 3d.—making a total income of £170,015 4s. 10d. Including the annuities and interest and £4486 6s. 5d. of outlay on the river supply works, the year's expenditure amounted to £118,911 11s. 7d.; so that there was a gross balance of £51,103 13s. 3d., out of which it is intended to carry to the sinking fund account the sum of £37,625 3s. 7d.; thus leaving a balance of £13,478 9s. 8d. to be carried to the credit of the revenue account for the year 1888-9. When the revenue for the past year is compared with that for the year 1886-7, several points of interest crop up. The domestic rate within the municipality yielded during the year £31,379 14s. 2d., which is less than that of 1886-7 to the extent of £4413 6s. 3d. On the other hand, the "outside" domestic water-rate showed an increase of £425 16s. 11½d., on a total revenue of £32,513 1s. 6½d. From the meter supplies within the municipality the amount realized during the year was £39,294 13s. 2d.; showing an increase of £2379 6s. 1d. The revenue for meter supplies outside the municipal area was £14,926 9s. 7d.; being an increase of £1457 9s. 5d. The year's increases amounted to £4998 5s. 4d., as compared with £4547 12s. 10d., which was the amount of the decreases over the year on the various items of revenue; and the total revenue for the year was £163,923 18s. 7d., as against £163,473 6s. 1d.—the difference (an increase) being only £450 12s. 6d.

As already mentioned, the total expenditure over the past financial year was £118,911 11s. 7d.; and the total expenditure during the year 1886-7 was £123,793 10s. There was thus a decrease of £4381 18s. 5d. on the expenditure side of the accounts, which is certainly somewhat remarkable in such a gigantic concern. During the past year there was added to the capital account the sum of £54,615 12s. 1d., of which upwards of £42,000 was on account of three of the new extensive works. Nearly all other items were also on account of new works and extensions. Under the Glasgow Corporation Water-Works Act of 1885, the borrowing power was increased to £3,000,000; and the loans on mortgage, the funded debt issued, Corporation loans, redeemed mortgages, and sinking fund on money borrowed—year 1887-8—represent a sum of £1,813,913 1s. 8d.; so that there is still a balance of unexhausted borrowing power amounting to £1,186,086 18s. 4d. The sinking funds set apart for, and applied in, redemption of mortgages and annuities, in terms of the Water-Works Acts, now amount to £450,999 2s. In view of the unanimous report of the Boundaries Extension Commissioners recommending the enlargement of the Municipality of Glasgow (which if carried into effect, will considerably reduce the domestic revenue), the Water Committee—notwithstanding the large surplus at the credit of the revenue account—have resolved to continue, for the year commencing on the 28th of May last, the same domestic water-rates, public water-rate, and rates and charges for supplies of water for other than domestic purposes, as those of the year 1887-8.

The second portion of the report is devoted to the works. It states that these continue to be maintained in a state of good repair, and that nothing beyond ordinary maintenance appears at present to be required in certain comparatively unimportant exceptions.

The report gives a few facts regarding the water supply of the past year. The quantity of water sent into the city and district during the year ending the 31st of May last, averaged as follows:—

	Gallons per Day.
From the Loch Katrine works	35,206,641
From the Gorbals works	4,367,650
Together	39,574,291
Average for 1886-7	41,376,479
Decrease	1,802,188

The steps taken by the Water Committee during last summer to check the wilful waste and the extravagant use of water have been attended with considerable success; and although the population has increased during the year, as well as the quantity of water sold for trade purposes, it is gratifying to the Committee to find that the average consumption during the past year was notably less than during the previous year. Lastly, the river supply works are statistically dealt with in a brief way. These works continue in a satisfactory state of efficiency. The quantity of water supplied by them during the year averaged 2,419,385 gallons per day; being a decrease of 93,367 gallons per day as compared with the previous year.

THE PROGRESS OF THE VYRNWY WATER-WORKS.

The members of the Water Committee of the Liverpool Corporation have lately made a tour of inspection of the new water-works at Vyrnwy. The party first visited the filter-beds. These are among the largest ever constructed, and are so extensive that three out of four of the beds are sufficient to meet a maximum supply, while the fourth is being cleaned. The filter-beds, being one of the most important parts of the Vyrnwy scheme, will be amongst the earliest portions to be completed. From the reservoir at Vyrnwy, water will be conveyed to Oswestry by two sets of pipes, and thence to Liverpool in one large main upwards of 4 feet in diameter. At Oswestry carriages were hired for the Committee, and a drive was taken across the country to the reservoir; but as it was then evening, nothing further was done. The night was spent in the Engineer's residence on the banks of the intended lake. On the next morning the Committee were driven along the road which marks the boundary of the lake for a distance of about four miles. They subsequently transferred themselves to one of the steam trams in use at the works, and inspected the vast quarries that extend along the hills on one side of the reservoir for a distance of more than two miles. They also went a distance of about 200 yards down the tunnel in which the mains will be carried through the hills. From this point they returned to the "straining tower"—a great structure erected at what is believed will be the stillest portion of the lake, for the purpose of relieving the filter-beds, and preventing any choking of the mains by removing from the water, as it leaves the reservoir, all large floating particles. Obviously the line of mains to Oswestry will need periodical inspection and cleaning; and hence it has been made double. Water will leave the lake by two mains. The first, placed at a certain distance above the bottom of the reservoir, will remove the water after it has reached a given level. It is 4ft. 6in. in diameter. The second, placed at the lowest level, will, if necessary, drain the lake dry. It is 3 feet in diameter, but will only be used in very dry seasons. Lastly, the Committee inspected the embankment, which completes the lake, making it form like a horseshoe. This wonderful piece of constructive engineering is now about complete. Only one or two of the range of archways that have been built above it for the passage of the surplus water have yet to be erected. When the lake reaches its maximum level, the overflow will form one of the most magnificent cascades in the world. Very great confidence is placed by the Committee in the stability of the embankment. The pressure at the base will be 60lbs. per square inch, or 8640lbs. per square foot. To meet this, the embankment at its base is 60 feet thick, and to all appearance is as solid as the surrounding mountains. It may almost be said to be of one piece; for the blocks of stone (many weighing several tons) are cemented together with a mortar composed of special cement, mixed, instead of sand, with the same rock as that of which the embankment has been constructed, but powdered and carefully washed. The interstices have also been filled with gravel of the same material. When the church and village now on the site are removed, the reservoir will be ready for filling. The pipe-lines from Vyrnwy to Halton Castle, Cheshire, on the one side, and from Prescott to Widnes on the other, have already been completed; and provided the connection across the estuary of the Mersey is made without undue delay, the water supply of Liverpool will in April next, or at the latest in May, be assured as long as the city lasts. The Committee will commence filling the reservoir in October next; and in a few months there will be an ample stock, for the capacity of Vyrnwy is 11,000 million gallons, or more than four times that of Rivington. With the average rainfall of the district it can be filled in two months to the height at which the water would commence to flow in the direction of Liverpool.

REDUCTIONS IN PRICE.—The Wandsworth and Putney Gas Company have reduced the price of gas to 2s. 8d. per 1000 cubic feet, as from Midsummer last.—At the annual meeting of the Berwick and Tweedmouth Gas Company last Wednesday, the price of gas was reduced from 4s. 10d. to 4s. 8d. per 1000 cubic feet.—The Directors of the Yeovil Gas Company have reduced the price of gas 2d. per 1000 cubic feet as from the 1st inst., bringing it down to 3s. 7d. net per 1000 cubic feet.

NOTES FROM SCOTLAND.
(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday.*

In this transition period, when the two local Gas Companies have virtually ceased to have an interest in the future of their businesses, and the Corporations of Edinburgh and Leith are considering how they are to conduct the large and responsible trust which will in a few days come into their hands, it is natural that the minds of all who take an interest in the gas industry should turn upon the question of whether the bargain which has been come to is a good or a bad one. This has already been done in the columns of the JOURNAL. On Tuesday last the Town Councils of Edinburgh and Leith both had the felicity of listening to the views of the two men who have piloted them into their present position. In the Leith Council, Bailie Archibald said nothing worthy of notice. It was different in the Edinburgh Council, where Mr. Colston dilated upon the outcome of his labours. Considering that he has not got everything his own way, it is not surprising that he did not say much about the terms of the transfer, but rather sheltered himself behind the views of Mr. Lass and Mr. Livesey on the question of the Leith purchase. Of course, he could not do otherwise than acknowledge that the terms were good—even favourable for the city. Having taken upon myself long ago to urge upon Mr. Colston and his colleagues the propriety of advancing their terms, it is a satisfaction to find that he now virtually coincides with me in the view that at that time they did not offer sufficient. But there is a remark to which I must take exception, when he says: "The agreement with the Leith Company, on the other hand, was of a more difficult nature; and while some, who were imperfectly informed, might hold that as good or better terms might have been obtained at an earlier stage, those who had charge of the business knew better." I do not know what he means by this statement. If the Joint Committee knew then that they could not get these "good or better" terms, why did they not offer the terms which have been now accepted? This knowledge of the Joint Committee was of no value, for they did not act upon it. But I am not aware that anyone ever said that as good or better terms might have been obtained at an earlier stage. All that I am aware of having been advanced against the Joint Committee is that at an earlier stage they wanted too good terms—terms which it was impossible they could get; and that by their refusal to offer worse terms (for the community, better for the Company) they caused needless expenditure. But leaving this side question, it is gratifying to be able to give the opinion of Mr. G. W. Stevenson, C.E., one of the Corporations' advisers, on the Leith purchase. In his letter, read by Mr. Colston, there occurs the passage: "Although the terms of purchase of the Leith Company are not so good as those of the Edinburgh Company, they are yet good in themselves, and but for the exceptionally favourable terms on which the Edinburgh Company was bought, not a word could have been said against the terms of the Leith purchase. It was simply not possible to get two such extraordinary bargains as the Edinburgh purchase." The Corporations are to meet on an early day after the Royal Assent has been given to their Bill, to appoint the Gas Commission. Mr. Colston and his Committee were thanked for their services—a motion with which, although I differed considerably from the Committee on several points, I heartily concur, because the result they have arrived at is eminently satisfactory, bearing out, as it does, the views which I all along urged upon them.

The Berwick and Tweedmouth Gas Company show a good record for the past year. The shareholders met on Wednesday, when it was reported that the total income for the year was £5068 3s. 7d., in which was included £4664 0s. 10d. for gas sold. The expenditure was £3917 9s. 11½d., leaving a net profit of £1150 13s. 7½d. Out of this a dividend of 10 per cent. was declared; and it was agreed to reduce the price of gas from 4s. 10d. to 4s. 8d. per 1000 cubic feet. It may be noted that a year ago the Company made a reduction in the charge for meter-rents. It was stated on Wednesday that the Company's works were now completed, and that the new purifying plant was working most efficiently. The Chairman expressed the belief that next year they would be able, by reason of their new plant, to make a further reduction in the price of gas. The quality of the Company's gas is kept at an average of 80 candles.

The lowering of the price of gas at Alloa is to bear fruit in an increased consumption in the public lamps. The Police Commissioners were contemplating the desirability of paying by meter for the gas they required; but at a meeting on Monday, Mr. Moyes, the Convener of the Lighting Committee, intimated that he would not, on account of the cheapening of the gas, press that proposal. The Commissioners, however, agreed to another part of the motion of which Mr. Moyes had given notice, to reorganize the lighting arrangements of the town by the introduction of additional lamps and the equalizing of the space between those now in use.

The Lauder Gas Company, in the energetic hands of Mr. Turnbull, has, it is reported, had a better year last year than the previous one, but is still unable to pay a dividend. The price of gas is very high—9s. 7d. per 1000 cubic feet.

The Cupar Gas Company have paid a dividend at the rate of 4 per cent.; though the Company have of late years been understood to be in a better position than this figure indicates. Is this the making of a "poor mouth," in view of the dispute with the Town Council about the cost of gas for the public lamps?

The annual meeting of Forres Gas Company was held on Monday. It was stated that the Directors had been considering the question of the price of gas, and now saw their way to recommend a reduction. A dividend at the rate of 7½ per cent. was declared; and it was resolved to reduce the price from 7s. 1d. to 6s. 8d. per 1000 cubic feet.

The affairs of the Edinburgh and District Water Trust are at present attracting a good deal of attention. More than one change has already taken place in the staff of officials; and others are in contemplation, over which there may be some controversy. But the most important question before the Trustees is the necessity for providing an addition to the city water supply. It is already foreseen that, if the great increase of the city since the last supply was brought in from the Moorfoot Hills continues, the present supply will only be equal to the demand for about five years. The Trustees have had their attention turned to two or three sources—the further utilization of the Pentland Hills supply; the bringing in of the Manor Water, a tributary of the Tweed; and the taking up of the scheme, rejected in 1874, of going as far as St. Mary's Loch, in Selkirkshire. To-day the Trustees visited the Manor district to inspect it; and doubtless the other proposals will be similarly dealt with. The Manor water is highly spoken of.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday.*

At a meeting of the Gourrock Burgh Commissioners on Tuesday evening, the gas minutes were submitted, including the annual statement of accounts for the past year. This showed that the total income was £2194, and the expenditure, £1687; thus leaving a surplus of £507. From this there fell to be deducted for interest and repayment of loan, the sum of £471 12s. 3d., leaving a net surplus of £35 7s. 9d. Bailie Lang, Convener of the Gas

Committee, stated that tenders had been received for the supply of coals for the year ending May 15, 1889. With 200 tons on hand, it was found that 800 tons would suffice. There were eleven tenders; the prices ranging, for the various qualities, from 7s. 9d. to 21s. 5d. per ton—the average price being 12s. 4½d. per ton. Bailie Lang said that the contracts which had just been closed were very favourable; and that the Gas Committee hoped next year to be able to recommend a small reduction in the price of gas.

During the last financial year the Selkirk Gaslight Company made 17,306,600 cubic feet of gas; the sales (at 3s. 6½d. per 1000 feet) yielding a profit of £386. The shareholders are receiving a dividend of 10 per cent on the past year's profits.

During the year ending May 31, 1888, the amount of gas made at the works of the Glasgow Corporation Gas Commissioners was 2,705,444,000 cubic feet, as compared with 2,596,470,000 cubic feet in the preceding year. The quantities of gas sold and accounted for during these two years were respectively 2,427,078,000 and 2,285,136,000 cubic feet. During the past year the leakage and unaccounted-for gas was less than that of any former year; the amount being 10·289 per cent., as compared with 11·99 per cent. in the year 1886-87; 11·32 per cent., in the year 1885-86; and 10·66 per cent. in the year 1884-85.

It will be some days yet before the Glasgow Corporation Gas Committee will be able to deliberate upon, and make recommendations in connection with the accounts of the past year of the great undertaking which they have to administer. It may be mentioned, however, that the balancing of the accounts has just been completed; and they seem to indicate that if the allocation of the surplus is made under the various heads in the same way as it was last year, there will still be somewhere about £2000 to the good. It is very likely, therefore, that Bailie Shearer will be unable to obtain the vote of £5000 from the gas profits for the Public Good, which he has been for some time aiming at; and in connection with which he gave notice of motion awhile ago at a meeting of the Town Council.

There has been more firmness during the past week than for a long time previous in the Scotch pig iron warrant market, as there is an improved demand for home consumption, with the consequent reduction of the quantity going into store. There is also a demand for several special brands, the price of which has risen. Scotch warrants touched 38s. 6d. per ton cash yesterday; but the close was 1½d. less. The gains during the week have been: Scotch warrants, 6d. per ton; Cleveland, 4d. per ton; hematite, 5d. per ton.

The local coal trade is showing more favourable signs this week; and coal masters have a more hopeful opinion of the future than they have held for some time.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *July 21.*

Sulphate of Ammonia.—The market continues to recover; and buyers are paying (with bad grace, of course) the improved values. As much as £11 15s., Hull, and £11 12s. 6d., Leith and Liverpool, have been realized during the week; and there is at the moment remarkably little offering. In fact, everything points to a great strain upon the production in the near future; and there are certainly no stocks now accumulating. Heavy shipments are being made to Germany and Spain; and it almost goes without saying that France and Belgium will "follow suit" presently. There are very few of the requirements filled in the latter countries; and the indications are that sulphate will be used largely. The steady maintenance of nitrate rates, both for present and autumn shipments augurs well for the keeping up of sulphate values; and therefore no decline can at present be foreseen (as it is, nevertheless, by the dealers) when the production again increases after the summer season. With buyers of nitrate cargoes Sept.-Nov. sailing at fully 9s. per cwt., sulphate may be valued at £11 10s. at least for the winter months.

LONDON, *July 21.*

Tar Products.—A better feeling obtains in this market. Benzol has risen; and anthracene is quoted a little higher. Pitch, on the other hand, continues weak; and buyers offer absurd prices for the ensuing season. Prices: Tar, 15s. to 20s. per ton. Benzol, 90 per cent., 2s. 9d. per gallon; 50 per cent., 2s. 4½d. Toluol, 1s. 8d. per gallon. Solvent naphtha, 1s. 2d. per gallon. Crude naphtha, 30 per cent., 1s. per gallon. Light oil, 3½d. per gallon. Creosote, 1½d. per gallon. Pitch, 13s. to 16s. per ton. Carbolic acid (crude), 3s. 5d. per gallon. Cresylic acid, 10d. per gallon. Tar salts, 15s. per ton. Anthracene, 30 per cent., "A" quality, 1s. 4d. per unit; "B" quality, 1s. 2d.

Ammonia Products.—A speculative rise has taken place in sulphate; but, so far as can be seen, there is no substantial back to the rise which has taken place during the week. Prices: Sulphate of ammonia, £11 10s. to £11 15s. per ton, less discount. Gas liquor (5° Twaddell), 8s. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 2d. per lb. Carbonate of ammonia, 3½d. per lb. Muriate of ammonia, brown, £18 per ton; white, £28. Sal ammoniac, £30 per ton.

[From the *Chemical Trade Journal*, July 21.]

Sulphate of Ammonia.—The hardening of the market shown in embryo last week has now fairly burst out into bud, though makers should not put too much confidence in the sudden rises in value induced by the machinations of a few speculators. Having bought pretty well at low values, there are some who are extremely anxious for a rapid rise; but it should be remembered that nothing demoralizes the market so much as these extreme fluctuations. Sulphate makers will bave, more and more, to study the markets during the various seasons of the year, and not trust too much to some of those misleading circulars which are occasionally issued by peculiarly interested parties in order to furnish them with the means of feathering their nests. There is a fable of *Æsop's* which seems to us to specially bear upon the earnest solicitations which some speculators profess to have for the sellers of sulphate of ammonia. We will give it next week. Hull price is to-day (Thursday) £11 15s.; while Leith may be stated at £11 12s. 6d. London prices are: Beckton, £11 15s.; and outside makes at £11 15s.

Tar Products.—Benzol has risen during the past week, and a substantial change for the better was visible on Manchester 'Change last Tuesday. On that day the values of 90's and 50/90's might safely have been set at 2s. 11d. and 2s. 5d. respectively; and actual business has been reported at a fraction less than these prices. Solvent naphtha is in good demand at old rates; while crude carbolic (60's) is not value for more than 3s. 4d. The demand for creosote for lighting purposes (the Lucigen Luminator, and other lights) is very good indeed; and it is stated that the Manchester Ship Canal works will soon absorb a very large quantity for their lamps. Anthracene stands at 1s. 1½d. for "B" quality, and 1s. 4d. for "A"; and there is every prospect of these prices being maintained. Pitch is still in an anomalous position; and we can only reiterate what has been said before on this subject. Our London correspondent informs us that 27s. per ton was the price paid for the Salford tar; and further states that he would not be surprised to find prices forced up still further.

SALES OF SHARES.—At the Mart, Tokenhouse Yard, last Wednesday, Messrs. E. Fox and Bonsfield disposed of 50 £10 fully-paid shares in the *West Kent Gas Company* (on which the maximum dividend of 10 per cent. is being paid) at the following prices:—Five at £20 each; 5 at £19 5s.; and 40 at £19. They also sold 25 £10 shares (£4 paid) in the same Company, on which 7 per cent. is being paid, at £6 per share.—At a sale by auction last Friday, small parcels of stock in the *Scarborough Gas Company* were sold at the following prices:—£100 of new ordinary 7 per cent. stock, £106; £80 of 5 per cent. preference stock, £110 15s.; an allotment of new ordinary 7 per cent. stock (£18 paid), £33 5s. The stock was sold with the dividend accrued to June 30 last.

GAS V. OIL AT MALVERN LINK.—The Malvern Link Local Board have decided to light the roads in their district by oil-lamps during the coming winter. This decision has been arrived at in consequence of a dispute with the Malvern Link Gas Company. The Board will not pay for lighting the public lamps what the Gas Company regard as a fair charge. The Company decline to accept the terms proffered by the Local Board. A reference to arbitration was suggested by the Company; but it is said to have been declined. At the last Local Board election, reference was made to the price of gas; and a comparison was instituted between the local charges and those at Worcester, which, as the circumstances of the two places very widely differ, was unfair to the Gas Company.

INCOME-TAX ON GAS-WORKS PROFITS.—A case of considerable interest to the ratepayers of Newcastle-under-Lyme and other corporate towns has just been decided by a Judge in the Queen's Bench Division, sitting in Chambers. Up to the present the Gas Committee of the Town Council have successfully maintained that the sum of £500, annually placed to the credit of the depreciation fund, should be exempt from income-tax. This has been disputed by Mr. Clayton, Surveyor of Taxes, Stoke; and the sum he sought to recover was £15. The Gas Committee were supported in their contention by several large Corporations; and two cases were fought out on the precise point, with success. The Newcastle-under-Lyme Corporation were not represented by Counsel when the case came before the Judge; it having been intimated that such representation would really not be necessary. However, the Attorney-General appeared on the other side; and judgment, with costs, went against the Newcastle Corporation, by default. The effect is that the Gas Committee will have to pay income-tax upon the £500, although no decision is given on the merits of the case at issue; and as the five years during which the depreciation fund was allowed to accumulate have passed, it is understood that the point will not again be raised.

COLNE VALLEY WATER COMPANY.—The report of the Directors of this Company for the half year ending June 30 last, which will be presented at the general meeting of shareholders to be held at the Company's works, at Bushey, on the 3rd prox., states that the total receipts on revenue account amounted to £5037, and the expenditure to £2217, as against £4610 and £2129 respectively during the corresponding period of 1887. Thus the profit carried to dividend and interest account was £2929, as compared with £2481; and the balance of this account, after payment of the 4 per cent. interest on the £65,000 debenture stock and £12,500 preference shares, and transferring another £100 to the reserve account, is £1826. The Directors again propose the payment of a dividend at the rate of 2½ per cent. per annum, less income-tax, which will leave £472 to be carried forward. Since the 30th of June the Directors have sold 8½ acres of the surplus reservoir land at Busley Heath, leaving about 9 acres still in the possession of the Company; which they consider amply sufficient for future requirements. The land was sold by public auction at the Mart, Tokenhouse Yard, and realized £1550, which sum (less the expenses of the sale, &c.) will be credited to capital account; the expenditure on which account last half year was only £491. The disused Harrow Water-Works were offered at the same time, but were not sold.

THE SHEFFIELD CORPORATION WATER-WORKS ACCOUNTS.—The annual abstract of the accounts of the Sheffield Corporation (prepared by the Borough Accountant, Mr. B. Jones) has just been published; and for the first time contains the accounts connected with the water-works undertaking. These show that the liabilities of the Water Company in share capital and debentures, and taken over by the Corporation, amounted to £1,826,000; and that this sum, with an overdraft from the bank of £35,000 (at March 31 last), had been expended in reservoirs, conduits, and other works. The loan transactions of the Corporation in connection with this part of the accounts show that in lieu of the share capital of the Company of £1,336,200, the Corporation have issued annuities amounting in redemption value to £1,549,466. Other accounts show the operations of the water undertaking; distinguishing between the transactions of the Company up to the 25th of March last, and those of the Water Committee. The latter for the quarter ending March 25 shows a trade profit of £797; but this figure, as appeared from a recent debate in the Town Council, is made up under circumstances which admit of a good deal of diversity of opinion. The cost of the water undertaking to the ratepayers is put down at £2,092,689; and the Water Committee have arranged for the additional expenditure of £80,000 or £90,000. No provision appears in the accounts for a sinking fund, which will amount to more than £5000 a year. The total capital account of the Corporation, after the acquisition of the water undertaking, considerably exceeds three millions.

THE CONVEYANCE OF THE VYRNWY WATER TO LIVERPOOL.—On Saturday, the 14th inst., Sir Douglas Galton, the Arbitrator appointed by the Board of Trade to determine the method by which the pipe-line conveying the water from the Vyrnwy shall pass under the River Weaver on its way to Liverpool, resumed the inquiry (which was opened on the 23rd ult.) at the Surveyors' Institution, Westminster. Mr. Pember, Q.C., appeared on behalf of the Liverpool Corporation; Mr. W. H. Higgin, Q.C., for the Weaver Trustees. The latter body urge that a tunnel should be constructed at a considerable depth below the Weaver, in which the pipe-line should be laid; while the Corporation contend that all practical purposes will be served by digging a trench across the river bed and sinking the pipes therein. Further evidence was called on behalf of the Corporation,—viz., Mr. E. B. Ellington, M. Inst. C.E., Engineer to the London, Liverpool, and Hull Hydraulic Power Company, and Mr. J. Quick, M. Inst. C.E., Engineer to the Amsterdam Water-Works—both of whom stated that the propositions of the Corporation would meet all contingencies, and that the scheme sought to be imposed on them by the Weaver Trustees would represent a vast and unnecessary increase of expense. Mr. Higgin then opened the case for the Trustees, arguing that the laying of the pipes across the river bed would be a danger to the navigation, and prevent the Trustees from deepening the river, as they proposed soon to do. Mr. Higgin called two salt manufacturers, having works upon the Weaver, and maintaining large fleets of steamers and barges, who gave evidence in favour of the construction of a tunnel. Mr. Dalo, Accountant to the Weaver Trustees, produced statistics showing the traffic on the river and the revenue of the Trust for several years, and stated that during the last six years the surplus income devoted to the relief of the county rates had been £15,000 a year. Other witnesses were also examined; and the sitting was adjourned till the 26th inst.

THE METROPOLITAN BOARD OF WORKS AND GAS-METER TESTING.—At the meeting of the Metropolitan Board of Works last Friday, the Works Committee reported that the Special Purposes and Sanitary Committee had recommended the Board to take action in Parliament to obtain an amendment of the law to include provision for the testing of the indices attached to gas-meters. The Works Committee, after careful consideration, suggested that the best course to adopt would be to address a communication to the Board of Trade, laying before them all the facts; and they recommended that this should be done, and that the Wandsworth and Putney Gas Company, who had been in communication with them on the matter, should be informed of the present position of the question. This was agreed to.

YEovil GAS COMPANY.—The report of the Directors of this Company to be presented to the shareholders at the annual general meeting next Monday, states that the profit on the year's working will allow of the payment of a dividend of 10 per cent., which the Directors recommend to be declared (free of income-tax), carrying £74 to the reserve fund, and the balance of £911 to next year's account. The reserve fund will then stand at £1500, at which sum it will be closed for the present. There has been a satisfactory increase in the demand for gas for cooking, heating, and motive power, as well as for lighting purposes. Considerable additions to the producing power of the works are now in progress; and important extensions of the distributing mains have been made in various districts. The price of gas has been reduced 2d. per 1000 cubic feet.

PONTEFRAC TOWN SUPPLY.—A special meeting of the Pontefract Town Council was held last Tuesday, to consider the minutes of the Gas and Water Committee. It was recommended that application should be made to the Local Government Board to borrow £25,632 for carrying out the proposed scheme to procure a fresh supply of water from Roall, near Whitfield Bridge. There was much discussion on the subject; and an amendment was proposed and seconded to postpone the question until September, in order, if possible, to induce Knottingley, Featherstone, and other places, to unite in the procuring of a new supply. The Mayor (Alderman Mathers) said the scheme was the best ever proposed for the benefit of the town. At present, in case of fire, £30,000 worth of property might be destroyed, as there was no supply of water in the storage tanks. On being put to the meeting, 13 voted for the original scheme; and 8 for the amendment; so that the Roall scheme is the one that will now be adopted.

THE EXTENSION OF THE BRIGHOUSE GAS-WORKS.—Mr. Arnold Taylor, one of the Inspectors of the Local Government Board, held an inquiry at Brighouse last Tuesday, as to the application of the Brighouse Local Board to borrow £1500, to complete the extension of the gas-works and to purchase sulphate plant. It was explained that in 1884 the Brighouse Local Board obtained a Provisional Order, by which they were empowered to borrow £15,000 for gas-works extension. Of this sum £13,500 had been raised and spent. The Board now intended to manufacture sulphate of ammonia, the building and plant for which would cost £800; £700 would also have to be expended to complete the extensions at the gas-works; and it was for these purposes that the Board asked for sanction to borrow £1500. The Gas Manager (Mr. J. Parkinson) gave particulars of how it was proposed to lay out the money, and said it was estimated that the Board would be able to realize some £200 or £300 a year more by selling sulphate than by disposing of the ammoniacal liquor in its crude state as at present. There was no opposition to the application.

COCKERMOUTH LOCAL BOARD GAS SUPPLY.—At the last meeting of the Cocker-mouth Local Board, Mr. McQuhae, Chairman of the Gas Committee, reported that the Gas Manager (Mr. E. W. Smith) had during the half year ending the 30th of June last made 5,786,000 cubic feet of gas, against 5,517,000 cubic feet made by the Gas Company in the corresponding half of the previous year; showing an increase by the Board's Manager, of 269,700 cubic feet on the half year. The quantity of coal used was 539 tons; being at the rate of 9823 cubic feet of gas per ton of coal carbonized. The Company used about the same quantity of coal. This showed the receipts for the sale of gas at 4s. per 1000 feet, at upwards of £50 more than those received by the Company; whilst the difference in the price of coal was over £100—the coal used by the Company costing about 15s. per ton, and that used by the Board's Manager about 11s. per ton. The quality of the gas was superior; whilst the average candle power for the half year had been 17·27, being 1·27 candle power more than was required by the Act. The sale of residuals had also had a corresponding increase. Since the gas exhibition had been held, the Manager had placed 34 gas-cooking stoves which were giving great satisfaction. The Company during the four months in summer, made less gas than the average of one month in winter; whilst the Board's Manager had made in the two months in summer the average of one month in winter. As the difference in the cost of labour between the winter and summer months was not great, it was clear that an increase in the sale of gas during the summer would show good results at the end of the year.

STOKE-UPON-TRENT GAS SUPPLY.—At the meeting of the Stoke-upon-Trent Town Council last Thursday, the annual abstract of the accounts of the borough, recently presented, were commented upon by Alderman Leason, with special reference to the progress of the gas undertaking. He stated that altogether a sum of £62,700 had been borrowed on the works, but part had been repaid. At the present time they were making yearly at the gas-works 83½ million cubic feet of gas, and selling 77½ millions; so that their loss from leakage was less than 7 per cent., while in the first record after their purchase of the undertaking the leakage was 13½ per cent. It would thus be seen that the Committee and their Manager (Mr. Herman Taplay, Assoc. M. Inst. C.E.) had reduced this very considerably. The residuals last year realized £272 more than in the previous year. The revenue account showed the receipts to be £13,871, while the expenditure was £7723; leaving a gross profit of £6148. Interest on capital, bank commission, &c., absorbed £2338 of this sum; leaving a net profit of £3210. Of the latter sum, £2500 had been handed over to the Council towards the reduction of the rates; leaving the Gas Committee with £700 to the good. Alderman Leason further remarked that he considered their finances were in a satisfactory condition, and that in a short time the adverse balance at the bank would be removed. With regard to the gas undertaking, he thought the inhabitants had no right to more than a fair proportion of the profits, and that the people who made the profits—the consumers—ought to be taken into account. It was, therefore, a matter for consideration whether the time had not arrived for a further reduction in the price of gas. Mr. Sant thought the position of affairs did not justify any reduction. They were now, he said, selling gas as cheaply as any town in the Potteries. It must be borne in mind that there was still a heavy liability on the gas-works; and now that electricity was running gas so close, if the undertaking failed before this liability was cleared off, it would be the ratepayers who would suffer, and not the consumers. A reduction in the price of gas would mean an increase of the district rate; and he did not think they were prepared for that.

THE NORTHERN COAL TRADE.—The demand for steam coals in the north-east of England indicates a large volume of trade, and one which does not as yet show any sign of falling off; but it is at prices which cannot be considered profitable. Best steam coal sells at about 7s. 9d. per ton; and in one or two instances a slight discount is allowed from this rate. Second-class coal is rather more abundant, and about 7s. to 7s. 3d. is the rate. There is a large output of steam coal; and the price is, if anything, a little weaker. Gas coal is slightly more in demand, and every day will increase the sale now, whilst the shipments abroad continue good. There is little doing in household coal; and the demand is reduced by the more seasonable weather. Still some of the land-sale collieries ask 9s. per ton for best household coal at the pit. For export the price is much lower.

BOLTON CORPORATION GAS SUPPLY.—At the last meeting of the Bolton Town Council, the members were presented with a copy of the Borough Treasurer's accounts for the year ending March 25 last. According to the statement of the Chairman of the Gas Committee (Alderman Miles), as to the operation of this branch of the Corporation work, there is the large sum of £12,436 carried to the reserve fund (one-third more than the Committee in 1874 thought would ever be necessary); and £11,500 is transferred in aid of the district rates. Amongst other items of income, a sum of £7179 6s. 10d. is noticeable from public lamps. This item appears for the first time. The residual products returned £14,964; the sulphate of ammonia manufactured forming the larger proportion. In the gas-works capital account, which is more clearly and fully set forth than hitherto, the sum of £30,000 is written off for depreciation of works not covered by expenditure on renewals.

THE WIGAN CORPORATION DEBT.—At the last meeting of the Wigan Town Council, Mr. Lamb, the Chairman of the Finance Committee, submitted proposals for the conversion of the Corporation stock. The stock bears interest varying from 4½ to 3½ per cent. (a very small proportion being at the latter figure), and is redeemable by annual drawings by lot. The gas loan is represented at £177,085, repayable in 60 years; and the other loans at £131,000, repayable in 80 years—making a total of debenture bonds of upwards of £308,000. The Committee's proposal is to convert the whole of the stock to a uniform basis, bearing interest at 3 per cent.; and with a view to bring about the change, they recommend that there shall be offered for 3½ per cent. stock a premium of £8; 4 per cent., £8; and 4½ per cent., £10. They also propose to remove the liability to be drawn by lot, and to guarantee that the stock should not be further interfered with for ten years except at the option of the holders, but that it should afterwards be redeemable upon six months' notice being given. The Council sanctioned the scheme.

MONTROSE GAS COMPANY.—The annual general meeting of this Company was held on Wednesday last—Ex-Provost Reid in the chair. The Solicitor (Mr. Dickson) read the report for the past financial year, which showed that the total income (including £1279 from the previous year) was about £6593 9s. 4d., and the expenditure £4071 17s. 2d.—showing a surplus of £2521 12s. 2d., or, deducting the balance carried forward, a profit of £1242 1s. 2d. It was agreed to pay the usual dividend of £3 per share, to meet which, however, about £257 will have to be taken from the reserve fund. It appeared from Mr. Dickson's statement, that the consumption of gas in the town had been gradually decreasing for three years past; and that the falling off in the income was chiefly due to the depreciation in the value of residual products, which in 1886 realized £474, in the following year £464, and last year only £185 11s. 5d. Had they fetched their previous price, instead of a deficiency, there would have been a small surplus. The Chairman thought, in view of the depressed state of the town, the shareholders might congratulate themselves on the position in which the Company stood. In moving the reappointment of Mr. Hall as Manager of the works, the Chairman paid a high compliment to him for the able manner in which he had discharged his duties; and stated that the Directors had agreed to recommend that his salary be increased by £25 per annum. The Chairman moved accordingly; and Mr. J. Johnston seconded the motion. Mr. Deans moved, as an amendment, that, in view of the fact that the income of the Company was falling off, and of the slight prospect of the trade of the town improving, no increase be given. On a division, the motion was carried by a large majority. Mr. A. Melville Watt was re-elected as Secretary and Treasurer; and a vote of thanks to the Chairman concluded the proceedings.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.
(For Stock Market Intelligence, see ante, p. 156.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.					£ s. d.
GAS COMPANIES.								
590,000	10	12 Apr.	10½	Alliance & Dublin 10 p. c.	10	183-192	..	5 7 8
100,000	10		7½	Do. 7 p. c.	10	134-14	..	5 7 2
300,000	100	2 July	5	Australian (Sydney) 5½ p. c.	100	109-111	..	4 10 1
100,000	20	30 May	10	Bahia, Limited	20	23-25	+1	8 0 0
200,000	5	11 May	7½	Bombay, Limited	5	7-7½	..	5 0 0
40,000	5		7½	Do. New	4	5-5½	..	5 9 1
380,000	Stock.	15 Feb.	11½	Brentford Consolidated . . .	100	225-230	+2	5 2 2
110,000			8½	Do. New	100	165-170	+2	5 2 11
220,000	20	14 Mar.	10½	Brighton & Hove, Original .	20	43-45	..	4 13 4
320,000	20	12 Apr.	11½	British	20	45-47	..	4 15 9
50,000	10	14 Mar.	11	Bromley, Ordinary 10 p. c.	10	20-22	..	5 0 0
39,000	10		8	Do. 7 p. c.	10	134-14	..	5 10 4
328,750	10	30 May	8	Buenos Ayres (New) Limited	100	134-14	..	5 10 4
200,000	100	2 July	6	Do. 6 p. c. Deb.	100	106-109	..	5 10 1
150,000	20	29 Feb.	7	Cagliari, Limited	20	25-27	..	5 3 8
550,000	Stock.	12 Apr.	13½	Commercial, Old Stock . . .	100	267-272	+2	4 19 3
130,000			10½	Do. New do.	100	205-210	..	5 0 0
121,234		28 June	4½	Do. 4½ p. c. Deb. do.	100	120-125	..	3 12 0
557,920	20	14 June	12	Continental Union, Limited	20	44-45	..	5 5 6
242,680	20		12	Do. New '69 & '72	14	39-40	..	5 10 0
200,000	20		9	Do. 7 p. c. Pref.	20	35-37	..	4 17 3
75,000	Stock.	28 Mar.	10	Crystal Palace District . . .	100	205-215	..	4 13 0
234,060	10	27 Jan.	13½	European, Limited	10	25-26	..	5 0 0
120,000	10		13½	Do. New	7½	18-19	+½	5 2 8
354,060	10		13½	Do. do.	5	12-13	+½	5 0 0
5,468,350	Stock.	15 Feb.	13½	Gaslight & Coke, A. Ordinary	100	260-264	+2½	4 18 5
100,000			4	Do. B, 4 p. c. max.	100	98-103	+1	3 17 8
665,000			10	Do. C, D, & E, 10 p. c. Pf.	100	263-268	+3	3 14 7
30,000			5	Do. F, 5 p. c. Pref.	100	127-132	+2	3 15 9
60,000			7½	Do. G, 7½ p. c. do.	100	185-190	+2	3 18 11
1,300,000			7	Do. H, 7 p. c. max.	100	170-175	+2	4 0 0
463,000			10	Do. J, 10 p. c. Pref.	100	261-266	+3	3 15 2
1,061,150		14 June	4	Do. 4 p. c. Deb. Stk.	100	118-121	..	3 6 1
294,850			4½	Do. 4½ p. c. do.	100	125-130	..	3 9 3
650,000			6	Do. 6 p. c. do.	100	175-178	+2	3 7 5
3,600,000	Stock.	11 May.	10	Imperial Continental . . .	100	205-208	+3	4 16 1
75,000		14 June	6	Malta & Mediterranean, Ltd	5	42-52	..	5 14 3
560,000	100	3 Apr.	5	Met. of Melbourne, 5 p. c. Deb.	100	114-116	..	4 6 2
541,920	20	14 June	6	Monte Video, Limited . . .	20	194-204	..	5 17 1
150,000	5	30 May	10	Oriental, Limited	5	92-94	..	5 2 7
60,000	5	28 Mar.	7	Ottoman, Limited	5	6-7	..	5 0 0
People's Gas of Chicago—								
420,000	100	2 May	6	1st Mtg. Bds.	100	104-109	..	5 10 1
500,000	100	1 June	6	2nd Do.	100	92-97	..	6 3 9
100,000	10	26 Apr.	10	San Paulo, Limited	10	154-164	..	6 1 2
500,000	Stock.	29 Feb.	15½	South Metropolitan, A Stock	100	319-324	+4	4 15 8
1,350,000			12	Do. B do.	100	245-250	+2½	4 16 0
141,500			13	Do. C do.	100	255-265	+5	4 18 1
550,000		28 June	5	Do. 5 p. c. Deb. Stk.	100	135-140	..	3 11 5
60,000	5	29 Feb.	11	Tottenham & Edm'ton, Orig.	5	11-13	..	4 4 0
WATER COMPANIES.								
717,467	Stock.	28 June	9	Chelsea, Ordinary	100	250-255	+1	3 10 7
1,720,560	Stock.	12 Apr.	9	East London, Ordinary . . .	100	193-198	+1	3 10 8
700,000	50	14 June	7	Grand Junction.	50	121-126	+½	3 11 5
708,000	Stock.	29 Feb.	10½	Kent	100	267-272	..	3 17 2
1,043,800	100	28 June	9	Lambeth, 10 p. c. max.	100	252-257	+1	3 10 0
400,200	100		7½	Do. 7½ p. c. max.	100	200-205	..	3 13 2
200,000	Stock.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	117-120	..	3 6 8
500,000	100	27 Jan.	12½	New River, New Shares . . .	100	348-353	..	3 8 8
1,000,000	Stock.		4	Do. 4 p. c. Deb. Stk.	100	123-128	..	3 2 6
902,300	Stock.	14 June	6	S'thwk & V'xhall, 10 p. c. max.	100	161-166	+1	3 12 3
126,500	100		6	Do. 7½ p. c. do.	100	151-156	..	3 16 11
1,155,068	Stock.	14 June	10	West Middlesex	100	264-269	..	3 14 4

† Next dividend will be at this rate.

THE QUALITY OF THE LONDON GAS SUPPLY

DURING THE FOUR WEEKS ENDED JULY 17.

[From returns to the Metropolitan Board of Works by Mr. W. J. DIBDIN, F.I.C., F.C.S.]

COMPANIES—DISTRICTS.	ILLUMINATING POWER. (In Standard Sperm Candles.)						SULPHUR. (Grains in 100 Cubic Feet of Gas.)						AMMONIA. (Grains in 100 Cubic Feet of Gas.)					
	Means.						Means.						Means.					
	Maxi- mum.	Mini- mum.	June 26	July 3	July 10	July 17	Maxi- mum.	Mini- mum.	June 26	July 3	July 10	July 17	Maxi- mum.	Mini- mum.	June 26	July 3	July 10	July 17
The Gaslight and Coke Company—																		
Notting Hill	20.1	17.8	18.7	18.8	18.5	18.3	11.5	7.8	8.7	9.5	10.0	9.6	0.5	0.0	0.0	0.2	0.3	0.2
Camden Town	17.1	15.9	16.2	16.3	16.5	16.5	11.9	8.9	10.1	9.9	9.8	10.2	0.4	0.1	0.2	0.2	0.3	0.3
Dalston	16.9	16.2	16.6	16.6	16.6	16.6	15.6	13.1	14.6	14.6	14.3	13.5	0.4	0.2	0.3	0.3	0.3	0.3
Bow	17.5	16.3	16.8	17.1	17.0	16.8	8.7	5.2	7.1	7.2	6.1	6.3	2.8	0.8	1.6	2.2	1.1	1.2
Chelsea (Fulham)	17.1	16.3	16.9	16.9	16.9	16.6	14.0	8.7	9.1	10.2	12.3	13.4	0.4	0.0	0.0	0.1	0.0	0.0
Do. (Nine Elms)	17.1	16.4	16.7	16.9	16.7	16.7	11.3	8.5	8.6	9.0	10.3	9.2	0.6	0.0	0.2	0.6	0.5	0.5
Kingsland Road	18.0	16.5	17.0	17.0	16.7	17.3	14.0	5.5	9.6	11.6	11.3	11.5	0.2	0.0	0.1	0.1	0.1	0.2
Charing Cross (48-inch main)	17.2	15.8	16.3	16.7	16.8	16.6	10.5	7.7	9.6	8.2	9.6	8.7	0.7	0.2	0.3	0.5	0.6	0.5
Do. (district main)	17.2	16.4	16.8	16.8	16.7	17.0	10.9	7.8	9.6	7.9	8.3	9.6	0.7	0.4	0.5	0.6	0.5	0.6
St. John's Wood	17.1	16.4	16.8	16.8	16.7	16.8	11.5	7.4	8.4	9.4	9.2	10.2	0.9	0.1	0.7	0.7	0.5	0.5
Lambeth Road	17.0	16.3	*	16.8	16.5	16.5	12.3	7.8	*	9.0	9.2	9.7	0.6	0.0	*	0.5	0.4	0.4
Westminster (cannel gas) . . .	21.6	20.4	21.0	21.1	21.2	21.0	14.7	8.9	12.1	11.5	10.0	11.1	0.5	0.0	0.2	0.2	0.2	0.1
South Metropolitan Gas Company—																		
Peckham	17.3	16.4	16.6	16.7	16.6	16.7	11.8	6.7	10.0	10.4	9.9	9.7	0.3	0.0	0.0	0.0	0.1	0.1
Tooley Street	17.0	16.2	16.6	16.5	16.5	16.3	10.6	7.6	10.1	9.7	8.7	8.6	0.0	0.0	0.0	0.0	0.0	0.0
Clapham	16.7	16.0	16.5	16.5	16.5	16.4	14.5	10.4	11.7	11.7	13.1	12.2	0.3	0.0	0.0	0.0	0.0	0.0
Lewisham	17.1	16.0	16.7	16.4	16.4	16.2	16.0	8.7	11.2	11.6	13.7	10.7	0.4	0.0	0.2	0.1	0.0	0.0
Blackfriars Road	16.8	16.1	16.4	16.4	16.4	16.3	14.4	8.6	11.8	12.3	11.6	10.3	0.4	0.2	0.3	0.3	0.3	0.3
Commercial Gas Company—																		
Old Ford	17.7	15.9	17.1	16.7	16.4	16.6	11.0	3.2	9.0	8.7	6.3	7.1	0.7	0.4	0.5	0.6	0.6	0.5
St. George's-in-the-East	17.2	16.0	16.7	16.6	16.8	16.6	13.6	6.4	8.9	12.6	9.7	8.0	0.7	0.4	0.6	0.5	0.5	0.5

* Station closed for cleaning.

SULPHURETTED HYDROGEN.—None on any occasion.

PRESSURE.—In excess on all occasions.

Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 17 grains in 100 cubic feet of gas; ammonia not to exceed 4 grains in 100 cubic feet of gas. Pressure between sunset and midnight to be equal to a column of 1 inch of water; between midnight and sunset, 6-10ths of an inch.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

PLEASE ADDRESS IN FULL—

GWYNNE & CO.,ADDRESS FOR TELEGRAMS:
"GWYNNEGRAM LONDON."

HYDRAULIC AND GAS ENGINEERS, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

TELEPHONE No. 2008.

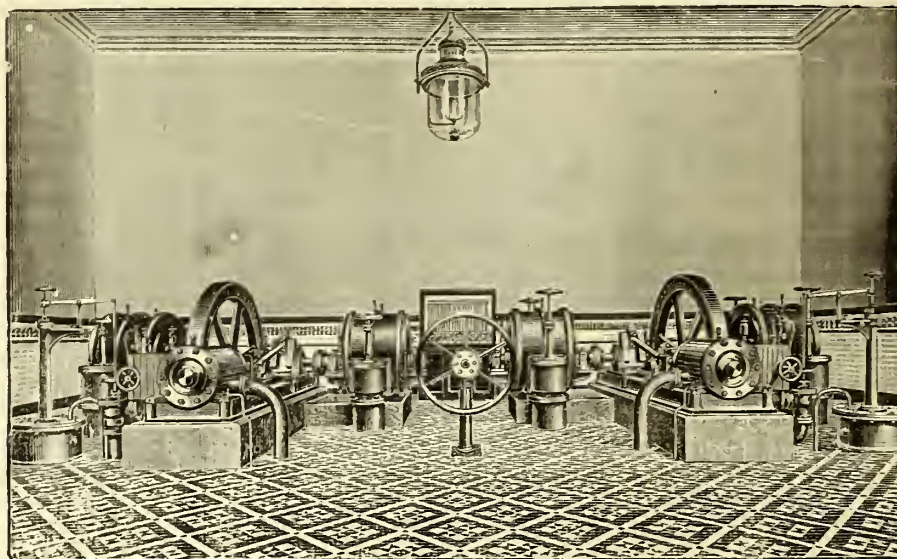
Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co. for Gas Exhausters, &c.

Only Medal at the Liverpool International Exhibition, 1886, for Centrifugal Pumping Engines.

They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality.

The result is that in every instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 24,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.



ONLY 75 REVOLUTIONS PER MINUTE.

The above Engraving shows Two Engines driving Four GWYNNE & CO.'S PATENT NON-FLUCTUATING EXHAUSTERS, to pass 200,000 cubic feet per hour (without the slightest oscillation), at the EFFINGHAM STREET GAS-WORKS, SHEFFIELD.

Can be made, when desired, on their New Patent principle to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

GAS VALVES, VACUUM GOVERNORS, REGULATORS, PUMPS, &c., &c.

Catalogues and Testimonials on application at the above address.

OXIDE OF IRON.

THE Gas Purification and Chemical Company, Limited, advise their friends that their only representatives for the Sale of Oxide are Mr. Andrew Stephenson and such Sub-Agents as may be accredited from the Head Office. They further state that the royalties possessed by them extend over an area of more than 350,000 acres, and are held for a long term of years. They employ their own overseers and labourers, and there are no intermediate profits between them and the consumer.

Address 161 to 163, Palmerston Buildings, Old Broad Street, LONDON, E.C.

JOHN WM. O'NEILL,
Managing Director.

ANDREW STEPHENSON, Agent for the Gas Purification and Chemical Company, Limited, 158, Palmerston Buildings, Old Broad Street, LONDON, E.C.

CANNEL COAL, &c.

JOHN ROMANS & SON, EDINBURGH. Gas Engineers, supply all the most approved SCOTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.

Prices, &c., will be forwarded on application to No. 80, St. Andrew Square, EDINBURGH, } SCOTLAND.
No. 54, BERNARD STREET, LEITH, }

SULPHURIC ACID, B.O.V., for Sulphate of Ammonia Making. Guaranteed clear, of full strength, and to produce a fine white-coloured salt. Delivered in carboys or railway tank waggons.

For prices and terms address BALE, BAKER, and Co., 120 & 121, Newgate Street, LONDON.

CROWTHER BROTHERS solicit a trial of their IMPROVED SYSTEM OF RETORT SETTING. Can guarantee them to heat well, and the bottom Retorts to Carbonize as much Coal as those at the top. Constructed to burn Tar or Coke. Can be altered in a few minutes.

For particulars, write to 384, Mile End Road, LONDON, E.

GAS-WORKS of any magnitude leased, at premiums ranging from 5 to 10 per cent., according to the size of the Works. Gas-Works erected or re-modelled upon the most modern principles.

Address GEORGE WELLER, Gas Engineer, St. Ives Cornwall.

A YOUNG Man (aged 22), the Son of a Gas Manager, will be glad to meet with an appointment as CLERK, COLLECTOR, or MANAGER for Gas-Works at home or abroad.

Good references; and security given.
Address No. 1017, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

A MARRIED Man, 31 years of age, seeks an Engagement as WORKING MANAGER, or the charge of Engines and Exhausters. Now Manager of small works. Can have good testimonials.
Apply to C. P. Mr. Smith, Ratlington Street, Chatham, near Canterbury, Kent.

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RETORT-SETTER Wanted, at once; thoroughly practical.
Apply, stating wages and giving reference, to CROWTHER BROTHERS, 384, Mile End Road, LONDON, E.

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Make only the best quality of FIRE-CLAY RETORTS, BRICKS, TILES, & LUMPS. Also SPECIAL SILICA BRICKS, to stand great heats. All descriptions kept in Stock.

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ALEX. WRIGHT & Co., 55, 55a, and 56, MILLBANK STREET, LONDON, S.W.

[Telegraphic Address: "PRECISION LONDON."] Makers of Wet and Dry Gas-Meters, Station Meters and Governors, Photometers, and Gas-Testing Apparatus, Test Gasholders and Meters, Registering and other Gauges, &c., &c.

* * See Advertisement on Page III. of the Wrapper of last week's issue.

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AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. A'so for Collingwood's Regenerative Retort-Settings.

* * See Advertisement p. 182 of this week's issue. Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

"EXCELSIOR" TAR-BURNER.

TAR worth 30s. per ton for Burning. Come and see and believe, or send for Burners complete, with Instructive and Descriptive Pamphlet, 16s. 6d.

Estimates given for Fixing and Starting, and satisfactory working guaranteed on application to THOS. BURTONSHAW, Gas-Works, CHIPPING NORTON.

WANTED, at once, a Gas Exhauster; capacity, 10,000 or 15,000 feet per hour. Must be in good condition.

Apply to the SECRETARY, Gas-Works, NUNEATON.

WANTED, a Situation by a Practical

GAS-FITTER, as Leading Hand or otherwise. Well up at Index Taking, Stoves, Services, &c. Good references.

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WANTED, for the Rochford Gas Com-

pany (1500 Inhabitants), a Man competent to undertake the duties of WORKING MANAGER. House and firing provided.

Apply, stating age, qualifications, and wages required, to GEO. WOOD, Secretary to the Gas Company, Rochford, Essex.

WANTED, 5000 feet per hour Exhauster

and ENGINE, with 6-inch connecting-pipes. Also Small HORIZONTAL BOILER. Must all be in good working order.

Apply by letter to No. 1636, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WAGGON-TANKS.

WANTED, Second-hand Railway Tank-WAGGONS, in good condition.

Full particulars and prices to the SHARON CHEMICAL COMPANY, DERRY.

TO GAS ENGINEERING FIRMS AND COLLIERY PROPRIETORS.

WANTED, by a Consulting Gas Engineer, the LONDON AGENCY for any good Firm. The Advertiser has a good Gas Connection.

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IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased. 120 and 121, NEWGATE STREET, LONDON, E.C.

TUBES.

FOR Gas, Steam, and Water; Galvanized, White Enamelled, and Hydraulic Tubes and Coils. JOHN SPENCER, Globe Tube Works, WENNESBURY, and 14, Great St. Thomas Apostle, LONDON.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID for making SULPHATE OF AMMONIA of high quality and colour. Highest References and all particulars supplied on application.

OLPHERT'S Natural Oxide of Iron— SUPERIOR IRISH BOG ORE (obtained from the finest estates in Ireland)—is now VERY LARGELY and SUCCESSFULLY USED for Gas Purification.

The sole representative for selling this Oxide is A. C. FRASER (late Gas Engineer at Bolton). Bridgewater Chambers, Brown Street, MANCHESTER.

SULPHURIC ACID.

HUGH WALLACE & CO., Chemical Manufacturers (the old-established firm), supply the above, which is specially adapted for making White Sulphate of Ammonia. The latter purchased in any quantities at highest market prices, or contracts for the year.

For price and terms apply Botolph House, Eastcheap, LONDON, E.C.

BRISTOL UNITED GASLIGHT COMPANY.

THE Directors of the Bristol United Gaslight Company are about to appoint a CHEMIST at each of their Avon Street, Canons' Marsh, and Stapleton Road Works, and invite applications for the appointments.

The candidates selected will be required to devote the whole of their time to the duties of their respective offices, and must be capable of making the usual tests and analyses required in Gas Manufacture.

The commencing salary in each case will be £80 per annum.

Personal canvassing will be a disqualification. Applications with copies of testimonials must be sent in, addressed to the Chairman of the Company, not later than Ten a.m. on Monday, the 30th of July prox.

JAS. V. GREEN, Secretary.
Gaslight Offices, Canons' Marsh, Bristol,
June 21, 1888.

BRISTOL UNITED GASLIGHT COMPANY.

THE Directors of the Bristol United Gaslight Company are about to appoint two RESIDENT GAS ENGINEERS, to take charge of their Avon Street and Stapleton Road Works respectively, and invite applications for the appointments.

The candidates selected will be required to reside on the premises—where free House with Gas, Coal, and Water will be provided—and to devote the whole of their time to the duties of their respective offices. They must have had a thoroughly practical training, and be conversant with Gas Engineering in all its branches.

The salary in each case will be £300 per annum. Personal canvassing will be a disqualification.

Applications with copies of testimonials must be sent in, addressed to the Chairman of the Company, not later than Ten a.m. on Monday, the 30th of July prox.

JAS. V. GREEN, Secretary.
Gaslight Offices, Canons' Marsh, Bristol,
June 21, 1888.

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NOTICE TO SUBSCRIBERS
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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JULY 31, 1888.

GASHOLDERS WITHOUT GUIDE-FRAMING.

THE account which will be found in another column, of the raising of a three-lift gasholder at the Rotherhithe station of the South Metropolitan Gas Company, without extension of the guide-framing beyond the height of the second lift, is a noteworthy evidence of a striking advance in gasholder construction. The question of the possibility of dispensing with the upper portion of the guide-framing of gasholders has been discussed in the columns of the JOURNAL upon numerous

occasions, and formed the subject of a paper read before The Gas Institute at Glasgow last year; but it is only natural that the minds of the practical men who are fond of declaring that "an ounce of fact is worth a pound of theory" should be struck with this Rotherhithe experiment, as they never would be by any number of papers and articles in engineering publications. We shall not be far wrong, therefore, in assuming that the news of the successful inflation of this—according to old ideas on the subject—imperfectly framed holder, will bring the matter forward again in the thoughts of gas engineers with a freshness and force that could not be imparted to it by any other means. Mr. George Livesey deserves to be congratulated on the success of his bold experiment, which, it is not too much to say, no other man would have attempted upon such a large scale. It is one thing to profess acceptance of a theorem in applied mathematics, when the result is merely stated in a technical communication to a professional society, or to confess that there "may be something" in a well-written article stating novel views of a matter of engineering practice that has always been treated in some traditional fashion. It is an altogether different affair to carry out one's convictions by sending up a 150-foot gasholder into the air without that support which tradition would declare to be necessary to prevent overturning. In the informal conversational discussion that followed the reading of Mr. Webber's paper at Glasgow, and in which, as is usual, men's real opinions were more candidly confessed than in the formal debate, a remark commonly made was: "It may be all right to guide a gasholder from the bottom instead of in the ordinary way, but I should like to see it tried by somebody else first." This is a cheap kind of criticism which is worth nothing; and, fortunately for gas engineering, it is a kind of criticism that has never been favoured by Mr. Livesey. He has now added one more to the proofs of daring originality which he has shown during his career. It cannot but be regarded as deplorable that, while the most authoritative discussion of this particular point in gasholder construction took place at last year's Gas Institute meeting, the members will not have an opportunity for considering the practical proof of the principles there advanced, since Mr. Livesey has now withdrawn from the Institute, and nobody will remain to explain his work.

It will be advisable to recapitulate a little, in order that the full significance of this Rotherhithe experiment may be realized. Up to last year it was generally accepted that the overturning force of the wind, exerted against a gasholder from one direction, tended to push the holder along a horizontal plane, and could be equally divided among the number of guide-rollers brought into play, irrespective of whether these happened to be on the bottom, middle, or top of the holder. This is, briefly stated, the old theory of gasholder stability. Such was the view taken by Mr. Corbet Woodall last year, when discussing Mr. Webber's paper. He said that "the pressure would be evenly divided between the top and bottom rollers on the leeward side. . . . He maintained that beyond doubt the effect of a strong wind upon a holder, . . . if guided in the ordinary manner, would be to "push it upright against the leeward guides." Mr. Hunt prudently decided to await the issue of the projected Rotherhithe experiment before declaring himself; and Mr. Foulis thought that wind does push a holder along a horizontal plane, and spoke of a holder as "fairly resting upon both top and bottom guides." If, however, a holder does so rest upon top guides, what would happen when this support is taken away? By the old theory, destruction through overturning; by the new, nothing at all. The Rotherhithe example answers this question conclusively.

Thus it will be seen that the new departure is a radical one, and contradicts the fundamental assumption of the old theory. The theory must accordingly be reconstructed; and in what direction if not in that already indicated? The extent to which gasholder guide-framing can be cut down becomes, therefore, a question of degree; and the best way to settle the problem in its new phase is by direct experiment. The opportunity may perhaps be presented in connection with demolition; if not with construction. It would not be much trouble, when a holder is to be broken up, to ascertain the minimum conditions of its stability by progressively removing the guide-framing first. The chief objection to this proposal is that when holders come to be demolished they are generally so old and rickety that no useful purpose could be served by experimenting with them. Yet there may be occasions—as when a small holder in good condition is removed to make room for a larger one—when an experiment of this

order could be satisfactorily instituted. It would be necessary, of course, in such a case, to start with a proper understanding of what is desired to be learnt by the experiment, and then to carry it out in a proper manner.

It is remarkable, in connection with the Rotherhithe experiment, that the behaviour of the holder was not affected in any way by the wind. It has been assumed, in all discussions of this subject, that the wind is the principal overturning agent that must be reckoned with. This example shows, however, that the wind has ordinarily little or no effect on the elements of stability of a gasholder. In a great storm, of course, the case would be different; but it would perhaps not be an exaggeration to say that a holder that is stable in fine weather would be stable in a storm. We do not speak here of the effect of weaknesses of materials (which might be developed with disastrous results during the extra strain of a gale), but of the ordinary statical conditions of a holder, regarded as an unstable vessel maintained in equilibrium by external supports. If it will stand by these means in fine weather, it will stand in any weather, because the influence of its own weight and form in creating instability is greater than anything the wind can bring to bear. Wind is a casual and irregular overturning force; but a gasholder always contains in its constitution the strongest influences working for its own destruction. Wind or no wind, a gasholder will fall if not sufficiently supported. The problem now is to show how the needful support may be most economically and efficiently supplied. The Rotherhithe holder works without top supports: How much else could be safely dispensed with?

THE MEETING OF THE NORTH BRITISH GAS MANAGERS' ASSOCIATION.

The North British Association of Gas Managers met in Glasgow last week, under the presidency of Mr. David Terrace, who delivered a sensible, unpretentious address. Mr. Terrace is greatly in favour of regenerator firing for gas-retorts, to which he rightly ascribes high effectiveness in the matter of increasing output without extending retort-bench area. There can be no doubt that in many places the adoption of this system has increased the productiveness of retort-houses by 50 per cent. and upwards—an important consideration, especially in crowded neighbourhoods and wherever land is not readily obtainable. Mr. Terrace made some wise remarks on the subject of the comparative values of gases of different illuminating power, especially when oil gas is compared with coal gas; and also on consumers' burners, to which he has apparently devoted a considerable amount of study. The most important paper submitted to the meeting was Mr. Geo. R. Hislop's report upon the best standard burner for Scotch gas. Mr. Hislop has taken great pains with his subject, and has succeeded in producing a statement of lasting interest. Starting from the datum that the union-jet burner is the standard for photo-metrically testing Scotch cannel gas, with a regulation pressure of 5-10ths at the point of combustion, Mr. Hislop hit upon the notion that a great deal depends upon the angle at which the convergent holes of these burners are drilled. The details of his experiments, as given in his paper, are sufficient testimony that he was on the right track in this research. He claims to have discovered that, while a burner of this description may fulfil the requirements of the law, it will not give a satisfactory flame with the holes drilled at the usual angle, unless the gas is consumed at a pressure far below that specified in most Acts of Parliament. He establishes the important generality that the richer the gas the greater must be the angle between the convergent jets. Beginning at the very bottom of the scale with the poorest imaginable gas—say, 5 candles per 5 cubic feet per hour—a round jet would be the best for burning it; and this flame would be produced by two parallel jets placed side by side. For every higher quality of gas recognized by gas makers, the two holes should converge more and more, until with gas of about 32½ candles they would stand at an angle of 45°, which would at the legal pressure give a flame 3½ inches wide and 3¼ inches high. Mr. Hislop deserves the thanks of all who are interested in the practical problem of gas consumption for his masterly statement of the secret of the construction of union-jet burners. He has certainly worthily discharged the obligation placed upon him by the Association to discover the best standard burner for Scotch gas; and it may be expected that union-jet burners drilled to different angles, and marked for the quality of gas for which they are best fitted, will henceforth become stock articles of trade. It is seldom one sees an inquiry sent to a Committee answered so promptly and fairly as this has been by Mr. Hislop. It

should be remarked that his North British colleagues have signified their appreciation of Mr. Hislop by making him their President for the third time; and that next year's meeting is to be held at Dunfermline.

THE AFFAIRS OF THE MANCHESTER CORPORATION GAS DEPARTMENT.

The accounts of the Manchester Corporation Gas Department for the year ending March 31 last are to be presented to the Town Council to-morrow, with the usual report of the Committee on their administration of the undertaking and its returns for the year ending March 31 last. In their report, which will be found elsewhere, the Committee claim that from the 293,348 tons of coal and cannel carbonized they have obtained an average production of 10,383 cubic feet of 19·96 candle gas per ton. If this is a reliable statement—that is to say, if the average is a fair one—this is very good working. The Committee draw attention to the improvement in carbonizing results as compared with previous years, which they ascribe to the introduction of better appliances in the works. The consumption of gas in the district served by the Corporation mains is almost stationary, however; the increase for the year having been only 0·85 per cent. With regard to profit, it is stated that after writing off £33,623 for depreciation, there remains a balance of £106,072. Out of this come the charge for interest, £29,832; wages and repairs for street lighting, £8528; sinking fund, £26,454; and £23,331 paid into the city treasury during the year. These payments leave a balance of £17,925, which has been applied to the reduction of the adverse balance of the profit and loss account for the past two or three years. There is in these facts plenty of matter for warm debate at the Council meeting. A strong appeal will be made for a substantial reduction in the price of gas; and another will in all probability be preferred for an increased subsidy in aid of the city funds. It is unnecessary to say to which cause we incline. The consumers of Manchester gas have suffered long, and surely they are entitled to some relief at last. When we commented upon the preceding report of the Manchester Corporation Gas Committee, we were constrained to animadvert somewhat strongly upon the terms of the report of the Official Gas Examiner, Mr. John Leigh, the Medical Officer of Health for the city. This year Mr. Leigh has been a little more explicit, and has wisely dropped his former practice of apologizing for the shortcomings of the Committee. He states that sulphuretted hydrogen was present in the city gas on 18 days. What would the Corporation have said if this dirty gas had been sent out by a Company? Carbonic acid to the amount of rather under 3 per cent. was nominally present in the gas—thus robbing the consumers of some thousands of pounds' worth of illuminating power; and the average dose of sulphur was 37·34 grains per 100 cubic feet. There is in all this nothing very creditable to the Manchester Corporation Gas Committee. Selling bad gas is not, unfortunately, the only questionable custom into which this representative Gas-Works Committee have fallen. Their revenue account for the year sets out in detail the salaries paid to their officers, from the Superintendent and the principal Station Manager down to the clerks in the various departments. We say nothing at present of the totally inadequate remuneration paid to the men who are mainly responsible for the profitable working of the undertaking; but what is to be thought of the administrators of a gas undertaking with a revenue of £442,362 a year, who pay their Chief Bookkeeper the magnificent sum of £200 a year, and their Chief Cashier the same? The Chief Rental Clerk gets no less than £170 year; the best-paid receiver of rentals in the office earns £140 a year. Not one of the collectors succeeds in touching £300 a year. What a striking example is this of Manchester of the benefits accruing from the Corporation management of gas undertakings! The Manchester Corporation have had their own gas-works longer than any other English local authority; and to-day the gas is dear and bad, niggardliness rules the administration, while scores of thousands of pounds have been squeezed out of the profits of the undertaking to be squandered in public improvements that nobody wants. To study the Manchester Corporation through all their capacities, from gas makers to hotel builders, is to receive a startling lesson in the practices of Reformed Bumbledom.

MR. L. T. WRIGHT'S LECTURES ON GAS MANUFACTURE.

The four lectures on the "Manufacture of Coal Gas," just delivered by Mr. Lewis T. Wright, at the City and Guilds of London Institute, will be found reported in the last and present issues of the JOURNAL. It is impossible, when taking

note of these aids to the study of gas manufacture, for which learners of the art are so much indebted to Mr. Wright, to refrain from an expression of regret that the accomplished author is going to voluntarily put himself out of the way of such work for some time to come. The course of lectures now under notice constitutes a complement to those delivered under the same auspices by Mr. Wright last year; and both courses follow the same lines. The first topic to which Mr. Wright directed the attention of his audience was coal; and he treated this branch of the subject in a style at once interesting and instructive. The lecturer took occasion to express his conviction that the physical formation of coal deposits is due to the agency of water currents. In dealing with carbonization, Mr. Wright stated as a novel observation that in practical working, when retorts are charged at different periods, so as to mix in the hydraulic main the yields of gas at various times after charging, the illuminating power of the whole product is higher than it would be if the retorts were all charged at the same time. In his second lecture, Mr. Wright said a good word for the carbon deposit found in clay retorts, which he does not believe represents so much loss of valuable hydrocarbons to the gas maker as is commonly supposed; and he also brought out prominently the importance of temperature in connection with washing ammonia out of gas. The third lecture was principally devoted to the subject of purification, which was dealt with in a more lucid manner than is to be met with in the ordinary text-books. Throughout his course, Mr. Wright kept in view the desirability of expounding principles and giving reasons; and he accordingly succeeded in making his teaching truly elementary in the highest meaning of the word. If his hearers were not carried beyond the contemplation of processes into an understanding of the underlying reasons, it was not the lecturer's fault. Mr. Wright has provided an admirable pattern for other lecturers who may come after him; and those students who have attended his course must be dull indeed if they do not show, in their examination-papers, the benefit of the superior advantages they have enjoyed as compared with others not so well situated.

COKE SALES.

Those who are interested in the question of coke sales will do well to read with particular attention the remarks on this subject made by Mr. H. M'L. Backler at the recent general meeting of the European Gas Company, reported in our last issue. Mr. Backler had evidently read and reflected upon the references to this matter which have lately appeared in the JOURNAL; and his statement may be regarded as his contribution towards the elucidation of the mystery of the present scarcity of coke, based upon a lengthened experience of coke-selling in many countries. It is worthy of notice that what is true with respect to the state of the English coke market is true of all the markets supplied by the European Gas Company. At all the Company's stations, there has been a good demand for this residual, so that the stocks were almost exhausted at the date when the accounts for the working year were made up. Mr. Backler stated that "within his long experience of the Company, it has several times occurred that stocks had been exhausted in this way; and when such had been the case, and the time of trial had passed away, he had observed in several instances that the increased price had been maintained, sometimes for several years." The reason given was that the "circumstances which enabled them to raise the price of coke operated some time after the trying season has passed away—that was to say, people grew accustomed to the use of coke as fuel, and they continued to use it when the price was no longer a temptation compared with other fuel." Upon further inquiry at various English gas-works where considerable quantities of coke are produced, we learn also that most of the increased demand which has kept down the stocks comes from consumers who send for it by their own carts—that is to say, it is wanted for steam-raising and other industrial purposes. This is said to be specially true in London; whence the satisfactory inference is drawn that the movement for supplanting coal by coke is gaining ground. How much of the increased demand for coke for factory uses is due to a better appreciation of its fuel value, and whether it is traceable in any noteworthy degree to the progress of the smoke abatement movement, cannot be known. It is quite possible that an increased activity of the authorities charged with the execution of the Smoke Prevention Acts may have something to do with the result; but the fact remains, and it can only be hoped that Mr. Backler's views as to permanence of an expanded demand for coke may prove well founded.

Water and Sanitary Affairs.

THE action brought against Mr. T. Hawksley, a report of which appears elsewhere, illustrates once again the difficulty of two persons looking at the same matter from a similar point of view. Mr. Burstal, the plaintiff evidently believed that it was intended he should share Mr. Hawksley's commission for superintending the construction of the new water-filtration works at Oxford. Mr. Hawksley, on the other hand, was even more strongly persuaded that nothing had been said or done to justify such a claim against him. His Counsel hinted, and with good ground, that Mr. Hawksley's position was such that a few hundred pounds would not matter to him one way or the other. He fought the case on principle; and for aught we know, although the verdict has been given against him, steps may even yet be taken to obtain the opinion of another tribunal. Certainly there was a good deal to be said on both sides. The minutes of the Oxford Corporation told somewhat in the plaintiff's favour; and the claim was further supported by the testimony of various gentlemen connected with that local body. But, when all was said, it still remained necessary to deduce the facts from conflicting evidence. The bargain which the plaintiff set up was based upon a constructive rather than a direct agreement. The arrangement on which Mr. Burstal acted, and which his friends in the Corporation seemed to have sanctioned, is not of a usual character. Mr. Charles Hawksley, who was called as a witness for the defence, and who has been his father's partner for the last twenty years, stated that the alleged agreement was distinctly contrary to professional usage in such matters; and, apparently, this statement was accepted as correct by the plaintiff's advisers. At all events it was not challenged in cross-examination. Speaking generally, it will be allowed that the functions of resident engineers and consulting engineers are by no means the same. Each should be paid for his services, but not necessarily in the same way. If the resident engineer receives a salary for the work he performs all the year round, there can, in our judgment, be no need that he should be paid, and no propriety in his receiving, a commission, which is the accepted method of remunerating a specialist, whose services are only required for the purposes of some particular undertaking. Originally the Oxford Corporation nominated Mr. Hawksley and Mr. Burstal to act as Joint Engineers for the works in question. To this Mr. Hawksley pointedly objected; and the minutes were modified. The truth seems to be that there was a prevailing desire on the part of the Corporation that Mr. Burstal should, in one way or another, obtain a share of the commission. Mr. Burstal believed that he should get it; but Mr. Hawksley denies that he assented to any such arrangement. Yet, strangely enough, though it is shown that he objected to be treated as a Joint Engineer, the jury have found that the defendant must, in reality, have contemplated acting on this footing; for how otherwise could it be held that he had agreed to divide the commission? The whole matter is unfortunate and disagreeable. But the trial may serve a good purpose in rendering people more cautious and precise when similar questions arise for consideration and adjustment.

MR. GEORGE LIVESEY AND THE GAS INSTITUTE.—We have received the following from Mr. G. Livesey, and are asked by the writer to state that, as it is the sequel to the communication which appeared in the JOURNAL for July 12 last year, he is desirous that it should receive similar publication:—

[COPY.]

5, Camden Park, Tunbridge Wells, July 24, 1888.

W. H. Bennett, Esq., Secretary, The Gas Institute.

DEAR SIR,—My letter of Friday last, the 20th inst., informed you that the time for carrying out my determination to resign if Mr. Bray remained a member, had arrived. The formal notice was delayed for a reason that no longer exists. I therefore now resign my seat on the Council, and withdraw from membership of The Gas Institute; and have to request that you will make the necessary arrangements for relieving me of the position of Trustee.

It is with great regret that I sever myself from the Institute after a very pleasant connection of nearly a quarter of a century, during which I have made the acquaintance, and I hope I may say the friendship, of so many worthy men engaged in the gas industry. But Mr. Bray's conduct has been, and continues, of such a character that I can take no other course than that indicated immediately after the meeting at Glasgow, from which I have never wavered—that with Mr. Bray as a member I cannot remain in his company in the Institute.

I can never forget the many acts of kindness, and the honours done to me by the members; and I trust that, notwithstanding this official severance, the old kindly feeling may long continue.

Yours faithfully,

GEORGE LIVESEY.

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(FOR STOCK AND SHARE LIST, see p. 218.)

THE course of business on the Stock Exchange during the past week has been rather unsteady. The tendency at first was all upwards; the general outlook, political and otherwise, being in favour of peace and prosperity. A slight reaction set in about the middle of the week; some of the markets lacking support. The tendency, however, was again favourable at the close. With the advent of August, business will probably become much more restricted; and the markets will show less animation. Money is easier. In the Gas Department, business has been quite up to average. The feature of the week has been the relapse of Gaslight "A," which, after touching 263 the week before, fell away till, on Friday, it marked 256½. This is really a low price; and we think an immediate improvement may be looked for. At the present quotation, the stock may be purchased to pay a clear 5 per cent., with a dividend of £6 10s. payable in a month. All other variations in price are upward. Gaslight 4 per cent. debentures are higher. A large parcel of this stock was sold at the Mart on Wednesday at about 119½; but on Saturday it was done in the market at 121. South Metropolitan have been quiet, at good firm prices. There has been more demand for Commercial; and the old stock marks another slight advance. Of the Foreign Companies, Imperial Continental has been fairly active and very steady. Some of the minor undertakings have improved. The second mortgage of Chicago has advanced 3; and Monte Video and San Paulo are each ½ better. Among the Water Companies, Lambeth has been the most active; but in none has business been more than moderate. Several, however, continue to make the small movements upward which we noted last week. New River pays the now invariable dividend of £6 1s. 3d. for the half year. The daily operations were: Good business in Gas on Monday; many issues being dealt in at steady prices throughout. Commercial old advanced 1; and Monte Video and San Paulo, ½ each. Water was quiet and unchanged. Gas was much less active on Tuesday; few issues being touched. Gaslight "A" was not done at all; and the quotation began its fall by dropping 1. Prices of all others were steady. Water was an absolute blank. Wednesday was another quiet day for gas. South Metropolitan "A" was done as high as 323; but quotations did not move. One or two Water stocks changed hands, at good prices. Thursday would have made little business in Gas, but for the set against Gaslight "A," which dropped 3. Everything else was quiet and unchanged. Water was strong; Kent advancing 2, and East London, Grand Junction, New River, and Lambeth 10 per cents., 1 each. Friday opened very heavy for Gaslight "A;" but it went no worse, and the closing mark was the best of the day. Very little else was dealt in, and business altogether was moderate. Several Water issues were done at good average figures. On Saturday, Gaslight "A" was steady at the previous day's figures. The 4 per cent. debentures rose 1. All else remained quiet and unchanged. A single transaction in Lambeth 10 per cents. comprised the business in Water; and all quotations were without variation.

ELECTRIC LIGHTING MEMORANDA.

PROSPECTIVE REVIVAL OF ELECTRICAL SPECULATION—EFFECTS OF THE RECENT JUDGMENT IN THE EDISON PATENT CASE—ELECTRIC LIGHTING OF THE ADELPHI THEATRE—THE POWER OF ELECTRICITY TO PRODUCE A VACUUM.

THE revival of projects for electric lighting ventures, in consequence of the recent alterations of the law, to which we have drawn attention in this column for several weeks past, has attracted the notice of the financial press; and it is to be gathered that an attempt will be made to repeat the speculative developments of six or seven years ago. Prophecies are being freely uttered that, in consequence of the great development which electrical science has made during the past few years, new electric lighting companies may now, with good management, do a very profitable business in any of our large towns. Great stress is laid upon the assertion that many of the electric lighting companies of the United States are paying large dividends. A New York Company, "operating under difficulties at least as great as would have to be encountered in London, earns easily 12 per cent. on its capital. The City of Cincinnati shows an annual profit of 20 per cent.; while some second or third rate towns in the State of Pennsylvania pay from 12 to 22 per cent." This is precisely the kind of vague flourish with which the speculator waves his bait before the eyes of the man who, with a little money lying idle at his bankers, is constantly on the look-out for a profitable investment. The difference between the cost of gas in the United States and in England is either ignored or belittled as a consideration of no real moment. The *Financial News* recently published an article of this kind, with the object of advertising the South Metropolitan Electric Lighting Company, who, as we have already announced, are endeavouring to obtain a Provisional Order to enable them to commence business in a West-end district. It is reported that this concern has two schemes in hand at present—one for a lighting station at Whitehall, which is to be ready by October, and the other for an installation in Lincoln's Inn Fields. Some good names are associated in this enterprise, and much interest will be felt in its fortunes. Newspaper writers may prophesy as they will; but while we do not deny that a fair amount of business in lighting *de luxe* may await the first well-

managed West-end Electric Lighting Company that can reap it, it is very certain that gas at London prices will be a hard nut for the most skilful electricians to crack.

The electrical journals continue to occupy themselves with discussions as to the effects of the recent decision of Mr. Justice Kay with reference to the Edison and Chesebrough patents. It is concluded that the maintenance of the latter patent for "flashing" carbon filaments in an atmosphere of hydrocarbon vapour will practically keep the monopoly of low-priced and reliable lamps in the hands of the Edison and Swan Company, because, although good lamps can be made without flashing, it is such a very convenient process, that it has considerable economical recommendations. Meanwhile, now that attention has been concentrated upon the Chesebrough patent, rumours are circulated to the effect that it was anticipated by somebody else. It can be very well understood that one result of such a judgment as that of Mr. Justice Kay in the case under notice would be the careful overhauling of all records bearing, however remotely, upon the question at issue; and there is no knowing what may turn up to reward careful search. It used to be said that Truth hid herself in a well; and this was regarded as a strong metaphor illustrative of the difficulty of getting at her. The old-fashioned dug-out well was meant when the metaphor was originally hit upon, when also patent litigation was unknown. It is fortunate, for the sake of the metaphor, that, thanks to the diamond drill, the depth of wells now-a-days keeps pace with the profundity of the search for Truth in connection with a patent case in the Chancery Division.

The Adelphi theatre in London is one of the latest examples of isolated electric lighting; the work having been just finished by the Edison-Swan Company. It is a rather large job—comprising about 1500 lights in all; and there is some novelty in lighting the auditorium by means of eight incandescent lamps, each of 200 candle power, suspended from the middle of the dome. Shadows are obviated by ornamental bracket lights in front of the tiers of boxes; and there are single lamps where required. Elaborate provision has been made for the production of scenic effects. The engine-room is in the basement of a house in a court adjacent to the theatre; the plant consisting of three 156-horse power Babcock and Wilcox water-tube boilers, working at a pressure of 140 lbs., and four Willans compound high-speed engines—two of 75, and two of 180 horse power, coupled direct to four Edison-Hopkinson dynamos. It will be observed that this is a large plant for the lighting of one theatre; but it appears to be intended to extend the lighting to an adjoining restaurant, and to as many other buildings in the neighbourhood as can be supplied. Of course, the installation has been worked out in the most superior manner; and the proprietors contemplate being able, "in the course of a few weeks, to entirely dispense with the gas service throughout the theatre, as far as lighting is concerned." Wherefore we shall not be surprised at any time to hear that the new light has gone out at an awkward moment. Like the other electrically lighted theatres of London, the Adelphi will probably continue on the books of the Gas Company.

For a long time past the announcement has been made that an experiment would be set on foot with the object of practically solving the question whether the trains on the Metropolitan Railway—called by London cabmen "the sewer"—can be drawn by electric motors instead of steam locomotives. It has now been explained that the delay in fulfilling this promise has arisen from the necessity of providing a substitute for the vacuum brake fitted to all trains on this railway, and without which, or something equally reliable, the Board of Trade will not permit the line to be worked. Lord Bury, the Chairman of the Electrical Company which is supposed to have the business in hand, has written to the Directors of the Railway Company, with a view to publication, a letter in which he says his people have been in treaty with the Vacuum Brake Company to devise some way of working these brakes without steam. Upon this announcement the *Electrical Review* is unkind enough to remark that the vacuum which the electrical locomotive in question will make will be in the coffers of its creators. Unfortunately, electrical companies have displayed only too great facility in the production of this kind of vacuum.

THE COMPULSORY ELECTRIC LIGHTING OF THEATRES IN MADRID.—The Madrid Correspondent of *Industries* states that, in connection with the compulsory electric lighting of theatres, the Government have declined to grant any extension of time. No theatre will be allowed to re-open in the forthcoming autumn unless the order has been complied with. Most of the theatres have already made arrangements for their installations.

THE SALFORD CORPORATION AND THE GAS INSTITUTE.—The following resolution, notice of which has been given by Mr. Mandley, is set down for consideration at the meeting of the Salford Town Council to-morrow:—"That, in view of the positive and apparently incontrovertible assertion made by Mr. George Bray, C.E., in his pamphlet entitled 'Corrupt Practices in the Gas Industry,' namely, 'that corruption in the gas industry has been largely fostered by the policy pursued by the Council of The Gas Institute,' no further subscription be paid, nor any other support whatever be afforded by or on behalf of this Corporation, to The Gas Institute; and that it be a standing instruction to the Gas Committee that they shall, whenever occasion arises, express their strong disapproval of membership of the said Institute being entered into or maintained by any of their officials."

A GASHOLDER WITH PARTIAL GUIDE-FRAMING.

ON Wednesday last a highly interesting and important experiment in structural gas engineering was successfully carried out at the Rotherhithe Station of the South Metropolitan Gas Company, when in the presence of Mr. George Livesey, Chairman of the Company, Mr. Frank Livesey, Chief Engineer, and Messrs. John Somerville and A. F. Browne, of the Company's engineering staff, a three-lift gasholder, of which the guide framing only extended to the height of the second or intermediate lift, was for the first time inflated to its full height. The problem discussed on various occasions by Mr. G. Livesey, Mr. V. Wyatt, Mr. W. H. Y. Webber, and in the valuable series of "Communicated Articles" upon the stability of gasholders which appeared in the last two volumes of the JOURNAL, has therefore received its first practical solution; and from henceforward the most conservative of gasholder builders must confess that the principles of this particular branch of gas engineering have received a fresh development. Members of The Gas Institute and others who have followed the technical transactions of that body at Glasgow last year, will remember that mention was then made, in connection with Mr. Webber's paper on "The Guide-Framing of Gasholders," of this proposed experiment at Rotherhithe. We have kept the matter in view ever since; having been determined, with Mr. Livesey's permission, to report the result of the test, whatever it might be, so that there should not be any misapprehension concerning the effect of such a grave departure from custom. It is with particular pleasure that we are now able to signalize the triumph of the new principle. The theoretical discussions of this question have had the most satisfactory of all possible sequels; and we are gratified to-day in being able to congratulate together those engineers who paved the way for, as well as those who have carried out this most striking of modern developments of gas engineering construction.

The conditions of the Rotherhithe experiment require to be explained in detail. The holder selected for the test was a not very modern double-lift one, 150 feet in diameter, with 25-foot lifts, in a wrought-iron tank only half-sunk in the ground. The site is very close to the River Thames; and the subsoil is full of water. The fact of the tank being constructed of such comparatively yielding material as wrought-iron plates standing to a height of 12 feet clear above the ground, was not favourable to the execution of the scheme, which depends for success upon the existence of a high degree of rigidity and strength in the bottom guiding arrangements. In this case the essential rigidity was absent. The 12 feet of tank plating above ground was not even supported against the guide-columns; and the top edge of the tank was finished off with an absurdly light channel-iron curb, put on apparently more to prevent the look of a "raw edge" to the plating than with any idea that strength was desirable to keep the circle true at this point. The guide-framing for the holder consists of massive cast-iron columns of the old regulation Doric pattern, with a high rectangular base, standing on heavy blocks of Bramley Fall stone. The guide-channels, which start from the top of the tank, are of H-iron, connected to the columns by the usual cast-iron chairs, originally about 5 feet apart. There were no diagonal braces; but there was one tier of lattice girders half way up, and another at the top of the columns. It was all very massive-looking—quite a typical old-fashioned substantial piece of work; very heavy, very expensive, and supposed to be very strong. It should be stated that the crown of the inner lift was very heavily framed, in a style that will be understood when it is remarked that the main tie-rods are 2½ inches in diameter. Altogether, this lift has to carry up and down with it every time it rises and falls about 80 tons of superfluous metal; and is accordingly by so much more top-heavy than it need be. This is perhaps all the better for the purpose of the experiment, because it may be said that if an old-fashioned top-heavy structure such as this can be sent up and down without guide-framing, there need be no fear of attaining similar success with more favourable specimens.

As might have been supposed, when this solid, respectable piece of work (which cost the now extinct Surrey Consumers' Gas Company a pretty penny at the time it was built, now some one-and-twenty years ago), came to be examined critically, with a view to the proposed addition of another lift, its apparent strength considerably dwindled. To begin with, it was possible for a man sitting on the grip of the outer lift, when grounded, to spring with his feet the top of the tank at any point of the circle. The bottom curb of the outer lift, upon which, according to the new theory so much depends, was anything but so strong as was desirable; and the bottom rollers, carriages, and guides were likewise inferior in strength. The work was reinforced, however, as thoroughly as circumstances permitted; no great expense being incurred for the purpose. A horizontal plate, forming a flat girder, was fixed upon the top curb of the tank, which was thus prevented from springing when the bottom rollers should come into play. There was a tank guide on each side of the position of every column, and about 5 feet from it. These guides originally stood out from the tank plates, being bolted against distance-pieces or washers. They were filled in solid with concrete between the guide and the tank plating; and, in addition, raking struts were bolted outside the tank between the line of the guides and the columns. The space between the tank plating and the columns was also filled in solid with concrete. The effect of these measures was to bind the tank and its guides to the columns in a very much more rigid manner than was previously the case. Strong flat diagonal bracings were also provided between the columns; and tangential rollers were added to the middle and lower lifts. The chairs connecting the column guides to the columns were doubled

in number by the insertion of intermediate ones. The result of these reinforcements was to improve the working of the holder even before any attempt was made to employ the additional third lift. It had originally listed as much as 5 inches in one direction; but the increased rigidity of the tank, and the consequent greater resistance of the tank guides, diminished this by two-thirds. Even thus, however, it seemed like a straining of the new theory to apply it to a holder that was known to have a permanent list of two or three inches. If it was so much out of the perpendicular *with* guide-framing, what would the inner lift be *without* this safeguard?

Notwithstanding this cause for disquietude, the preparations for dispensing with the guide-framing for the top lift of the enlarged holder were pushed on. The radial rollers and goose-necks of the top lifts were retained; but the last length of the column guides, at the level of the tops of the columns, was bent outward with a circular curve, so as to permit of the easy disengagement and re-engagement of the rollers upon ascending and descending. This is all that a curious observer can see when the holder is empty, or only partly full, to distinguish the guide-framing from that of any other gasholder; and it is nothing very extraordinary to look at. The guide-framing is simply that of an ordinary double-lift holder; and nobody who should see it from a distance when not fully inflated would suspect it of being anything different. We make a point of this, in order to show that there was nothing elaborate or noticeable in the preparations for the experiment.

Everything was ready last Wednesday morning for the crucial test of the holder's ability to work without guide-framing for the last third of its height. When the chief officials of the Company arrived on the scene, the holder was two-thirds full, and the top guide-carriages were even then clear of the guides by a space quite sufficient to prove the stability of the holder under the novel conditions, for it was *not supported in any way above the rollers on the grip of the middle lift*. To this extent the holder has been regularly worked all through the past winter; and therefore the success of the principle may be said to have been assured long ago. But, for a variety of reasons, the final test of raising the holder to its full capacity was not attempted until last week. A few minutes before half-past ten everything was ready, and the order was given to proceed. Rivet after rivet slowly rose out of the tank, when a discharge of water from the cups indicated that the holder was taking fresh bearings, and the exhaustor was temporarily stopped while the various water-levels were verified. The engine was then re-started; and the holder rose uninterruptedly, with a steady gauge, until 12.30, when it was reported full. It then presented a remarkable spectacle—the top carriages and rollers stretching out in the air far above the guide-columns; but the height above the ground took off the awkward look, that might be supposed in the circumstances, of the holder "stretching out its arms helplessly in the air, as though seeking for support and finding none." Indeed, the spectators of the curious sight remarked that it looked less odd than might naturally have been expected. When full, the holder showed itself to be about 2½ inches out of the level, which was less than was usual with the double-lift before it was improved in the manner stated. Latterly, however, the two lifts have worked with a list of only 1 to 1½ inches; so that the abandonment of the guide-framing for the top lift apparently increased the list by rather more than an inch. It was found on examination, however, that the rollers on the intermediate and lower lifts required adjustment; and this is to be attended to forthwith, when it is expected that the apparent excess of list will be corrected. Owing to the weakness of the bottom curb of the holder, already noticed, and to a slight defect in the plumbing of the columns that cannot now be conveniently corrected, the holder may always remain a little out of the perpendicular. We learn that since Wednesday the holder has been filled and emptied regularly; all three lifts working with the utmost steadiness. Inspection of the bottom rollers, rendered possible by the full raising of the holder, has revealed that they do not fit properly. They are found to bear tight on the higher, and not to touch the guides on the lower side. When this is put right, it is expected that the holder will work level, or pretty nearly so.

We have now described the nature and course of last Wednesday's experiment in every particular. It only remains to state that the day was stormy—the wind sweeping over the works in sharp, but irregular gusts. The wind's direction and force were, however, immaterial, as they had no effect at all upon the holder, which did not show the slightest tremor during the heaviest squalls. At the conclusion of the test, Mr. G. Livesey expressed himself as perfectly satisfied with the result, which practically marks a new era in gasholder construction. Henceforward there will be no reason whatever for carrying guide-framing to the full height of a three-lift gasholder, to say nothing of a four-lift one; and the extent to which the framing may be safely cut down must be matter for further experiment on the first convenient occasion, since it would be wrong to assume that the Rotherhithe test exhausts the possibilities of advancement in this direction. It should be remarked that this experiment has been made at very little cost, for all the measures we have described, which had for their object the cure of weaknesses of the old structure, would have been equally necessary, even if a third tier of guide-framing had been contemplated. No prudent engineer would think of adding another lift to a telescopic holder considerably out of level without endeavouring to remedy the old defect; and that is what has been done in the present instance. The whole course of the treatment of this Rotherhithe holder is a lesson in the principles

of gasholder stability, and conveys much information to gasholder builders. It shows that monumental structures are not necessarily strong, and that massive Doric columns and heavy crown trussing are not enough by themselves to constitute a trustworthy holder. Regard for right principles is the only fountain of security in gasholder construction; and the most important principle of the art may be briefly, if somewhat imperfectly, summarized in the aphorism, "Take care of the bottom, and the top will take care of itself."

It should be stated that the cost of the double-lift holder and the wrought-iron annular tank was £25,000 in 1867, or (as the content is 825,000 cubic feet) about £30 per thousand cubic feet. The expense of adding the third lift was £2550; and the strengthening of the tank cost less than £200.

THE GLASGOW INTERNATIONAL EXHIBITION.

SEVENTH ARTICLE.

THE Glasgow Exhibition provides us with two instances of the practical manufacture of illuminating gas, in both of which the raw material forming the source of the gas is mineral oil—semi-refined petroleum, or that product which is known as the "intermediate" oil of the Scotch shale-oil works. Both systems claim to be specially suitable for adoption at country mansions, large factories of various kinds in villages, and other places that have not yet been brought within the civilizing influence of an ordinary gas supply, and for large hotels, halls, railway stations, &c. These small gas-works are both "outside exhibits," and closely adjoin each other immediately outside the North front of the Machinery Court; and on the occasion of the visit of the North British Association of Gas Managers to the Exhibition last Thursday, they received the attention of skilled experts in gas-making operations.

First in order, may be mentioned the exhibit of the Paraffin Gas Lighting Company, Limited, of Glasgow, whose process (the patent of Messrs. Alexander and Paterson) was shown at the Edinburgh Exhibition two years ago, and which has since been adopted in the Fifeshire village of Colinsburgh. It may be remembered that, in connection with this Colinsburgh installation, there have been two or three lively and interesting passages of arms, in which Mr. Macpherson, the well-known Gas Manager at the "Lang toon o' Kirkcaldy," has taken a prominent part. It seems reasonable to suppose that the intermediate oil used by the Company as the source of the gas should give a product which is quite free from sulphurous and ammoniacal impurities; and that the gas shown at the Company's stand has a very high illuminating value goes without saying. Assuming that it is of 60 or 65 candle power, questions such as these arise: Can anything like this illumination be got out of it in actual practice? Can it be adopted, as an economical alternative, in lieu of ordinary coal gas? It is well known that the suggestion to test the process on a large scale has been several times before the Glasgow Corporation Gas Committee; but up to the present the negotiations that have been carried on have not been attended with any practical result, partly, we believe, in consequence of no tangible or feasible proposal having been made to them by the Paraffin Gas Lighting Company. The Company seems to be making some progress, though not in Glasgow itself. Last year sixteen works were erected by the Company, who are at present in negotiation with Steveston, in Ayrshire, and Oban, in the Western Highlands, for the erection of works, even though ordinary gas-works exist in both places. Notwithstanding the very strong statements made regarding the oil gas manufactured at the Colinsburgh Gas-Works, the Secretary of the Company, so recently as the end of January of this year, reported favourably of the gas which they have been supplying to their customers. Their now Manager keeps accurate statistics daily of the quantity of oil used, the time occupied in making the gas, the total make, and the yield of gas per gallon of oil. He can therefore speak with perfect confidence as to the working of the system. Taking the two months ending Dec. 31, 1887, he gives the following figures:—

	Cubic Feet.
Total make of gas	97,666
Total gas consumed, as per meter	81,800
	15,866
Deduct street lamps, which burn free, say	1,000
Unaccounted-for gas	14,866

Or 15½ per cent. of the total make. The Secretary of the Gas Company goes on to state that the quantity of oil used was 1057 gallons, and that the amount of gas yielded (97,666 cubic feet) was equal to 92½ feet per gallon; while the maximum quantity registered to the gallon was 97.18 cubic feet, and the minimum 76.1 cubic feet. In order that customers may be able to compare the price of the gas with that of coal gas, they are charged by the Company every 1000 feet as 2500 feet. As the gas is of 65-candle power, this equalizes it with coal gas of 20 candles—at least so says the Secretary. When the paraffin gas was introduced into the village of Colinsburgh, the price of the coal gas was 7s. 11d. per 1000 cubic feet. But the price of the gas now used has been reduced to 6s. 3d.; and the Secretary says that after feeling their way, he is certain they will be able to reduce the price very much further. He reports that the light gives the greatest satisfaction, as it is very brilliant and perfectly free from smoke and sulphur. His next statement must be taken with a certain amount of reserve. It is that the atmosphere of rooms is not in the slightest degree vitiated by the gas; the heat which it generates being, in his opinion, a healthy one. We would in passing ask him, "What becomes of the large amount of carbonic acid which

is produced by burning gas which is so exceedingly rich in carbon?" On the question of the economy of the gas, where it is made for general consumption, he comes to a very practical conclusion—that the system may with confidence be adopted in towns where the price of coal gas is more than 3s. 6d. per 1000 cubic feet.

The other exhibit of oil-gas plant referred to is that of Messrs. E. Mansfield and Sons, of Manchester. Their apparatus is designed for the economic manufacture of gas from cheap oils and fats; the gas produced being suitable for illuminating purposes and for motive power. The process of manufacture is shown at the stand ("intermediate" shale oil being used); the storing of the gas in a somewhat capacious gasholder; and subsequently the use thereof as the motive power for driving a Crossley "Otto" gas-engine, which is installed within a little glass house, attracting the notice of many visitors. Within the same house, after nightfall, the gas is shown in use as an illuminating agent. The apparatus used in this instance, as in the other, is exceedingly simple; indeed, the simplicity of the whole arrangements is quite remarkable, and the operations can all be conducted by an unskilled person. The gas produced by the apparatus bids fair to aid materially in extending the use of gas engines both at home and abroad.

THE ARTESIAN BORING IN THE CITY.—The contractor for the artesian well which the Commissioners of Sewers are sinking at Aldgate have now been at work for twelve months, and have only gone down about 130 feet out of the 350 feet which they have to bore. This portion of the well has been an expensive piece of work; but the Engineer (Mr. W. Haywood, M. Inst. C.E.) considers that it is not the most difficult.

PRACTICAL HINTS ON GAS CONSUMPTION.—In a little brochure, bearing this title, Mr. Joseph Shaw, of Lockwood, Huddersfield, shows the advantages to be derived from a proper application and use of gas, and how to obtain the best results therefrom. The author being the inventor of a gas-governor, it is only natural to suppose that in the portions of the little book which point out the remedy for excessive gas bills, the merits of this appliance should be enlarged upon. However, any information which enables gas consumers to burn their gas more rationally than they now do in too many cases, should be welcome, as tending to remove dissatisfaction. A useful accompaniment to the book is Mr. Shaw's meter-card, which, by means of printed dials furnished with moveable pointers, instructs consumers how to read their meter indices.

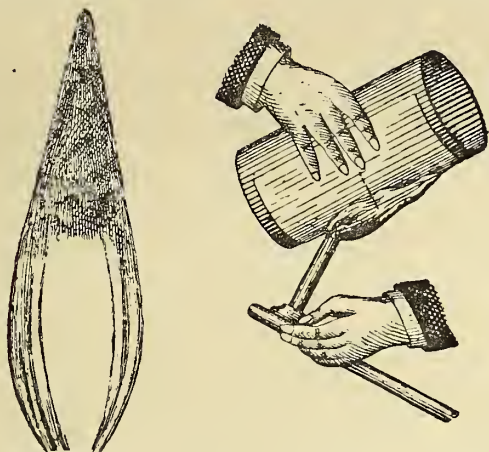
DEATH OF MR. J. O. N. RUTTER.—We regret to have to announce the death last Friday, at Black Rock, Brighton, in his 90th year, of Mr. John Obadiah Newell Rutter, F.R.A.S. Mr. Rutter's name has been for many years associated with the gas supply of Brighton; he having filled the position of Engineer of the Black Rock works. On the amalgamation of the Brighton Gas Companies about six years ago, he was offered a retiring pension. But he preferred to continue to discharge his accustomed duties; and this he did almost to the last. Mr. Rutter always displayed great interest in questions connected with gas engineering; and was a frequent contributor to the earlier volumes of the JOURNAL. His last communication—on the subject of "Gas Lighting and Ventilation"—appeared about three years ago. He was the author of several pamphlets; that on the "Advantages of Gas," which reached its 204th thousand, being the most conspicuous. Interested as he was in matters appertaining to his profession, Mr. Rutter never attended any of the meetings of The Gas Institute, of which he was an honorary member. He nevertheless testified his appreciation of one branch of the Institute's work by presenting the Committee of the Benevolent Fund with a donation of 100 guineas—a munificent gift which was announced in the report presented at the meeting of the Institute held at Sheffield in 1883. Mr. Rutter has passed away after a long life of useful work; and his departure severs one more link connecting the present with the past of gas engineering.

NORTH OF IRELAND GAS MANAGERS' ASSOCIATION.—The annual meeting of this Association, the formation of which, as the result of a movement initiated by Mr. J. Whimster, of Armagh, was announced in the JOURNAL in September last year, is fixed to take place at Lisburn on the 14th prox., under the presidency of Mr. E. Stears, Engineer and Manager of the gas-works in that town. The Honorary Secretary of the Association (Mr. J. Whimster) has issued a good programme of business; as, in addition to the President's address, three papers on subjects immediately connected with gas-manufacturing operations, and one on gas companies' policy, are set down for consideration. The last-named matter will be introduced by Mr. T. Travers, of Cork, who will give the members his views in regard to the best way of assisting consumers. Mr. J. Robb, of Limavady, will describe a retort-setting for small gas-works; Mr. A. Waddell, of Newtownards, will relate his experience with Mr. G. R. Hislop's regenerative furnace; and Mr. W. B. Featherstone, of Dundalk, will deal with the utilization of tar. At the close of the proceedings, the members will dine together in the Railway Hotel. The first business meeting of the new Association promises to be very instructive; and it is to be hoped the Committee and Secretary will receive the co-operation of all Irish gas managers to increase the usefulness of the society. It is frequently inconvenient for Irish gas managers to cross the Channel to attend the meetings of their English and Scotch colleagues; and, in view of this fact, there is the greater need of some such means of intercommunication as that afforded by this Association.

Notes.

PROOF OF THE HOLLOWNESS OF A BUNSEN FLAME.

It is generally known that the flame from an ordinary Bunsen gas-burner is a hollow cone, the interior of which is filled with air. This fact is proved by the classical experiment with a match thrust into such a flame, when the parts in contact with the edges of the flame ignite while the interior remains intact. *La Nature* gives another very simple method by which the figure of the



longitudinal section of a Bunsen flame may be obtained through the instrumentality of the flame itself. All that is necessary is to take a piece of metallic tube of sufficient size, as shown in the figure, and wrap round its outer surface a piece of filter-paper, which is kept in position by the fingers. This paper is then to be presented to a Bunsen burner in the manner indicated, and in this way, after a trial or two, the form of the section of the flame as shown will be obtained. As the portions of paper which touch the flame carbonize more quickly than the rest, it is advisable to put underneath the sheet of paper (above the dotted line of the drawing) a second piece, which serves to diminish the conductivity of the metal at this point, and gives more uniform results. This demonstration is calculated to be specially useful as a class experiment.

FLOORING FOR ENGINE-HOUSES.

Much difference of opinion prevails as to the best flooring for engine-houses and machinery-rooms. Tiles are greatly favoured, but have the drawback of rigidity, and do not lend themselves to occasional necessary disturbances and rearrangements of the floor area. The *Deutsche Bangewerkes-Blatt* recommends long narrow oak panels for the floors of engine-houses. The wood should be perfectly dry, being stored for some time, if necessary, in drying-stoves. It might be suggested that retort-houses in gas-works would form admirable drying-places for hard woods. The oak panelling should be laid upon oak joists, and nailed down with 4-inch wire nails at close intervals. It does not much matter whether the oak flooring is laid in compartments or in long planks with alternating butt-joints. In the latter case, however, the planks must not exceed 2½ inches in width. A floor laid in this way has all the advantages of cleanliness and durability attaching to the best parquetry. It will not warp, notwithstanding the vibration and other disturbing influences to which it is liable to be exposed in an engine-house. The cost will vary according to circumstances; but it would not, in most cases, be so great as that of a good tiled floor.

A WATER-LEVEL INDICATOR.

A convenient device for indicating the water-level in wells, bore-holes, &c., is described in the *Journal de l'Eclairage du Gaz*. It is recommended as a very simple process; and is employed by the Engineers of the service of the Ponts et Chaussées for their new tide indicators. It consists in covering a small copper tube, which is the sounding instrument, with a sheet of paper impregnated with a solution of sulphate of iron, rubbing it over when dry with a pad dipped in powdered gall-nut. The paper thus prepared takes, when plunged into water, a very pronounced black tint, in consequence of the reaction of the iron salt upon the tannin, forming ink. It is remarked that this process is susceptible of many modifications, and may find several applications in connection with gas apparatus. It is suggested, for example, that it could be used to record maximum pressures in water gauges, and in other hydraulic appliances employed in gas-works. In the case of pressure gauges, to convert an ordinary gauge into a recorder of maxima it would suffice to insert a strip of sensitized paper into the branch communicating with the air. If, in consequence of the capillarity of the paper, the water-line indications became a little confused at the end of a prolonged immersion, strips of parchment or parchmentized paper treated the same way could be used instead of plain paper.

THE COMPOSITION OF THE ATMOSPHERE OF WORKSHOPS.

The extent to which the atmosphere is altered in composition in workshops and factories of different kinds is a matter of great importance in connection with scientific ventilation. Dr. Schuler, a Swiss inspector of factories, has recently published some useful information upon this point. He visited 180 industrial establishments of various kinds, and made carbonic acid determinations in

the workshops. The result was as follows:—In a finishing-shed the proportion of carbonic acid was as low as 0·40 per cent. In four carding-sheds there was 0·68 per cent.; in 27 cotton-spinning mills there was 0·69 per cent.; in five twist-sheds there was 0·79 per cent.; in six foundries and machine-shops, 1·24 per cent.; in nine printing-works, 1·73 per cent.; and in sixteen silk-mills, 2·21 per cent. To diminish the proportion of carbonic acid in workshops, Dr. Schuler proposes, in default of special means of ventilation, to put a perforated plate in every window. The difference between the exterior and internal temperatures would produce an energetic draught. Experiments have shown that the rate of passage of air through the perforations of a plate will range from 633 mm. per second with a difference of temperature of 17° C., to 725 mm. with a difference of 24° C. M. Delahaye, who notices this subject in the *Revue Industrielle*, remarks that Dr. Schuler recommends perforated metallic plates for this makeshift ventilation; but the perforated glass of M. Appert, in which the holes are conical, would be preferable, as their use would not entail any sacrifice of light.

SOCIETY OF ENGINEERS.—Last Tuesday, the members of the Society of Engineers accompanied by a number of gentlemen interested in sewage disposal, visited the new precipitation works at the Barking outfall sewer, now erecting, under the authority of the Metropolitan Board of Works, for the deodorization of the sewage falling into the Thames from the northern parts of London. Among those present were: Mr. A. T. Walmisley (President); Messrs. J. R. Baillie and H. Adams (Vice-Presidents); Messrs. Jabez Church and Charles Gandon (Past-Presidents); Messrs. C. Anderson and J. H. Cunningham (Members of Council); and Mr. G. A. Pryce Cuxson (Secretary). The party went by steamboat; and on their arrival at Barking landed at a temporary pier, near to where the whole of the North London sewage is conveyed to Barking by three great sewers—the high one from Islington, the middle one from the north side of Hyde Park, and the low one from Chelsea; the contents of the latter being pumped to high chambers, whence it is delivered into the Thames on the turn of the tide at high water. The visitors were received by Mr. G. Marshall, on behalf of Sir J. W. Bazalgette, C.B., the Engineer of the Board, who fully explained the works, which extend over an area of 50 acres.

ARTESIAN WELL BORING AT GAINSBOROUGH.—The Gainsborough Local Board have for nearly four years been engaged in an attempt to improve the water supply of the town, and, if possible, to abandon the use of the water from the Trent, which is often very unsatisfactory. In 1884 the Board determined to bore for a supply of water, and agreed to spend £2000 in the experiment. During last year, after considerable discussion, it was decided to spend a second sum of equal amount to the first. When this had been done, a test of the quantity and quality of the yield was made, with the result that only about one-fourth the quantity required for the town's supply was obtained; and as to the quality, the five analysts to whom the water was sent varied considerably in their opinions as to its purity, but they were all of opinion that it was very hard. Another attempt has been made recently to increase the yield by piercing the Bunter sandstone 100 feet further; and this was concluded on the 20th inst. The depth of the bore is now 1200 feet below the surface; the diameter of the bore-hole in the sandstone being 12 inches. The Local Board have agreed to first test the yield by pumping continuously for 16 days and nights, and then ascertain, by means of a 1000-gallon tank, the exact number of gallons per hour obtained. The result of the testing is looked forward to very anxiously by the inhabitants, as the cost has already exceeded £5000.

SMOKELESS FUEL.—The following letter appeared, under the initials "T. N.," in the *Manchester Examiner* last Tuesday:—"The waste of smoky chimneys has often been pointed out; but no practical effort has been made to avoid it. The manufacturing world and private individuals seemed to be awed by the magnitude of the task. Feeble efforts have been made to 'cure the smoke nuisance' by using some contrivance or other for consuming the smoke after it has been made; and the aspect of Manchester and Sheffield show with what little success. The best way to render our towns free from smoke is to make no smoke. Some persons may think this an impossibility; but if the following figures are correct, it is not only possible but highly probable. The figures are professed to be the result of trials made in the last few weeks at a bleach works near Nottingham, and are said to be verified by representatives of the owners of the works, as well as by those of the London Mercantile Gas Company, Limited, who supplied the gas and coke producers. Here they are—

	Coal Firing.	Smokeless Fuel.
Coal used in gas and coke producers and in the boiler to raise steam to 81 lbs.	628 lbs.	504 lbs.
Do. the next hour	785 "	224 "
Do. average per hour while working	471 "	224 "
Water evaporated, do.	3480 "	3543 "
Do. per pound of coal	7½ "	15½ "

The smokeless fuel is simply small coal turned into gas and coke. The gas and coke are then burnt in the boilers instead of coal; and, according to these figures, give more than double the heat. We wish every success to those who can produce such results. Absence of smoke, and duplication of the power of fuel, will prolong our lives and our coal-fields at the same time."

Technical Record.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

ANNUAL MEETING IN GLASGOW.

The Twenty-seventh Annual Meeting of the North British Association of Gas Managers was held in Glasgow (in the rooms of the Philosophical Society) last Thursday, with Mr. David Terrace, of the Glasgow Corporation Gas-Works, Dawsholm, as the President. There was an unusually large attendance.

After the meeting was constituted, Mr. Robert S. Carlow, the Secretary, submitted the annual report of the Committee of Management. It gave a comprehensive *résumé* of the business done during the past year. The remit on "The Best Standard Burner for Scotch Gas" had been under the consideration of the Committee; and it had been resolved to place the results of the testing of the burners in the hands of Mr. Geo. R. Hislop, the Convener of the Sub-Committee on the question; and he had undertaken to prepare a paper upon the subject for the meeting. The report stated that the Research Fund had now been contributed to by fifty gas companies. It also referred to the endeavours resolved upon a year ago to institute an investigation into the purification of coal gas in closed vessels. Arrangements could not be completed in time to admit of a report being presented to the meeting; and it was recommended that the Special Sub-Committee which had been appointed, should be requested to continue in office for another year. During the year the Benevolent Fund had been drawn upon to the extent of about £20. After dealing with some other matters, the report stated that it had again been considered advisable to postpone taking definite action in reference to the Murdoch Memorial. There had been subscribed to the Memorial Fund the sum of £287; and the Committee intended to make further efforts to increase this amount. Mr. Robb, of Haddington, had made an offer to the Association to present to it his bound volumes of the JOURNAL, &c., on the condition that a "home" be provided for them in Glasgow or Edinburgh. The Committee of the Association, owing to this condition, had very unwillingly been compelled to decline the proposed addition to the property of the Association. There were now 242 members, as compared with 239 last year.

At a subsequent stage of the proceedings, a statement of the accounts of the Treasurer was made by the Auditor, Mr. D. Bruce Peebles, of Edinburgh. It was considered highly satisfactory; and both the Treasurer and the Auditor were cordially thanked for their services.

The Secretary also submitted the names of the members who had resigned or had died during the past year; and he likewise submitted applications from eight candidates for election as ordinary members, and three extraordinary members, together with four as associates.

PRESIDENT'S OPENING ADDRESS.

The Inaugural Address of the President was not of any great length, or comprehensive, in the ordinary sense of that term; but it was eminently interesting, pointed, and instructive. As the present issue of the JOURNAL contains the text of the address, it is not necessary to give any detailed summary of it. One topic of marked importance was the information which Mr. Terrace was able to give, in summary form, from the "Statistical Reports" (the origin of which was due to the now defunct West of Scotland Association of Gas Managers, and the publication of which was continued by the North British Association)—namely, that the annual make of gas, which was about 6008 million cubic feet in 1883, had risen to about 7133 millions in 1887; thus showing an increase of about 18·7 per cent. in five years. Considering the close connection which Mr. Terrace (under Mr. Foulis) has had with the working out of the regenerative system of retort firing at the Dawsholm Gas-Works, it was but natural to expect that he would have something of interest to say upon the subject. In the course of his remarks on it, he stated that there were now some fifteen gas-works in Scotland where the retorts are worked on the regenerative principle—making 3410 million cubic feet of gas per annum, or equal to 47·8 per cent. of the total manufacture. He further stated that if those works were taken into account where regenerative firing was contemplated, there would, in a short time, be manufactured in retorts heated by regenerative furnaces nearly 60 per cent. of the gas produced in Scotland. As regards choked ascension-pipes, Mr. Terrace mentioned that stopped pipes were not mere numerous with regenerative settings than with ordinary furnaces, notwithstanding the fact of the temperature of the retorts being much higher. The question as to the requisite temperature to which gas should be brought in the condensers before scrubbing and purifying take place received some consideration at the hands of the President; and his remarks upon it were very instructive, and might with advantage be studied by many of our readers. Owing to the very suggestive paper which Mr. William Young submitted to the Association at the meeting held in Stirling a year ago, Mr. Terrace was in duty bound to refer to the question of the purification of gas in closed vessels; and from the tone of his remarks we may confidently expect that the Sub-Committee of the Association, in co-operation with Mr. Young, may be able at next year's meeting to contribute a report of much scientific and practical value. A question of growing and very vital importance in connection with the gas industry is that of using mineral oil instead of coal as the raw material for the production of illuminating gas. This was also touched upon in a very effective manner by Mr. Terrace; and our readers will do well to peruse his

remarks upon it. How to get gas consumers to burn the gas supplied to them in such a way as to obtain something like its photogenic value is a question of great importance, and of perennial interest; and on this matter Mr. Terrace made some suggestive remarks. He also gave some exceedingly interesting data bearing upon the results obtained by testing various types of regenerative lamps with gas of different qualities. In the course of his concluding remarks, he referred to the excellent opportunity which members of the Association had in the Glasgow International Exhibition for inspecting and making acquaintance with some of the latest novelties, and some of the best apparatus in use for lighting, cooking, heating, and motive power; and he had no hesitation in saying that gas was still able to hold more than its own for brilliancy and applicability of the latest forms of light, even though confronted on nearly every hand by its would-be rivals, mineral oil and electricity.

Mr. A. Macpherson (Kirkcaldy), in proposing a vote of thanks to the President for his address, said that he thought Mr. Terrace had refuted the assertion that gas engineering had made little or no progress during the last twenty or thirty years. If they would only consider the question of burners, he was perfectly certain they would confer great benefits on the consumers of gas. And if the consumers themselves would give some little consideration to burners, they would certainly save their pockets to a very large extent.

GAS-BURNERS FOR PHOTOMETRICAL PURPOSES.

This was the first subject taken up in the programme of papers provided by the Committee of the Association. It was dealt with in a paper by Mr. Geo. R. Hislop, of Paisley, who stated that its consideration was the result of an obligation which he had come under to the Committee to dispose of a remit made to a Special Committee of the Association appointed three years ago for the purpose of determining the best standard burner for Scotch gas. After most exhaustive experiments which he had instituted, he had found that nearly all the burners manufactured had their orifices drilled at angles ranging between 45° and 60°, and this apparently without regard to quality of gas; whereas the investigations and the experiments which he had carried out unmistakably proved that the angle at which the holes of burners stood to each other had a remarkable influence on the quality of the gas. The principle which he had endeavoured to lay down (as will be seen from the text of the paper, appearing on p. 205 to-day) was that by the elongation of the flame as the scale of quality of the gas was descending, they secured what was equivalent to a reduction of pressure at the point of combustion of something like 2-10ths of an inch by increasing the period of incandescence of the carbon atoms, and this while fulfilling the requirements of the law in having a pressure of 5-10ths of an inch. A properly elongated flame could not be obtained from a jet drilled at the usual angles unless the gas was consumed at a pressure far below the requirements of the Acts of Parliament, and then a smoky flame would result. Mr. Hislop's paper excited peculiar interest; the general feeling of the members being that he had started on a new departure in reference to the construction of burners, and the suitability of different types of the same for different qualities of gas.

The discussion which arose on the paper was commenced by Mr. Foulis, who said that it could scarcely have been anticipated that burning gas under the same pressure and in the same quantity would have shown such very different results as the angles of the holes varied. The information was important, he said; and it showed that, in making comparative statements of different qualities of gas, it was very necessary to know the conditions under which the gas was being burned. It also showed how important it was that consumers should attend to getting proper burners to develop the full photogenic value of the gas; and that those who were in charge of gas-works should endeavour to educate consumers as far as possible, and see that the burners that were supplied to them were the proper ones for the quality of the gas manufactured in the different towns.

Mr. D. Bruce Peebles followed in the same strain of remark, and readily admitted that Mr. Hislop had brought out a very novel element as to the angles at which the gas issued from the burners. He pointed out that Mr. Stewart, of Greenock, had some time ago shown that each type of burner seemed to have its own idiosyncrasy, as each human being had. He urged that different pressures should be used along with burners having different angles in the orifices. After making a few remarks of a humorous character regarding the "gas-burner man," he spoke of the great importance of the subject which had been taken up in the paper, seeing that there was an enormous waste of gas through using bad burners.

Mr. Key directed attention to the fact that the internal diameter of the barrel of the burners ought also to be taken into consideration, inasmuch as in the old iron burners the tubes were very narrow, while in Bray's burners, which were now so extensively used, there were very wide tubes; thus giving a great amount of heating surface.

Mr. D. M. Nelson remarked that the tests carried out by Mr. Hislop had all been made with iron burners, whereas such things were now scarcely ever used.

Mr. Macpherson spoke of the paper as being altogether novel; and as it needed thinking over before it could be properly discussed, the author must excuse the members for not dealing with it as its merits warranted. He too admitted that the size of the burner barrel was a matter of great importance.

Mr. John McCrue regarded the treatment of the subject as

being altogether unique, and he urged that gas consumers should be educated to the proper use of their gas-burners, as it was the desire of every gas manufacturer that the gas should be burnt well, so that the consumers might be pleased. He also urged that burners suited for the different levels of a town should be kept and given to the consumers for ordinary use. That was a thing, he believed, which Mr. Hislop had attended to in his town.

Mr. Hislop made a suitable reply to the various remarks that had been offered, being glad to know that his paper had excited so much interest.

MANUFACTURE OF SULPHATE OF AMMONIA.

A short paper next followed, the author of which was Mr. R. Cowie, of Tillicoultry, who gave a plain and interesting account of a year's experience of the manufacture of sulphate of ammonia. In the course of his remarks, he explained the steps taken for the erection of the plant at the works where he was employed, so that they might themselves be enabled to work up the ammoniacal liquor into sulphate of ammonia. He stated that the process had not interfered very much with the ordinary work, even during the busy season. From 836 tons of cannel coal used in the past year, he had obtained 8 tons 17 cwt. of sulphate of ammonia. The sum received for the quantity sold amounted to £101 9s. 7d.; and after paying all expenses, and allowing a percentage on the capital used, there was a surplus of £59 3s. 1d. He stated that most of his produce had been sold in the district, and had not caused them any trouble.

The discussion which followed was quite as interesting as the paper itself had been; and the speakers generally acknowledged their indebtedness to Mr. Cowie for having shown that the manufacture in question could be carried on economically in small works such as those at Tillicoultry. Various suggestions were made to Mr. Cowie and to other managers who might think of following his example. The paper also received a little friendly criticism from one or two of the speakers. In his reply, Mr. Cowie stated that they were selling their tar; and that for two or three years they were getting for their residuals only 5½d. per ton of coal carbonized, whereas they were now getting 2s. 10d. per ton.

TAR AS FUEL FOR STEAM BOILERS.

Mr. John M'Crae, of Dundee, read a paper on "Coal Tar as Fuel for Steam-Boilers." He explained that the sudden fall which took place in the price of secondary products about three years ago forced gas manufacturers to look around for some better markets for their products. While boiled tar could readily be disposed of at several of the German ports, the expense and difficulty of loading ships took so much from the saving derived, that it occurred to him to look nearer home for a remedy. He had, therefore, made experiments to ascertain the relative value of coal and tar. The coal which he employed was what is known as Strathavenhouse small coal, which costs in Dundee 5s. per ton delivered. The experiment in each case lasted for 48 hours. The tar employed was "boiled" tar; the naphtha having been previously removed, but the pitch oil left in the tar. In Dundee the value of the tar was about 4s. per ton. The result of the experiments was as follows:—Coal, 10 tons 16 cwt., at 5s. per ton, £2 14s.; tar, 1400 gallons (9 tons 3 cwt., 160 gallons = 1 ton), at 4s. per ton, £1 16s. 7d.; saving per day by using tar, 17s. 5d. This was on the longest day, when they were using a mere fraction of steam as compared with their winter requirements. Consequently the profit was proportionately less than it would be when they were in full work. Mr. M'Crae explained, in detail, the working of the apparatus used in producing the results mentioned; and he stated that in the tar furnace tar only was burned. He also pointed out that in some districts even better results could be obtained, as in many country towns the coal could be had for 2s. less per ton than in Dundee, and that for the tar for which Dundee was receiving 4s. per ton they would get double this sum. In concluding, he said that there was a future for liquid fuels, such concentrated fuels as crude naphthas, paraffins, and pitch oil; and he referred particularly to the importance of such an application as the employment of these products for steam-boilers—land, locomotive, and marine.

This paper also led to an instructive and interesting discussion; the speakers being Mr. Sutherland, tar distiller, of Falkirk, Mr. Hislop, Mr. Macpherson, and Mr. Key.

At this stage the members adjourned for luncheon. After the meeting had been reconstituted, the President announced that the result of the scrutiny of the balloting-papers was that Mr. Hislop had been elected as President for the year 1888-9; Mr. S. Stewart (Greenock) and Mr. R. Robertson (Bathgate) as Vice-Presidents; Mr. R. S. Carlow as Secretary and Treasurer; Mr. D. Bruce Peebles as Auditor; and Messrs. J. M'Gilchrist (Dumbarton), J. Adam (Pollokshaws), and T. D. Hall (Montrose) as Members of Committee. Dunfermline had been selected as the place for next year's meeting.

AUTOMATIC GAS LIGHTING.

A short but very valuable paper on this subject was submitted by Mr. G. Keillor, of Nairn, who described what he claimed to be an improved system of lighting gas by means of an electric spark, and which he has had in operation for some time for lighting the pier at Nairn. By the aid of a working model, he explained the system of lighting; showing how the gas pressure, by means of a governor combined with an electric lighter, operated in automatically lighting the lamps. By his system the lighting of a town could be regulated from the gas-works, and the whole of the rows of lights manipulated from one battery. It would also be found convenient at railway stations, in factories, and similar places.

In the discussion which followed, Mr. Keillor was warmly complimented on the ingenuity, the economy, and the success of his arrangements; Mr. Macpherson remarking that gas managers did well in turning electricity—their great rival—to account in those circumstances where it was specially serviceable. The President and Messrs. Hall, Stewart, Smith (Aberdeen), Cheyne (Briton Ferry), and Key also took part in the discussion.

SELLING GAS.

This subject was dealt with in a very lively and humorous manner by Mr. James M'Gilchrist, who, in the course of his paper, described an ideal gas company of the future, which would canvass vigorously for business, on the system which is common in ordinary commercial pursuits. The company, he said, would supply gas of high illuminating power, and free from all impurities. It was a mistake to lower the illuminating power for the purpose of cheapening the gas. The public did not grumble at the price of the gas so much as at the bad light. His ideal company would also look to the piping and lighting arrangements within the houses of their customers. They would also abolish the rent for meters; and would introduce a system of payments as approximate as possible to the ready-money system. In the next place, they would protest against the iniquitous system of valuing gas-works now pursued by assessors, and which militated against the selling of gas. They would adopt the co-operative system of making consumers shareholders. This could, he said, be accomplished by a graduated system of deposits according to the number of apartments in each customer's house. Finally, gas corporations would not take gas profits in payment of rates which ought to be paid by the rate-payers at large. The day was soon coming when these taxes would be abolished, and gas sold at as near cost price as possible. In the course of his remarks, Mr. M'Gilchrist showed one of Messrs. W. and B. Cowan's automatic gas-meters, by means of which a certain quantity of gas can be paid for beforehand.

The discussion which followed turned to a considerable extent upon the question of deposits by consumers and the use of meters free of charge. One speaker was in favour of small and frequent payments; and would not press the deposit system too hard. He would also have the meters supplied free. Another said he would not supply free meters; and that in his town the Gas Commissioners are very easy as to the deposits—the result being that they did not lose more than ¼ per cent. on their total revenue. Then a speaker expressed himself in favour of monthly accounts, and said his usual practice was to exact a deposit of 5s. until the second account was paid. About half-a-dozen members spoke in the discussion; and in his reply Mr. M'Gilchrist threw out the suggestion that the Committee of the Association should bring up a report on the subject at the next meeting. He remarked that the practice in Dumbarton for the last dozen years or so had been that all the gas-pipes introduced into new houses were under the inspection of an officer of the Gas Trust. He was specially strong on the question of abolishing meter-rents, while recommending that the deposit system should be universally applied, and that the consumers should be allowed interest on their deposits.

REGENERATIVE FURNACES FOR SMALL GAS-WORKS.

Mr. J. Smith, of Rosewell, gave a short paper descriptive of a regenerative furnace which he had devised and worked out to a successful issue about a year ago, and which he had since improved upon. This short paper excited a discussion of considerable interest, inasmuch as the author had done, in the language of Mr. Smith, of Aberdeen, "a very smart thing." Mr. Stewart characterized the arrangement as a highly ingenious one; and other speakers also made complimentary remarks regarding it.

SCRUBBING, CONDENSING, AND WASHING COAL GAS.

Mr. W. Key read the concluding paper, in which he described a process for the elimination of the tarry particles in the gas after leaving the hydraulic main. In this apparatus (which he described, and which was fully illustrated by large diagrams), there is a dry scrubber having revolving arms fixed on an upright centre shaft, and by the velocity of these arms the gas is thrown against corrugated sides of the scrubber, the tarry particles being eliminated.

In the discussion which arose after the paper was read, some complimentary remarks were made by two or three speakers, and by others the system described by Mr. Key was severely criticized. The author was not able to say that the system had been put into practice, and the conclusions, therefore, were regarded as purely hypothetical.

This closed the ordinary business on the programme; and, in drawing the proceedings to a close, the President, on behalf of the meeting, thanked the authors of all the papers. Then Mr. M'Crae, on behalf of the Association, presented the gold medal of the Association to Mr. Terrace, the retiring President, who replied in feeling terms. The Revisal Committee was appointed; and, finally, on the motion of Mr. Hislop, a very cordial vote of thanks was awarded to the Secretary, Mr. Carlow.

The members then adjourned to the International Exhibition; and at six o'clock sat down to dinner, with their lady friends, in the Royal Bungalow. Mr. Terrace presided, and the vice-chairs were occupied by Messrs. Hislop, M'Gilchrist, and Carlow. Dinner over, the company at once dispersed over the exhibition, where they spent the remainder of the evening.

On the following day the annual excursion of the Association took place—by railway to Balloch, at the lower end of Loch Lomond, then by steamer up the loch to Tarbet, luncheon being served in the Tarbet Hotel; a drive or walk of about two miles to

Arrochar, and then by boat down Loch Long to Dunoon, where tea was partaken of; and lastly by steamer to Craigendoran, where train back to Glasgow was obtained. For the greater part of the day the weather was almost all that could be desired, and the members and their friends enjoyed themselves very much; and thus ended what will be regarded as the most successful meeting yet held by the North British Association of Gas Managers.

PRESIDENT'S INAUGURAL ADDRESS.

Gentlemen,—I thank you for the honour conferred upon me in electing me to preside over your deliberations at this our Twenty-seventh Annual Meeting.

There are now no fewer than nine similar Associations to this in Great Britain. Three of these are what may be termed "National," and six "District" Associations. These, and others on the Continent and in America have all sprung into existence since the year 1862, when the North British Association was instituted. The kindred Associations are doing good work in holding meetings, and otherwise disseminating very valuable information; each benefiting the other by publishing their reports, which are found of great service in our every-day work and transactions.

Taking our "Statistical Reports" as the basis of information, Scotland, I find that the make of gas in the year 1883 was about together with that from other sources regarding the gas supply of 6008 million cubic feet, and in last year (1887) about 7133 millions; showing an increase in five years of 18·7 per cent.

Although, in one sense, the process of gas manufacture may be said to be similar in its essential features to that so freely given to the world by Murdoch 80 years ago, it must be acknowledged that Science has greatly developed his ideas. Who, even ten years ago, could have foreseen that triple the carbonizing work would be done with the same floor-space in the retort-house, and that three times the illuminating value would be obtained from the same quantity and quality of gas? These vast improvements are due to the regenerative, or, as it is sometimes called, the recuperative principle—*i.e.*, regaining and utilizing the heat that otherwise would have been lost in the old open furnace, and in the combustion of the open gas-flames respectively. It is principally due to these and other such inventions, that coal gas will hold its position in the supply of artificial light for many years to come.

I need not recapitulate the many advantages derived from the use of regenerative retort settings; but I may say that the expectations formed when the system was introduced have been realized. The only development that I will notice here is the increase in the size of the retorts with the same oven space. The benefit that accrues from this is shown in that each retort can now carbonize 22 cwt. of coal per day, in the 21 in. by 15 in. size, as against 18 cwt. in the 18 in. by 13 in. size. Before this system was applied, it was only possible to carbonize 14 cwt. per retort per day in the 18 in. by 13 in. size. If you reckoned that eight retorts are now placed in one oven where there were only four to six in the old furnace arrangement, and that half the fuel is saved, you can estimate the great amount of carbonizing power and economy attained. Doubtless, in the course of a few years, the system will be more generally adopted than it is at present. There are about fifteen gas-works in Scotland, where the retorts are heated by this method, making about 3410 million cubic feet per annum, equal to 47·8 per cent. of the total manufacture; and if we take into account those works which contemplate introducing the new furnaces, nearly 60 per cent. of the gas produced will in a short time be manufactured in retorts heated by regenerative furnaces.

Judging by the frequency with which the subject of choked ascension-pipes is discussed, it would appear that these are always to be a source of annoyance. My experience is that stopped pipes are not more numerous with the regenerative settings than with the ordinary furnaces, although the temperature of the retorts is much higher. Pipes will choke in any setting, if the retorts are not evenly charged, and the liquid in the hydraulic main kept thin, to give as slight resistance as possible to the issuing gases.

The question as to the requisite temperature to which the gas should be brought in the condensers, in order to secure its proper after-treatment in the scrubbers and purifiers, is a most important one. The ever-changing temperature of the atmosphere, and the varying quantities of gas made, necessitate having a ready means whereby to regulate the cooling power. This requires constant supervision. I find that a continuous temperature of about 65° Fahr. is the best for the gas at the outlet of the condensers; but, although we may be able to control the temperature up to this point, it is next to impossible to guard against the effects of low temperatures on the scrubbers, purifiers, and gasholders; also of very severe cold on the street-mains, necessitating the use of increased quantities of high-class candle, in order to maintain a uniform quality of gas. To show how the different qualities of coal vary according to the seasons of the year, I may mention that when the temperature of the air is normal—say, 60° Fahr.—we can use coals, with good heats (say, about 2000° Fahr. in the retorts), and three-hour charges, giving an average illuminating power of 23 candles to maintain the standard quality of 23 candles; but when the temperature falls to 45° and 30°, it is necessary to use coals that will yield gas of 24 and 25 candles respectively at the normal temperature, in order to keep up the standard. These figures form a great contrast to those where 16 to 18 candle gas is supplied, as, in these circumstances, the average quantity of first-class coal used in midwinter does not exceed

5 per cent., and not more than 2½ per cent. on the yearly quantity; whereas, when 23-candle gas is supplied, it is found that in midwinter 20 per cent. of the higher class candles are required, and about 11½ per cent. in proportion to the yearly quantity. This proves that the higher the quality of the gas, the more it is subject to depreciation from atmospheric influences. It is, therefore, evident that great portions of the luminous properties of the gases are deposited in the apparatus between the retort and the consumer; the quantity depending on the quality of the gas supplied, and on the degree of cold to which the gas is subjected; and unless the extent of this is ascertained by frequent photometric testings daily, the consumer cannot be supplied with gas of uniform quality.

I need scarcely say that the scrubbing power should be sufficient to free the gas from ammonia; but it should not be taken for granted that, because there are no indications of this impurity at the outlet of the scrubbers, the gas must necessarily be free from ammonia when stored in gasholders. It is quite possible to have gas free from ammonia at the outlet of the scrubbers, yet containing ammonia in considerable quantity at the outlet of the purifiers, as a chemical reaction may take place, probably due to a decomposition of cyanides by the lime used in purification. When this occurs, means should be taken to absorb the ammonia before the gas enters the holders. Very wet lime is conducive to more, rather than less, ammonia being formed. The hydrate should not contain more moisture than 50 per cent. of its weight.

The purification of gas in closed vessels by means of the foul gases contained in itself, so far as its application to practical work is concerned, is still untried. It is unfortunate that arrangements have not been made to investigate the system advocated by Mr. William Young, who read a paper, and ably demonstrated his process at our last meeting. Apparatus on the Clans system has been erected at Belfast sufficient to purify gas from 250 tons of coal per day. This is expected to be in operation during the ensuing winter; and the results will be looked forward to with much interest. These two systems are now before the gas world; and I need only refer you for a full description of them to the past records of the various Associations. I trust that, before the expiration of another year, apparatus will be at work, showing the operation of Mr. Young's process on a practical scale; so that we may be in possession of actual data in regard to the cost of plant and working, and other necessary information, and also the relative advantages likely to be derived from employing each system.

The use of oil as a substitute for coal in gas making has again been receiving attention; the very high luminosity of the gas appearing to be considered as one of its principal advantages. This, however, is only one side of the question; and it may be conceded that we, as producers of light, are alive to the merits, or otherwise, of employing oil in our manufacture. The system may be suitable where a supply of coal gas at a moderate price is not available; but it will not be generally adopted until the "steady" price of the raw material makes it more profitable to use than coal. Even then the introduction of oil would require to be very gradual, as its use in gas-works, if only to a limited extent, would tend to greatly raise the price. The gas from oil is generally credited with being of 60-candle power. This may be the case when made and tested on the spot; but when it has to be stored and distributed in the usual manner to towns, the results may be vastly different. From practical tests made on oil gas after storage (the temperature of the gas being 48° Fahr.), I found the quality to be 37 candles, per 5 cubic feet, with a consumption of 2½ cubic feet per hour with one of Bray's No. 4 union-jet burners. When the same gas was tested with a No. 3 burner, consuming 2 feet per hour, the quality was found to be 29 candles, calculated to 5 feet per hour; making it apparent that the use of small burners is as injurious to gas of this comparatively high quality as to gas of lower illuminating power. The question arises: Is 60-candle power gas worth twice 30-candle gas, or thrice 20-candle gas? I think not. The greater pressures at which the higher qualities have to be consumed, in order to get the best photogenic results—say, from 10-10ths to 14-10ths—eject the hydrocarbon particles from the burner into the atmosphere at such a rapid rate that a quantity of them pass off unconsumed; whereas, with the lower qualities consumed at lower pressures—say, 5-10ths or 4-10ths—a greater proportion of the light-giving properties are utilized.

It is one of the most difficult problems how to get consumers to use the gas supplied to them properly; this being at the root of most of the complaints they make about the light obtained. It should be more generally known that the amount of light emitted depends as much (if not more) on the means of consumption as on the inherent quality of the gas. I trust some of the papers to be read to-day will touch on this subject. So much has already been said and written on the great waste of gas, and still so much has been left undone that the field for improvement in this respect is nearly as wide as ever. Until it is in the power of the companies and corporations to take charge of the gas supply from the meter to the point of consumption, nothing of any benefit is likely to accrue to the consumer.

In testing several of the devices intended to improve the ordinary open gas-flame, I found no increase in the luminosity per cubic foot of gas consumed from that given by the union-jet consuming 5 feet per hour at 5-10ths pressure. The inventors of most of these devices start on a wrong basis by first using small burners, thus forcing the gas through minute apertures at high pressure, and then baffling the flame at the point of ignition, instead of

regulating the pressure, and using the gas through a large burner. Although apparently a very simple matter, it seems a very difficult one to be understood, or acted upon, by the average consumer—that any ordinary burner (union-jet or batwing) provided it be the size suitable for the space to be lighted, is as good as any other (open flame), if used at the proper pressure, for the quality of the gas. When consumers cannot adjust the burners and pressure, they should, in order to obtain a good and economical light, use gas-governors (where the fittings are suitable), or burners containing within them the means for regulating the supply.

From the results of about 100 tests made on 23½-candle gas, to ascertain the relationship between the durability test and the candle power, I found (with a 5-inch flame from a single-jet burner, consuming, at 0.59 inch pressure, 1.204 cubic feet of gas per hour corrected for temperature and barometer), that the durability in minutes, divided by 2.117, gave the quality in candles. About half the number of tests ranged to 1.39 candles above, while the remainder varied to 1.36 candles below, the average results obtained by the Lethaby photometer. Considering that candles themselves may vary to a similar extent, these results would show that within certain limits the readings from the durability test may be relied on when the same class of coals and other conditions of manufacture are constant. Using the same divisor for other gases, however, I found variations of 3 to 4 candles above the actual quality, which can only be accounted for by altered conditions of manufacture. From these data we may infer that to use the durability test as a standard, it would be necessary first to obtain a factor from a series of experiments similar to the above, with comparative daily readings over a long period. We may also conclude that the same sources of error present themselves in the use of such appliances as the jet photometer.

Comparing the results obtained by testing seven types of regenerative lamps with various qualities of gas, I find the proportion of increase in light from that given by the usual test burner varies from 100 to 150 per cent. The following table gives the results of some of the tests made:—

The Illuminating Power of Various Burners (the Regenerative Lamps being at an Angle of 45° to the Candles).

No. 8 Union-Jet Burner (for Cannel Gas), consuming 5 ft. per Hour at 5.10ths Pressure.	No. 8 Union-Jet Burner (for Common Gas), consuming 5 ft. per Hour at 3.10ths Pres.	London Standard Argand.	Regenerative Lamps. "A" Series.	Regenerative Lamps. "B" Series.
25.18	—	—	49.96	—
23.50	—	—	58.29	—
22.97	—	—	—	55.02
14.02	15.69	17.39	30.98	—
12.74	14.86	17.40	27.78	—
11.52	13.81	16.35	26.91	31.81
7.02	—	13.84	—	29.45

It is generally conceded that the different qualities of gas ought to be tested in the burners best adapted to yield the highest photogenic results. Where there is no clause in the Gas Act determining the mode of testing, we may soon be having it reported that the gas supplied to certain towns is of abnormally high power—say, "50-candle gas," as shown by the photometer with the best burner, or, as some Acts put it, "the most suitable burner." When the quality of gas is stated as of such a candle power, it should, by way of comparison to that supplied by other towns which have to use the prescribed, or recognized standard burner, be mentioned as tested by a certain defined burner. This is now rendered all the more necessary on account of the introduction of incandescent burners and regenerative lamps.

In the Gas Annex of the Glasgow International Exhibition, the opportunity is afforded us of inspecting some of the latest novelties, and some of the best apparatus, in use for lighting, cooking, heating, and motive power. It will be observed that gas is still able to hold more than its own for the brilliancy and applicability of the latest forms of the light, although confronted on nearly every hand by its would-be rivals—oil and electricity. Gas lighting is applied wherever reliability is a *sine qua non*; and it is therefore ever ready to take the place of, and, when need arises, make good the defects of its luxuriously nurtured brother. The Machinery Department will also be of special interest to the members; and there, as well as in a great many other departments, the gas-engine—in its various forms—plays a very important part. Altogether we have reason to congratulate ourselves on the great success of the exhibits where gas is employed, as well as to the many useful purposes to which it so readily adapts itself. Its motto is always: "Ready, aye ready."

GAS-BURNERS FOR PHOTOMETRICAL PURPOSES.
(REPORT ON THE REMIT ON THE BEST STANDARD BURNER FOR SCOTCH GAS.)

By GEO. R. HISLOP, of Paisley.

The consideration of this subject is the result of an obligation which I have come under to your Committee, to dispose of a remit to a Special Committee of this Association appointed some three years ago, and of which I have recently been made a member, to determine "The Best Standard Burner for Scotch Gas." The title of this paper may justly excite surprise, and exact the enquiry why light is needed on such a subject, after an experience of three-quarters of a century of practical lighting by coal and cannel gas.

It cannot be denied that in the midst of abounding light on all possible questions affecting gas manufacture and distribution, we have been comparatively slow to discover the laws which regulate the elimination of the highest lighting power of different qualities of coal and cannel gas. Inasmuch as it is just within these last few years that we have been able to hail some dawning light, and now we have but entered upon a new era in the history of gas illumination, by the discovery of means whereby we are now enabled to realize, approximately at least, the highest possible lighting power of the gas. I refer to low-pressure combustion, and the utilization of the radiant and conducted heat of such combustion in the so-called regenerative gas-lamps. These are, moreover, entirely a new departure in gas lighting. But with respect to the common form of burners, while various improvements or devices have been introduced for the purpose of reducing to a minimum the pressure at the point of combustion, and with a corresponding increase in light—chief amongst which may be mentioned the ingenious automatic "Needle" governor burner—no attempt has been made to show that intensity is affected in any way under any other condition. The fact is well established that a low velocity *versus* slow combustion of the issuing gas from a burner, has an important effect upon the value of the light afforded by any quality of gas; but no definite rule has ever been laid down to enable anyone to order or procure a burner or burners exactly adapted for any particular quality of gas. Not one word of reference is ever made to the angle of the impinging jets or to relative dimensions of flame in relation to quality of gas, which I maintain are indispensable conditions. A flame even at 5.10ths of an inch pressure may be unduly spread; and this, in the case of gas of poor quality, is to expose it to over-oxidation, and the cooling effect of the nitrogen of the atmosphere, with its consequent reduction of light.

I purpose in this paper to define certain principles in the construction of burners, which have hitherto been disregarded generally, but which I hope to show are all-important in their bearing upon the quality of the gas. It is not my intention to do more than touch upon the subject of burners for domestic and public lighting; but simply to deal with the class of burners which we may or are compelled to employ under existing Acts of Parliament for the purpose of determining the highest illuminating value of the gas we deliver to the consumers, consistently with the conditions laid down in said Acts of Parliament. It will be borne in mind that one invariable condition is that "the pressure at the point of combustion shall be equal to 5.10ths of an inch;" hence all my results must necessarily be based on this hypothesis.

That our information is defective on the subject of suitable burners for testing various qualities of cannel gas will, I feel certain, be testified to by all careful experimentalists and gas managers who have to deal with gas of 20-candle power and upwards, and which is invariably tested by means of union-jets. Moreover the fact that this Association and your Committee have realized the difficulty, will itself justify the enquiry. Indeed I confess that for many years it has been a matter of considerable concern to me how or where to find burners of proper construction for different qualities of gas. When found it was purely accidental, and they were consequently prized as if worth ten times their weight in gold. Since having no definite theory regarding the construction of such burners, to order their manufacture was, of course, out of the question. I have in my experience, therefore, tried to bring to proper condition by stuffing, in various ways, all sizes and forms of burners I have been able to lay my hands upon; but general failure has been the result. But why should I succeed when the construction of the burners tried were entirely at variance with the conditions requisite to develop the lighting power of the gas? In short, the orifices of all the burners were drilled at angles much too high for the quality of gas I wished to test. Nearly all burners manufactured have their orifices drilled at angles ranging between 45° and 60° (and that without regard, apparently, to the quality of gas at all); whereas the investigations and experiments I have carried out unmistakably prove that the angle at which the holes of a burner stand to each other have a remarkable influence upon the quality of the gas. Suppose we take 22½-candle gas, the angle giving the highest intensity of light is 22°; but if the same volume (5 feet) be consumed at 45°, the illuminating power will be reduced to 19.71 candles, or 0.110 of a candle for each degree advanced; while the dimensions of the flame will have been altered from 3½ inches high by 2½ inches broad to 2½ inches high by 3½ inches broad. The table (on next page) will show similar results for all qualities of gas from 17.9 to 32.6 candles, advancing approximately 2 candles in quality for each series of tests.

In order to arrive at the results thus shown, I had specially made for the purpose of my experiments an extensive series of burners—consisting of sizes Nos. 5, 6, 7, and 8, drilled at the various angles up to 60°; but my experiments clearly proved that the No. 7 size afforded the best results for all qualities of gas. Hence I have given the results from that size of burners only. These burners were of iron, but carefully made, and without any stuffing or pressure-reducing medium save the smallest quantity of cotton-wool to prevent flaring, balance the flame, and give 5 feet per hour exactly at 5.10ths inch pressure. The illuminating power was carefully tested at the various angles, noting at the same time in each case the exact length and breadth of the flame. The latter, however, I have not given on the table, as not being absolutely necessary; but the connection between the angles of the jet orifices, the dimensions of the flame, and the illuminating power, is very marked.

Table of the Illuminating Power of Different Qualities of Gas Burned at 5-10ths Inch Pressure through No. 7 Union-Jets, Drilled at Various Angles.

Angle of Holes. Degrees.	Illuminating Power in Standard Candles.	Angle of Holes. Degrees.	Illuminating Power in Standard Candles.
(1)—17° 90-Candle Gas.		(5)—26° 29-Candle Gas.	
18	17·90	20	24·20
20	17·56	25	25·45
25	17·14	28	26·29
30	16·55	30	26·08
35	15·68	35	25·55
		40	24·51
		45	23·78
Difference for 17 deg. 2·02 cand.		Difference for 17 deg. 2·51 cand.	
Loss per degree . . 0·118 „		Loss per degree . . 0·15 „	
(2)—19° 77-Candle Gas.		(6)—29° 4-Candle Gas.	
Degrees. Candles.		Degrees. Candles.	
20	19·77	20	25·36
25	19·17	25	26·33
30	18·45	30	27·51
35	17·73	33	28·40
		35	28·05
		40	27·19
		45	26·54
		50	26·00
Difference for 15 deg. 2·04 cand.		Difference for 17 deg. 2·40 cand.	
Loss per degree . . 0·136 „		Loss per degree . . 0·141 „	
(3)—22° 25-Candle Gas.		(7)—30° 28-Candle Gas.	
Degrees. Candles.		Degrees. Candles.	
20	21·94	20	27·42
22	22·25	25	28·22
25	21·86	30	29·25
30	21·49	35	29·60
35	20·98	37	30·28
40	20·40	40	29·70
45	19·71	45	28·93
		50	28·12
Difference for 23 deg. 2·54 cand.		Difference for 13 deg. 2·16 cand.	
Loss per degree . . 0·110 „		Loss per degree . . 0·166 „	
(4)—23° 8-Candle Gas.		(8)—32° 60-Candle Gas.	
Degrees. Candles.		Degrees. Candles.	
20	23·29	30	30·27
24	23·80	35	31·20
25	23·69	40	31·87
30	23·09	45	32·60
35	22·48	50	31·66
40	22·18	55	30·80
45	21·27		
Difference for 21 deg. 2·53 cand.		Difference for 10 deg. 1·8 cand.	
Loss per degree . . 0·12 „		Loss per degree . . 0·18 „	

Table of Angles affording the Highest Results.

18 degrees for . . .	17·90-candle gas
20	19·77
22	22·25
24	23·80
28	26·29
33	28·40
37	30·28
45	32·60

The principle which I have endeavoured to lay down is that, by the elongation of the flame as the scale of quality of the gas is descending, we secure what is equivalent to a reduction of pressure at the point of combustion, of something like 2-10ths of an inch, by increasing the period of incandescence of the carbon atoms, as anyone may readily suppose would be the result in an elongated flame; and this while fulfilling the requirements of the law in having the pressure at 5-10ths inch (no reference being made in the Acts to the dimensions of the flame). A properly elongated flame cannot be obtained from a jet drilled at the usual angles, unless consumed at a pressure far below the requirements of the Acts of Parliament, and then a smoky flame would result.

It will be observed from the table that the necessary angle for the lower qualities of gas increases rather slowly as compared with that required for the higher qualities of gas; and it will be obvious to all that, by ascending the scale of quality, a corresponding increase of angle and more direct impingement of the issuing gas, will be necessary to burn 5 feet and secure the highest results, which, as a matter of course, is just under the smoking point. Conversely, by descending the scale of quality, the angles must be reduced, and with this a gradually narrowing flame, till we should reach for the 5 feet consumption a round flame like that of a rat-tail burner—the diameter of the burner tip cup being, of course, narrowed with the narrowing flame. Thus the principles I have laid down may be represented by two lines drawn from a point, the point representing gas of the value of say 5 candles with a solid flame, and gradually diverging till representing the diameter of the flame of gas of the highest intensity, or say 32·6 candles at an angle of 45° (as per table), and which gives 3½ inches as the breadth of the flame (by 3½ inches high). Thus, in gradually rising or descending the scale of quality, I contend that the diameter of flame giving highest intensity for different qualities of gas will fall within these converging lines.

With regard to burners made on this principle for ordinary lighting, it will be necessary only to obtain them at angles of say from 5° to 7½° higher than those giving the highest intensity for photometrical purposes—depending upon whether for domestic or factory use.

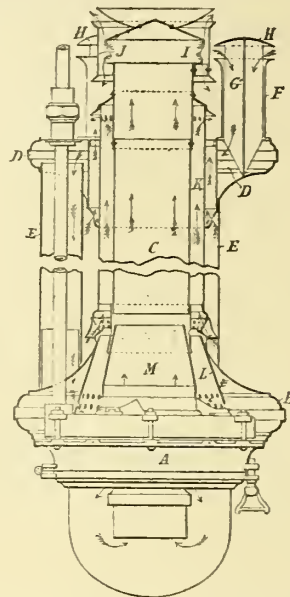
I might have said much more upon this important subject, but I trust I have made sufficiently clear to you the principle upon

which burners for all qualities of gas ought to be constructed; and if so I shall have discharged my obligation to your Committee to dispose of the remit "On the Best Standard Burner for Scotch Gas."

Register of Patents.

GAS-LAMPS.—Gordon, T., of Philadelphia, U.S.A. No. 11,698; Aug. 29, 1887. [8d.]

The object of this invention is to construct a gas-lamp that may be exposed to the varying conditions of the atmosphere without serious disturbance of the flame.



In the accompanying illustration, A is the burner; and B, an approximately air-tight chamber surrounding it. C is the escape flue of the burner; D, an air-tight chamber surrounding the escape flue; E, air tubes connecting the chamber B with D; and F, air tubes extending upwards from D. G are partition plates which may extend downward within the air tubes F; H are caps or plates which rest upon, or may be attached to the upper ends of the partition plates G; and I is a wind cap attached to the escape flue of the burner. Surrounding the flue C, is arranged a flue K, open top and bottom; air being allowed to circulate between the flues to prevent radiation of heat to the tubes E, also to prevent the cooling of the flue by sudden blasts of cold air.

When the burner is in operation, the waste products pass up through the flue C, producing a draught and causing the cold air to circulate downward through the passages E, and thence (as shown by the arrows) through the regenerative chambers of the burner. The object of this form of construction is to overcome the principal difficulty experienced with lamps in which the inlet and outlet are at opposite ends of the fixture—viz., the reversal of the draught in the escape flue, caused by gusts of wind sweeping past the inlet. The suction on the inlet is balanced by the arrangement of the partition plates within tubes F. From whatever direction the wind may blow, air is taken in on one side of the plates, to compensate for that drawn out on the other side.

To facilitate the lighting of the burner, and to prevent the circulation from being started in the wrong direction, a cone L is employed, which makes a tight joint with the chamber B above the air inlet. The top of the cone approaches the edge of the discharge cone M, so as to form a species of reducing nozzle or injector, which discharges through suitable openings round the base of the pipe C, and thus tends to create an up-draught through the discharge cone M and escape tube C. To prevent down gusts of wind in the escape tube, and to maintain an even discharge therefrom (and consequently an even flame within the lamp), the wind cap is made small enough in diameter to allow of only about half the waste products escaping at the top, while the rest should pass out at the bottom, as indicated by arrows. This throttles the suction without impeding the draught, and prevents any violent fluctuation of the flame.

VALVES FOR LIQUID METERS.—Barton, C. C., of Edinburgh. No. 11,699; Aug. 29, 1887. [8d.]

In patents No. 1561 of 1883 and No. 2876 of 1885 are described certain water meters designed by the present inventor; and in patent No. 4029 of 1887 improvements in the construction of liquid meters are detailed—part of such improvements relating to the construction of valves used therein. The present invention relates to further improvements in such valves; but the description is not intelligible apart from the specifications of the three earlier inventions.

GAS-MOTOR ENGINES.—Abel, C. D.; communicated from the Gas Motoren Fabrik Deutz, of Deutz, Germany. No. 12,187; Sept. 8, 1887. [8d.]

This invention relates to the construction of engines worked with combustible gas and air compressed previous to entering the engine cylinder. The principal feature of novelty is the method employed for forcing the combustible gas and the air separately into a reservoir, in such manner that they are only in contact over a very limited surface, so as not to mix to any practical extent. The inlet for the gas is situated near the inlet port of the cylinder, so that when this port is opened the gas enters first into the cylinder, and then the compressed air; the two mixing in the cylinder to form a combustible charge.

WOOD GRIDS FOR GAS-WORKS PURIFIERS.—Lowe, E., of Rowley Regis. No. 3159; March 1, 1888. [8d.]

Purifiers constructed according to this invention are made entirely

of wood, so as to minimize their liability to deteriorate through the action of the gas passing through the purifiers. The wooden bars of the grids are arranged parallel to each other, and maintained at equal distances apart by means of distance pieces; the bars and distance pieces being connected together by passing transversely through them tie rods composed of ash or other hard wood. Screw threads are cut in the opposite ends of the rods; the threads at one end of the rods being designed to enter threaded holes in a side bar of the grid, and the threads at the other end, to receive wooden nuts, which, when screwed home, will bear against the other side bar, and hold all the parts of the grid firmly together.

APPLICATIONS FOR LETTERS PATENT.

10,430.—SWEET, A., "Improved arrangements for automatically controlling or regulating the flow of, or combustion of gas used in heating liquids." July 18.

10,462.—WILLIAMS, H., "Improvements in mechanism for regulating the supply of gas or other fluid to motor engines." July 19.

10,490.—JARMAN, A. J., and STEBBING, W. C. S., "Improvements in the construction of gas economizers, and means employed for utilizing same." July 19.

10,508.—MITCHELL, J., LAIDLAW, R., and MACLAREN, R., jun., "Improvements in liquid-meters." July 20.

10,561.—HOYLE, W., "Lighting fires for domestic purposes by means of ordinary coal gas as is in use in any dwelling-house for lighting or cooking purposes." July 21.

10,678.—CASSON, R. S., and TALBOT, B., jun., "Improved gas-furnace." July 24.

10,742.—STUBBS, G., "Improvements in the construction of gas-cocks." July 25.

10,748.—CAMPBELL, H., "Improvements in gas motor engines." July 25.

PATENTS WHICH HAVE BECOME VOID.

[AFTER THE FOURTH YEAR.]

6093.—BEILBY, G. T., "Thermometry."

6174.—FLETCHER, T., "Gas-ovens."

6210.—REDMAYNE, T., "Gas-burners for cooking."

6273.—WILSON, A., and another, "Dip-pipes."

6489.—CAINK, T., "Indicating passage of water through meters."

6618.—BONNA, A., "Fluid-meters."

6631.—SCHWAB, M. (Overhoff), "Making of illuminating gas."

EXTENSION OF THE WOOLWICH ARSENAL GAS-WORKS.—Considerable extensions of the scrubbing and purifying plant at the Woolwich Arsenal Gas-Works are about to be made; and the War Office has selected Messrs. Willey and Co., Gas Engineers, of Exeter, to execute the work.

TAUNTON GAS COMPANY.—At the forty-third annual general meeting of this Company to be held to-day, the Directors will recommend dividends of 8 and 7 per cent. on the two classes of shares. This will leave a balance of about £2112 to the good. The quantity of gas sent out in the twelve months ending June 30 last was 57,214,000 cubic feet.

MAITLAND GAS COMPANY, LIMITED.—The thirty-first half-yearly report of the Directors of this Company, a copy of which has been forwarded to us by the Secretary (Mr. C. E. Crutch), states that the profit on the working in the six months ending April 30 last amounted to £939 which was increased to £1018 by £79 brought forward. Out of this, a dividend at the rate of 8 per cent. per annum was recommended, absorbing £820; £300 was to be written off works; and the balance carried forward. The continued prosperity of the Company was reported; an impetus having been given to the consumption of gas by a reduction in price.

THE WOLVERHAMPTON CORPORATION AND THE WATER SUPPLY OF BILSTON.—At the last meeting of the Bilston Improvement Commissioners, a report by the Sub-Committee appointed to deal with the water question, as between the Commissioners and the Wolverhampton Corporation, was presented. It set forth the result of the recent proceedings in regard to the Provisional Order applied for by the Corporation, in which the opposition of the Commissioners failed, and stated that the Sub-Committee had decided not to proceed further in opposing the Order, because if the opposition were successful in the Lords—and there were good strong reasons for believing it would be—no benefit would accrue to the Commissioners if the Corporation withdrew, as they said they would, that part of the Order to which the Commissioners objected, beyond the barren result of compelling such withdrawal. The money which it would take to oppose in the Lords would go towards promoting a Bill to dissolve the contract. The Sub-Committee considered, therefore, that Parliament, on it being proved to them that the Commissioners could obtain a good supply of water for 2½d. per 1000 gallons, and that the Corporation proved in the arbitration that they could not supply it for less than 5d. per 1000 gallons, would, without hesitation, on the ground of public policy, determine the contract. The Commissioners were recommended to empower the Water Committee to seek an interview with the Local Government Board on the subject, and report thereon. This was agreed to.

THE ELECTRIC LIGHT QUESTION AT BATH.—At the meeting of the Bath Town Council last Tuesday, the debate on the report recommending the adoption of the electric light for the central part of the city, which was commenced at the previous meeting, was resumed. Alderman Clark pointed out that the prosperity of the city depended upon its attractiveness, and asked why they should not adopt the beautiful electric light, which was the "light of the future." Mr. Heywood expressed the opinion that the question should be deferred for at least twelve months; as the rates were already increasing, without a further addition being made to them by the adoption of the new light. Mr. Rubie considered they were a little premature, and thought they could afford to wait another year; but he should certainly like to see the light introduced at the baths. Mr. Cox argued that the electric light would cost the citizens £927 a year more than gas. A good deal had, he said, been made of the lighting at Taunton; but he was not quite sure that they might not hear of a catastrophe there. The Gas Company should improve their gas, and nothing more would be needed. Mr. Walker contended that the introduction of the electric light would commit the city to an unknown expense. Mr. Sturges, replying on the discussion, said "procrastination" was the "thief of time." Many a good purpose had been ruined by people being contented to think that something better would turn up, instead of striking the iron while it was hot—when they were able to make an impression. On a division, 22 voted for the adoption of the light, and 12 against—8 members (shareholders in the Gas Company) not voting.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

"AMBITIOUS" SECRETARIES.

SIR,—In a recent issue of the JOURNAL you very significantly applied the term "ambitious" to certain secretaries of gas companies; and much might be written on the subject which will apply equally well to ambitious engineers. It is much to be regretted, however, that anything should be said to stir up envy and jealousy amongst gentlemen occupying these respective positions. A secretary or engineer would be worth very little if he were not ambitious to promote the best interests of his employers; and there is not the slightest necessity for either position to be subordinate to the other. Neither gas engineers nor secretaries can exist without adequate support; and you may be very certain that the "self-sufficient committeemen and directors" would "belittle and ignore either one or both." There have been engineers who have simply been "ambitious" to serve their own interests, promote the use of their own patented machinery, buy materials in markets approved by themselves, fill the works with men of their own choosing, and the better positions with their own favourites or members of their own families. Can you wonder, therefore, that a secretary should endeavour to alter this state of things, and when such matters are brought to the knowledge of committeemen and directors, that they should support his efforts? On the other hand, there have been secretaries who have meddled to mar everything in connection with the gas-works. They have succeeded in setting committeemen or directors by the ears, and introducing amongst them personal bickering and strife. They have behaved harshly to their subordinates, and for themselves have laid up stores of "wrath against the day of wrath." They have thus brought about a state of things of extreme difficulty, and of constant irritation and vexation. There are, however, engineers and secretaries who do work well and happily together, without thought as to "who shall be greatest." Be it yours and mine to endeavour to extend and promote this desirable state of things.

The real difficulty to be contended against is that directors and committeemen too often overrule and ignore both the engineer and the secretary. They are apt to think that anybody can make gas and keep the accounts, and that £200 or £300 a year is a big salary. They are "practical" men themselves and see in a good bricklayer or a stalwart navvy all that is needed in a manager of works, and that there are plenty of clerks who have had a School-Board training who will fill the post of secretary at very low wages. There may be exceptional cases in which all this is true; but it ought to be remembered that the position of a gas manager, especially in the larger and progressive works, requires a man of engineering skill, chemical knowledge, general intelligence, and ability seldom (if ever) found in the merely so-called practical man. Nor will any clerk do for a secretary; and few there are who have the qualities you enumerate as fitting a man for this position. He must be "an educated accountant, with a knowledge of finance and some acquaintance with company law and practice." In addition, there are many qualities which he ought to possess, without which he will be utterly unfit for the position, or in it prove himself a fraud.

July 25, 1888.

RETORT.

THE PHOTOMETER QUESTION AT THE GAS INSTITUTE MEETING.

SIR,—The testings I mentioned in my letter in the JOURNAL for the 17th inst. are not those referred to by Mr. Heisch in his letter in your last issue, but a series taken at the Three Nuns Hotel, Aldgate, about a stone's throw from my office in Jewry Street. They were, I believe, made at the suggestion of the then proprietor, the late Mr. East, who complained that the gas supplied to his premises was not of the quality reported by the Examiner.

Mr. Dibdin says he is supported in his views regarding the Evans photometer by Mr. Heisch; but that gentleman states distinctly that he objects to it, because it gives *low results*—which is quite the reverse of what Mr. Dibdin advances as his reason for condemning it. Mr. Heisch attributes the low results to which he refers to the presence of an excessive amount of carbonic acid in the air supplying the burner. Now, a simple estimation of the quantity of carbonic acid in the air inside the photometer would settle this aspect of the question; and I am surprised that this has not yet been done. I have, however, commenced some experiments in this direction, the results of which I will forward to you in a few days.

I am afraid this subject cannot be satisfactorily discussed without introducing candles, which seems to be objectionable to Mr. Dibdin. Indeed, on reading his paper, the question immediately arises: How much of the blame hitherto attached to candles is fairly attributable to them, and how much to the photometer? For my part, I incline to the belief that the candles must bear most of the blame; but, in the absence of details showing the condition of the wicks, the position of the bend of the wicks in relation to the photometer-bar (in other words, the position of the candle-flames), the number of times the candles have been lighted and blown out before commencing the test, and the length of time they have been burning, it is impossible to criticize published results. My experience teaches me that fairly uniform results can only be obtained with candles under the following conditions:—(1) They should have been burnt until the tips of the wicks glow, blown out, and allowed to cool at least three times before use. (2) The tips of the wicks should be not more than $\frac{3}{8}$ inch from the top of the candle; and they should bend at right angles to the photometer-bar, so as to bring the flames in a line to the pointer. (3) They should never be allowed to burn more than 15, or less than 10 minutes before use. If these precautions are not observed, there is a risk of obtaining results higher than the truth, no matter whether an open or a closed photometer is used. I have a strong suspicion that the discordant results obtained by the several experienced Metropolitan Gas Examiners in July, 1879, before the Committee appointed by the Board of Trade to inquire into the question of standards of light, were caused by neglect of the first of the above conditions, as they were each supplied with fresh candles, and requested to use them as they were accustomed

to do. I was one of the Examiners, and my result was 16.3 candles; but I think others made the same gas 18 candles.

Having officially to test the gas at seven different provincial gas-works, I have, for many years, had to use a variety of photometers, including one of the "old converted" Evans (which is at the present moment in disgrace for giving low results). Whenever low results have been obtained, they have always been confirmed by the appearance of the flame; and when the results have been higher than the size of the flame would seem to justify, the candles have been found to be defective. Therefore I cannot support Mr. Dibdin in his condemnation of the Evans photometer.

If the Gas Referees, in their half-yearly "Notification," were to give as much attention to the mode of using the candles as they do to the extremely simple operation of estimating the sulphur in the liquor of the sulphur apparatus, and provide a stringent code of rules to be observed, I feel convinced that it would be found to be quite immaterial whether an open or a closed photometer was in use.

Poplar, E., July 27, 1888.

W. C. YOUNG, F.I.C., F.C.S., &c.

Since the above letter was in type, we have received the following communication:—

SIR,—I have completed my estimations of the amount of carbonic acid in the air inside and outside an improved Evans photometer; the results, stated in percentage by volume, being as follows:—

Inside Air, taken from immediately under the burner, gas and candles burning, and photometer closed—

(1) 0.0676 (2) 0.0601

Outside Air, taken from front of photometer, 5 feet above the floor or same height as burner in photometer—

(3) 0.0601 (4) 0.0563

Inside Air, taken from immediately under candles, 18 inches from the disc, photometer closed, gas and candles burning—

(5) 0.0563 (6) 0.0563

These experiments show very clearly indeed how efficient the ventilation is in this photometer, especially as each extended over two hours, during the whole of which period the photometer remained closed, whereas in ordinary use it is closed for ten minutes only. The higher results of Nos. 1 and 3 are sufficiently explained by the fact that they were taken at night, whilst the others were taken in the early part of the day.

In order that your readers may judge of the degree of purity the above figures indicate, I may quote as follows from the late Dr. R. Angus Smith's well-known work on "Air and Rain:—" "When people speak of good ventilation in dwelling-houses, they mean, without knowing it, air with less than 0.07 per cent. of carbonic acid."

Poplar, E., July 28, 1888.

W. C. YOUNG, F.I.C., F.C.S., &c.

MECHANICAL V. HAND STOKING AT THE MANCHESTER CORPORATION GAS-WORKS.

SIR,—In reply to Mr. West's letter in your issue of the 17th inst., I should like to add a few words, beyond which I do not desire to continue the correspondence.

I do not incline to enter on the further question raised by Mr. West as to the relative cost of hand and machine labour. My object was simply to correct Mr. West's error as to the cost of Nos. 1 and 2 retort-houses in carbonization. On referring to the wages book, I find that the total wages and the amount charged under each head as "Carbonization," &c., all bear the signature of "John West," as certifying to their accuracy. If there is any error, it is hardly for Mr. West to say so; but I believe them to be correct. The wages include sub-forgemen, firemen, machine-men, buttyers (i.e., men who open retort-lids, and assist at pipe-opening and wheeling coke from the house), scurfers (who also assist at pipe-opening), coal wheelers and quenchers, engine men, valve boys to work the "automatic" anti-dip valves, and extra men employed by Mr. West in winter for pipe opening and valve cleaning; all of which are classified by Mr. West under "Carbonization." There is an item of cost which is not included, which would have arisen under the head of "wheeling coal" had all the houses at the station been constructed like Nos. 1 and 2. In such case they would have had to share their proportion of the cost of wheeling coal to the breakers from the store accumulated during summer. As it was, the other two houses having, from their arrangement, to wheel all their coal, enabled Nos. 1 and 2 to take nearly the whole of their requirements from the daily supply, and the coal was consequently delivered direct to the breakers without the cost of wheeling.

That the figures which I gave as the carbonization wages were certified by Mr. West, is, I think, sufficient to justify my statements.

Manchester, July 26, 1888.

JOHN KING, jun.

MR. HUNT'S CRITICISMS ON MR. CARPENTER'S PAPER.

SIR,—I am rather disappointed with Mr. Hunt's response to my "questioning," as he puts it. I was afraid he would make a quibble about the adjective "workable," as very likely he considers there is no workable regenerative furnace except his own at Birmingham. So I will repeat the question, but leaving out the word "workable," and hope for an answer. I am glad to see that Mr. Hunt admits, although in a half-hearted kind of way, that it was London that set the fashion of regenerative firing in this country. This may be taken as "absolutely something" towards "the great advancement."

It is quite true I omitted all mention of the tar employed as fuel, because I had no means of knowing how much tar had been used in Birmingham. But I will take Mr. Hunt's figures, and grant the additional equivalent of 2.1 bushels of coke to the 9.9 bushels as per "Field's Analysis," giving the South Metropolitan Company, which he quotes, a full consumption of 12 bushels per ton on their make of 49.8, or about 25 per cent. At the same time there appears to be no reason why the make of coke per ton of coal should be less in Birmingham than at the South Metropolitan works. In fact, it ought to be larger, as in Birmingham much less canal is used—only 0.62 per cent. And, on looking down the list, I notice some of the neighbouring towns, using a very large quantity of canal (ranging from 12.30 to 50.30 per cent.), credit

themselves with a much higher yield of coke per ton; in one instance 51.2 bushels, or about 10 bushels more than Birmingham. But taking the make to be only the same as the South Metropolitan, 49.8 or 8.1 bushels to be added to the 9.6 bushels as per "Field," then the coke used for fuel in the furnaces at Birmingham is 17.7 bushels, or 35.5 per cent. of the make. This cannot be considered a very good record for such elaborately constructed furnaces; and I believe all, or nearly all, the furnaces in use in Birmingham are on the new system, while I think I am correct in stating that at the South Metropolitan works they have not more than one-fifth or one-sixth of their retorts heated with any description of regenerator furnaces. For some reason or other, I understand there is difficulty in applying them to the old retort-houses; but they are using them and erecting them in all their new houses.

But it is not so much with reference to the fuel comparison of the furnaces that I now write, although that is very interesting, and it is, of course, possible that there may be some cause for showing a low make of coke, which is not explained in "Field's Analysis." What I am disappointed in, and I think your readers will be also, is that Mr. Hunt declines to mention the places in the provinces where, as he states, "it is no uncommon thing to hear of a make of 10,000 feet and upwards per mouthpieces by regenerating furnaces." I should like to know where in England it is done; so, to take away any and all appearances of the "circular-of-inquiry" style from the question, and thus remove Mr. Hunt's objections, I will not ask him for the particulars I wished him to mention, but only for the names of a few towns where this make is obtained, and if it is done in Birmingham.

July 27, 1888.

A. B.

SIR,—In connection with the point raised by your correspondent "A. B.," will you allow me to state that, after deducting the fuel-value of the tar burnt, I sell 10.3 cwt. of coke for every ton of coal carbonized? Taking the figures given in "Field's Analysis" for 1887, Birmingham works out to 8.5 cwt. on the same basis; that is, it sells nearly 2 cwt. of coke less per ton of coal carbonized.

CHAS. C. CARPENTER.

July 28, 1888.

THE INCREASED USE OF COKE.

SIR,—My experience in the above matter, to which reference has lately been made in the JOURNAL, is a pretty wide one, having been for many years closely connected with new processes and new applications of fuel for manufacturing purposes; and there can be no doubt whatever that a very large proportion of the increase in the demand for coke is owing to the development of new processes and the improvement of old ones. I am daily brought into contact with manufacturers who are endeavouring to improve existing processes. In many cases gas is selected, but when the work to be done is on anything like a large scale, coke is practically the only fuel which is admissible for exact work; and a very few manufacturers in each town who commence using it will soon make a serious difference in the demand. Owing to its freedom of motion in a furnace, coke is the only fuel which can be employed in self-feeding furnaces; and these are the only furnaces of the slightest use for steady temperatures. Our system of using coke exclusively has been examined by visitors from all parts of the world, although there is nothing whatever in it except a little management.

As regards forced draught, this is quite unnecessary in any ordinary case. The mistake usually made is that the fire-bars are set much too low. Coke always requires to be used as a thick fire; and the top of it should be as near as possible to the boiler—a good average distance being about 12 inches from the top of the fire-bars to the lowest part of the boiler. Further than this, we fill up our boiler-flues with loose fire-brick, until the space does not exceed 5 inches. So that not only are the burnt gases kept close to their work, but we also get valuable radiant heat from the mass of bricks. The brickwork is loose, to admit of easy removal for inspecting the boiler. One point of importance for forge work is that the coke shall be broken to a uniform and small size.

Personally, I have no faith whatever in the domestic use of coke in open fireplaces. The constant liability to "sparking," and the consequent risk of fire, will always be a severe check on its use. On the Continent, where close stoves are universal, this objection does not exist; and therefore coke, being the best fuel for this class of stove, will always fetch its full fuel value. In England, where close stoves are comparatively few in number, this demand is, and will remain, very small; and it is to the use of coke for manufacturing purposes and steam raising, that we must look for a demand of any importance. If all were like ourselves, the coke question would never have been raised; as by a curious combination of circumstances, we not only employ gas and coke in fairly equal quantities, but we also use both tar and ammonia products; and our necessities therefore make us consumers of practically the whole of the residuals of coal carbonization. So far as the use of coke is concerned, I think I may fairly claim to have been directly the cause of a demand for many thousands of tons per annum for purposes to which this fuel has not been previously applied; and a large proportion of this demand has arisen within the last two or three years.

Warrington, July 26, 1888.

THOS. FLETCHER.

GAS-PIPES DAMAGED BY LIGHTNING.

SIR,—A singular occurrence took place at St. Ives (Hunts) on Wednesday last. A thunderstorm passed over the town, and the lightning struck the premises of Messrs. Cooto and Sons, coal merchants. Their spacious office is lighted by copper ventilating Argand gas-pendants; the products of combustion being conveyed through the ceiling into the roof. The electric current descended the ventilating shaft of the gas-burner over the desk of the cashier (who was fortunately absent at the time), and made its exit by the office door, which was open. No damage was done here. The adjoining house is occupied by one of the clerks; and there a gas-pipe was melted and the gas ignited. From an inspection made here, the electric current was conveyed into the roof of the dwelling-house by the spouting, which is coupled up by a zinc pipe to convey the rain water to a tank under the roof. A 3-inch lead pipe is brought from the tank down through a bed-room and into the scullery, and carried partly round the scullery near the ceiling; crossing at right angles, and so as to touch a 1-inch composition pipe which conveys gas to a bracket. Here the gas-pipe was fused, and the gas ignited. There

is no chimney in the scullery or in the bed-room above. No other damages to the premises could be traced. I shall be glad to learn whether any of your readers have had similar experiences.

Gas-Works, St. Ives, Hunts, July 28, 1888.

W. J. BEST.

Parliamentary Intelligence.

HOUSE OF LORDS.

MONDAY, JULY 23.

The Llanelly Local Board Bill was reported, with amendments. Petitions were presented against the Electric Lighting Order Confirmation Bill from the London Electric Supply Company, Limited, and from the United Vestry of the parishes of St. Margaret and St. John, Westminster.

TUESDAY, JULY 24.

The following Bills received the Royal Assent by Commission:—Gas Provisional Orders Bills (Nos. 1 and 2), Gas and Water Provisional Orders Bill, Local Government Board Provisional Orders Bill, Edinburgh and Leith Corporations' Gas Bill, Falkirk and District Water Bill, Frodsham Gas and Water Bill, Limsfield and Oxted Water Bill, Lincoln Corporation Bill, London Sea Water Supply Bill, and West Surrey Water Bill.

HOUSE OF COMMONS.

THURSDAY, JULY 26.

The Staffordshire Potteries Water Bill (Lords) was read the third time, and passed, with amendments.

FRIDAY, JULY 27.

PRIVATE BILL LEGISLATION.

Mr. CRAIG-SELLAR gave notice that early next session he would call attention to the report of the Joint Committee of the two Houses of Parliament on Private Bill Legislation [given in another column], and move a resolution urging the Government to legislate on the subject.

IRISH MUNICIPAL FUNDS AND LOCAL BILLS.

A Bill to enable Corporations in Ireland to apply municipal funds in the promotion of Local Bills in Parliament was presented and read the first time.

Legal Intelligence.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

MONDAY, JULY 23.

(Before the MASTER of the ROLLS and Lords Justices LINDLEY and BOWEN.)

LEWIS AND OTHERS v. CORPORATION OF SWANSEA.—LEWIS v. THE SAME. PENALTIES FOR FAILING TO SUPPLY COMPENSATION WATER.

These were appeals from the decisions of Mr. Justice Denman, at Swansea, and Mr. Justice Wills at Cardiff, in actions brought by the plaintiffs to recover penalties and damages for not sending compensation water down a certain stream. The facts have already been reported in the JOURNAL.* The action in the first case was tried before Mr. Justice Mathew, who gave judgement for the plaintiffs; but the Corporation of Swansea obtained an order from the Court of Appeal for a new trial, which took place before Mr. Justice Denman, who did not accept the defendants' plea of inevitable accident, and allowed the plaintiffs penalties for four days—directing the damages sustained to be assessed. The plaintiffs entered a cross appeal, on the ground that the penalties ought to have been given for five days instead of four. In the second action Mr. Justice Wills gave penalties for 135 days, with damages, on account of the defendants having failed to supply water to the plaintiffs, who are mill-owners and riparian proprietors on a certain stream. The case for the Corporation was that there had been no failure, neglect, or default on their part, and that the omission to send down the water was owing to inevitable accident. The penalty provided in the Act of Parliament which authorized the Corporation to use the water in three streams for their water-works was £5 for every day they failed to send down the stream a certain quantity of water for the use of the riparian owners. Another question the Court had to decide was whether the penalty had to be paid to the owners as a class or to the owners separately; and the Corporation's case was that only one penalty of £5 was payable. Their main contention, however, was that they were not liable because the water had not failed through any act of theirs.

Mr. FINLAY, Q.C., M.P., Mr. R. T. REID, Q.C., and Mr. D. LEWIS appeared for the appellants; Mr. M'INTYRE, Q.C., Mr. HENN COLLINS, Q.C., and Mr. T. BULLEN for the respondents.

At the conclusion of the arguments,

The MASTER of the ROLLS proceeded to give judgment. He said that in order to entitle the plaintiffs to recover, it must be shown that the Corporation had neglected to do certain things, the failure to perform which prevented the flow of water down the streams. The reservoir had cracked; but this could not be regarded as an inevitable accident, seeing what was the extent of engineering skill in this country at the present day. The Corporation could have repaired the reservoir, and therefore it was an act of theirs which prevented the flow of water down two streams. Consequently they were liable. The question next arose, Who was to receive the penalties? The person only who brought the first action to recover a penalty could not recover it; a number of persons could not also recover for the same failure and neglect. It would be monstrous if more than one penalty could be recovered against the Corporation for one day's failure to supply water. The judgment of the Court would be that the plaintiffs who first brought the action for penalties should recover them. The penalties for the 135 days would be recoverable, and both the respondents would be entitled to such damages as they could show they had sustained. As the parties had partly succeeded and partly failed, there would be no order as to the costs of the appeal.

Lords Justices LINDLEY and BOWEN concurred.

Mr. FINLAY asked what order would be made as to costs of the trial before Mr. Justice Mathew. The plaintiffs, he said, had had their claim of £1000 cut down to £40.

Mr. M'INTYRE said the costs of that hearing were to abide the result.

The Court declined to make any order as to the costs of the trial before Mr. Justice Mathew.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

TUESDAY, JULY 24.

(Before the LORD CHIEF JUSTICE and a Special Jury.)

BURSTAL v. HAWKSLEY.—A QUESTION OF COMMISSION.

This was an action brought by Mr. E. K. Burstal, the Water Engineer of the Oxford Corporation, against Mr. T. Hawksley, who had been specially employed by the Corporation in connection with the construction of the filter-beds for their water-works, to recover a share of the commission he had received on the work under an alleged agreement come to between them to share it in certain proportion. It appeared that in 1880 Mr. Hawksley, who had been Consulting Engineer to the Corporation of Oxford for upwards of 30 years, recommended Mr. Burstal as Resident Engineer, and he was employed as such at a salary. In 1880 the Corporation resolved to establish filtration water-works for the city; and Mr. Burstal, who had been associated with Mr. Hawksley at Rochdale and other places, drew some plans for the purpose (without, however, making any borings to ascertain the nature and capacity of the soil). The Corporation then consulted Mr. Hawksley, and in October, 1882, came to a resolution that the works should be carried out by him as the Consulting Engineer, and by Mr. Burstal as the Resident Engineer. In consequence, it was said, of some mistake, the word "jointly" was introduced into the minute of the resolution. But Mr. Hawksley pointed out that it conveyed a wrong idea; and the resolution really agreed to was that he should be employed as Engineer-in-Chief and Mr. Burstal as Resident Engineer. Mr. Hawksley, finding that Mr. Burstal had drawn some plans, desired to see them, but said he must be solely responsible for them, and that they must be drawn in his office. He made borings for the purpose of ascertaining the nature of the soil; and his plans were drawn with an important difference. The works occupied some years, and were not completed until 1886. In 1887, Mr. Hawksley received his commission—about £700; and Mr. Burstal claimed two-fifths of this sum, under the alleged agreement to share the commission in the proportion of two-fifths to three-fifths. This Mr. Hawksley entirely denied; and hence the present action to recover £284.

Mr. FINLAY, Q.C., M.P., and Mr. COURTENAY FOOKS were for the plaintiff; the ATTORNEY-GENERAL (Sir R. E. Webster, Q.C., M.P.) and Mr. DANCKWERTS for the defendant.

Mr. Galpin, who was Mayor of Oxford and Chairman of the Water Committee at the time the agreement was said to have been entered into, was called to prove a conversation respecting it.

Plaintiff also gave evidence as to the agreement. In cross-examination he admitted that, though he had been associated with Mr. Hawksley as local engineer in other water and sewage works, he had never before made such a claim upon him as the present. This he explained by saying that there had never been ground for such a claim. He admitted that Mr. Hawksley said he must make his own plans, and did so; and that he made borings for the purpose of ascertaining the fitness of the soil. He also admitted that the plan he had drawn would require an alteration or addition of a certain nature with reference to something in the character of the soil which he afterwards discovered.

This closed the plaintiff's case.

The ATTORNEY-GENERAL then addressed the jury on behalf of the defendant, whose position in his profession, he said, made it a matter of indifference to him whether he should pay £200 or £300, if it was really and legally due; but he felt it his duty to resist this claim, for which he considered there was no foundation whatever, and his yielding to which would set a very bad precedent as to the relations between resident engineers and engineers engaged, as he had been, upon special works. Mr. Hawksley had, he said, been employed to construct water-works in 130 places, in some of which Mr. Burstal had been Resident Engineer, and he had never had such a demand made upon him before; so that he felt bound to resist it on this occasion.

Mr. Hawksley was called, and entirely denied having had any conversation or made any agreement as to dividing with Mr. Burstal the commission he was to receive, which was the usual 5 per cent.; such a course being quite contrary to his principles and practice. He admitted that he received plans of the site, as well as the levels, from Mr. Burstal; but this, he said, was always the work of the local engineer. In no other way did he have any assistance from Mr. Burstal.

In cross-examination by Mr. FINLAY, witness said he could not remember having any conversation with Mr. Galpin on Oct. 5, 1882, as to a commission of 5 per cent. promised in a letter received by him from the Town Clerk on Sept. 11; his mind being quite blank as to what passed at that interview. Being referred to the resolution of Oct. 12, 1882, appointing himself and Mr. Burstal "jointly" at 5 per cent. commission, and that he was to have £50 a year, witness said that the latter arrangement was merely a general retainer, just as it might be in respect of a Counsel. He expected to be engaged when he first went down to Oxford in October, 1882; and then the whole matter went off, and the Corporation made a fresh engagement, reopening the matter on April 21, 1883. The commission of 5 per cent. was the usual commission paid to a chief engineer.

The LORD CHIEF JUSTICE: It was to be paid "jointly" to you and Mr. Burstal, as you very properly point out. Is that usual? Did you expect to get it all?

Witness: Certainly not, my Lord, as the resolution at that date stood. But I say the position has since been altered.

The LORD CHIEF JUSTICE: Then what is he to have out of it? You see, that is the question we are now trying.

Witness: I cannot say, my Lord, how much. I say that the original resolution went off. I said nothing to the original proposal—I was silent on the subject.

The LORD CHIEF JUSTICE remarked that there was an old saying that silence gave consent.

Re-examined by Mr. DANCKWERTS: When engineers are not appointed joint engineers, they do not share the commission. In the engineering profession "jointly" means that any responsibility entailed is to be shared jointly by both officers, in order to entitle them to share the commission; and in this case, on April 21, 1883, the Corporation passed a resolution specially refusing to allow Mr. Burstal to share any of the responsibility, and placing it all upon me. It is this that distinguishes the case. It is the universal custom that where there is an engineer-in-chief, he alone is responsible, and the resident engineer has no responsibility. At the meeting of the Water Committee on April 21, 1883, the matter of construction, &c., having been discussed, it was resolved that I was to be Chief Engineer and Mr. Burstal Resident Engineer. At that meeting I was, for the first time, instructed to prepare plans and drawings; I had done nothing in that way before. On that occasion Mr. Burstal stood up and said, "What is to be my position?" No answer was given. At this meeting every former arrangement was superseded, and an entirely fresh arrangement was entered into.

Mr. C. Hawksley said he had been in partnership with his father for 20 years, and was acquainted with the resolution in question. He agreed with what the last witness had said as to the professional custom. In his experience he had never heard of any such arrangement as that suggested

* See Vol. LI., pp. 735, 1096.

by the plaintiff. He first heard of it when the plaintiff's letter, demanding to be paid a share of the commission, was received.

Mr. W. J. Davey, secretary to the defendant, said he had frequently discussed and conversed with the plaintiff about the works, but before the receipt of the letter he had not heard a word about the alleged arrangement. In cross-examination, however, he admitted that after a conversation he had with Mr. Burstal at Oxford in October, 1886, the impression on his mind was that the plaintiff expected some present from Mr. Hawksley—not a share of the commission.

Mr. Bickerton, Town Clerk of Oxford, said at the meeting on Oct. 2, 1882, there was a discussion, and slips of paper conveying different ideas were handed round, and he gathered from these what the intention of the meeting was. Accordingly, before the resolution was put, he scratched out the words "as Consulting Engineer" after Mr. Hawksley's name, and "as Resident Engineer" after Mr. Burstal's, and substituted the word "jointly." At the next meeting it was resolved that the word "jointly" was not to constitute a partnership between Mr. Hawksley and Mr. Burstal, and that the former was to bear the sole responsibility. At a subsequent meeting, on April 21, 1883, there was this entry in the minute-book:—"The resolutions and correspondence as to the construction of the filter-beds were read, and, after talking the matter over with Mr. Hawksley and Mr. Burstal, it was resolved that Mr. Hawksley be Engineer-in-Chief and Mr. Burstal, Resident Engineer," &c.

In cross-examination by Mr. FINLAY, witness said by the resolution of Oct. 12, he should understand that the word "jointly" meant that Mr. Burstal would have a share in commission for extra work. Beyond this resolution nothing was ever afterwards arranged by the Corporation to pay Mr. Burstal anything for extra work. He did not understand that Mr. Burstal was to be paid by Mr. Hawksley. Asked who was to pay him, witness replied nobody, because the arrangement originally made that Mr. Burstal was to carry out the works had been abandoned; and though, no doubt, he had, in anticipation of being so employed, incurred some expenses, this did not entitle him to any extra remuneration. He had heard that Mr. Burstal expected to be paid something from Mr. Hawksley.

Mr. Downing, formerly Water Engineer to the city of Oxford and Mr. Burstal's predecessor in that office, said he had been Resident Engineer under Mr. Hawksley, and had never received or expected any commission. He always supplied the levels to Mr. Hawksley. He was now a member of the Water Committee; and knew nothing of any arrangement between Mr. Burstal and Mr. Hawksley as to commission. He knew of the resolutions of Sept. 7 and Oct. 12, and, in his opinion, by them Mr. Burstal was entitled to some remuneration; but he should say the proper persons to remunerate him were the Corporation of Oxford.

This concluded the defendant's case.

Mr. DANCHEWITS having addressed the jury,

Mr. FINLAY replied.

The LORD CHIEF JUSTICE then summed up. Having explained the nature of the claim and given the history of the case, he commented upon the various points in the evidence to which he considered the attention of the jury should be specially directed; remarking, in conclusion, that it would be for them to say whether Mr. Burstal had or had not satisfied them that the arrangement he alleged had been made.

The jury at once returned a verdict for the plaintiff for £284—the full amount claimed.

Judgment was given accordingly.

CITY OF LONDON COURT.—FRIDAY, JULY 27.

(Before Mr. Commissioner KERR.)

EAST LONDON WATER COMPANY v. FOREMAN.

To-day the above case, which was before the learned Commissioner on the 21st and 22nd ult., and raised the question of the liability of the actual consumer of water to pay the water-rates, again occupied his attention.

Mr. G. KEBBELL, the Company's Solicitor, stated that the action was brought to recover the water-rate due in respect of a supply given to a house in Mare Street, Hackney. When the case was before the Court on a previous occasion, the defendant contested his liability, and positively swore that he was not the occupier, but was only manager of the business carried on on the premises supplied. An adjournment was granted, to allow the owner, a Mr. Fortescue, to be made a co-defendant; but since then Mr. Fortescue had called upon him (Mr. Kebbell), and had shown him a lease by which the defendant not only became Mr. Fortescue's tenant, but covenanted to pay all rates and taxes.

HIS HONOUR asked if Foreman was in attendance.

Mr. KEBBELL said he believed not.

HIS HONOUR: He ought to be indicted for perjury. Meanwhile there will be judgment against him for the water-rate.

Mr. KEBBELL: I ask for costs on the higher scale, on the ground that the case involves a novel point, and is of public interest.

HIS HONOUR: No doubt it was a novel point, whether, under the circumstances previously stated, Foreman could be made liable; but the novelty arose from his lying.

Mr. KEBBELL: The section of the Act says that the person "requiring, receiving, or using" the water is liable to pay.

HIS HONOUR: Are you likely to get your money in this case?

Mr. KEBBELL: Not a farthing.

HIS HONOUR: Well, you ought to advise the Water Company to prosecute this man in the public interest. As to the costs, they will be allowed on the ordinary scale.

THE COST OF THE VYRWY WATER SCHEME.—The Water Committee of the Liverpool City Council have just issued their usual quarterly return of the expenditure upon the Vyrwy water scheme. It appears therefrom that, for the three months ending June 30, the sum spent amounted to £37,742 19s.; increasing the grand total to £1,769,843 19s. 2d. The details of expenditure are as follows:—Embankment and works in connection with the reservoir, £12,838 2s. 11d.; Llanwddyn quarries, £3556 4s.; aqueduct, £20,708; land and easements, £639 15s. 11d. The embankment and reservoir (now all but finished) have cost so far £496,204 4s.; the working of the quarries, £181,038 2s.; the aqueduct, including both pipe-line and filter-beds, £821,385 11s. 10d.; and land and easements, £271,216 1s. 4d. Of the outlay on the pipe-line, £437,585 9s. represents the cost of the iron pipes themselves. Of the cost of the embankment and reservoir, the amount set down to date for trials, preliminary works, Council and Committee expenses, and sundries, is £5417 7s. 9d.; the new church and vicarage at Llanwddyn and the removal of the graveyard have cost £7535 5s. 6d.; workmen's houses, hall, provision stores, stables, &c., £19,624; machinery, £21,753 12s. 3d.; miscellaneous plant, including waggons and carts, £16,331 1s. 3d.; horses, £9500 18s.; expenses of engineers, superintendents, clerks, draughtsmen, travelling and office expenses, £38,011 4s. 11d.; and general expenses (embracing maintenance of hospital, postages, jobbers, rain gauging, sundries, and petty cash), £9848 10s. 3d. In connection with the pipe-line, the expenses of engineers, superintendents, and clerks, and of 11 offices at different points of the line, come to £49,791 17s. 3d.

Miscellaneous News.

THE MANUFACTURE OF COAL GAS.

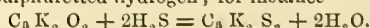
LECTURES AT THE CITY AND GUILDS OF LONDON INSTITUTE.

The third of the series of four lectures to students on "Gas Manufacture," was delivered at the City and Guilds of London Institute by Mr. LEWIS T. WRIGHT, Assoc. M. Inst. C.E., F.C.S., on Monday evening last week, and the final one on the following evening. Abstracts of the first two lectures appeared in the last number of the JOURNAL; and we now give summaries of the others.

In the third lecture Mr. Wright dealt further with the impurities contained in coal gas, and with the methods adopted for their removal; ammonia and its compounds being first referred to. He explained that theoretically there are two classes of compounds formed between the commoner acids which occur in gas and ammonia—one in which two volumes of ammonia combine with two of sulphuric acid or two of sulphuretted hydrogen; and the other in which complete saturation of the acids takes place, four volumes of ammonia combining with two of carbonic acid or sulphuretted hydrogen respectively. In employing ammonia as an agent for the removal of these objectionable acids, they would naturally prefer to use the combination which required least ammonia; but they could not always get what they liked, and, in practice, the engineer could not rely on 100 volumes of ammonia removing more than 50 volumes of carbonic acid and 12½ of sulphuretted hydrogen. Knowing the volume of ammonia in the crude gas, it was easy to calculate the amount of carbonic acid and sulphuretted hydrogen which could be removed by the ammonia in washing or scrubbing. To illustrate this point, the lecturer had drawn a diagram showing in an upright column varying quantities of ammonia per 100 cubic feet of gas, and on the base-line varying strengths of ammoniacal liquor; curves lying between the upright column and the base representing temperatures. From this it appeared, for example, that a gas standing over or in contact with a 5 per cent. ammoniacal liquor, at a temperature of 30° Fahr., would contain 30 grains of ammonia per 100 cubic feet; while if the temperature rose to 70° Fahr. the amount of ammonia would also rise to 70 grains. This showed the difference occurring in scrubbing during the summer months; but fortunately at that time there was less strain thrown on the scrubbing apparatus, owing to the smaller make of gas per diem. No apparatus, however, could yield results beyond those indicated on the diagram, which depended upon the tension of ammonia vapour over water at certain temperatures.

A large diagram was exhibited, showing the plant necessary for scrubbing; the capacity being 6½ cubic feet per 1000 cubic feet for use with gas liquor, and 8 cubic feet for use with clean water—assuming the liquor to be 3 per cent. In winter time the gas liquor would remove all the ammonia from the gas except about 25 grains per 100 cubic feet; and this could be dealt with by washing with clean water. The resultant strength of liquor would depend on two factors—the total quantity of ammonia in the gas, and the total quantity of water produced by the distillation of the coal; but to this must be added the clean water used in the final washing process. In cases where it was desirable to produce very strong liquor—for instance, where it had to be carried to a distance before being utilized—the quantity of washing water had to be reduced to a minimum. If a ton of coal produced on distillation 7 lbs. of ammonia and 15 gallons of water, and 2 gallons were used in the final washing, the strength of the liquor would be about 3½ per cent.—16-oz. liquor, or 8° Twaddell. Under such circumstances it would be impossible to turn out 5 per cent. liquor. In speaking of ammonia, he only meant that which existed in easily dissociated compounds, or "free" ammonia; not that which was commonly called "fixed," being combined with small quantities of sulphuric acid or hydrochloric acid, which would require some stronger alkali (such as soda, lime, or potash) for its separation.

Mr. Wright went on to remark that there were certain other compounds—cyanogen, &c.—in gas liquor, which had no practical interest to the gas maker; but the ammonia being removed, there were several technical impurities left, some of which were also legal impurities. There were still sulphuretted hydrogen and carbonic acid, and certain other sulphur compounds, mainly carbon disulphide, the amount of them varying with the description of the coal, and partly with the temperature of distillation. There were, however, certain limits. A normal amount of sulphuretted hydrogen per 100 cubic feet was 10 grains; and 12 grains of carbonic acid was also common in Newcastle coal. The other sulphur compounds varied largely with the coal used; some of the Silstone seams not yielding 22 grains of these compounds, while in other cases the quantity might reach as much as 80 grains. All these impurities could be removed almost entirely by treating the gas with moist lime, which would remove the whole of the sulphuretted hydrogen and carbonic acid, and reduce the other sulphur compounds from 40 to 12 or 15 grains; and in a number of small works this process alone was employed. But a more economical method had been found desirable in many cases. Lime had the property of forming sulphides with sulphuretted hydrogen; for instance—



This particular sulphide was very soluble. But this, together with another sulphide which was possibly formed, was easily destroyed by the action of carbonic acid, with the formation of the ordinary carbonate, and the re-expulsion of sulphuretted hydrogen; so that in the case of the purification of gas containing both sulphuretted hydrogen and carbonic acid, this action took place almost as soon as the sulphide was formed. Also, if it was necessary that no sulphuretted hydrogen should appear at the outlet of the purifiers, the quantity of lime used must be largely in excess of that which would be necessary for the removal of the carbonic acid only; and it was found more economical to remove the sulphuretted hydrogen by another agent—generally some hydrated form of ferric oxide. The lecturer then described in detail, with the aid of diagrams, the method of purification as carried on in a series of vessels, some containing lime, and others ferric oxide; and pointed out the desirability, in such a case, of thoroughly saturating the lime with carbonic acid, though practically, he said, the theoretical quantity of calcium carbonate could never be produced from moist slaked lime—there being a reverse action taking place which limited the principal reaction. He also pointed out that, in the removal of the other sulphur compounds, there was again liberated a certain amount of sulphuretted hydrogen, which had to be afterwards removed in another oxide purifier. This, therefore, was a comparatively complex system for effecting what could be done by the use of lime alone; but it was introduced for the sake of greater economy, and to avoid the inconvenience arising from having large quantities of foul lime to deal with. To completely saturate lime with carbonic acid, it was necessary to submit it to the action of 50 per cent. more gas than it could really purify; but the quantity of material to be used was largely determined by the mechanical assistance it offered to the passage of the gas. As a general rule, for every 100 tons of Newcastle coal carbonized per diem, each purifier should have an area of 360 square feet; and if it was fitted with four tiers of sieves, each having 7 or 8 inches of material, or (which was preferable) six tiers

with 5 inches, there would be in each purifier 33½ cubic yards. This was equal to 8½ tons of oxide of calcium, or 16½ yards of raw chalk lime, which doubled its volume when slaked, though some kinds of limestone would give three times their volume when slaked. This quantity of lime should absorb nearly ½ tons of carbonic acid; but, owing to the cause previously mentioned, its real efficiency was only 70 per cent. of what it would be theoretically. With these data, and knowing the quantity of carbonic acid there might be in any gas after the washing process, it was easy to calculate how much lime would be required for the removal of the carbonic acid. In 100 tons of a typical Newcastle coal, there would be 0·8 ton of carbonic acid; so that a purifier of the size he had mentioned, which had an actual efficiency of 4·54 tons of carbonic acid, would go on purifying gas for 5·7 days, and in so doing would also remove some portion of the troublesome carbon disulphide—probably about 10 grains per 100 cubic feet. In the scrubbing process also a small amount of carbon disulphide was removed—probably not more than 2 grains per 100 cubic feet.

Dealing next with the question of the use of ferric oxide, the lecturer pointed out that the difference between those forms which would, and those which would not react with sulphuretted hydrogen was so subtle as to elude chemical analysis; so that the value of any particular sample could only be determined by experiment. The most useful form was that known as bog ore, or natural oxide, which on its arrival at the gas-works generally contained 50 per cent. of water, 32 per cent. of ferric oxide, and 18 per cent. of vegetable fibre and other matters. Even of the ferric oxide, some portion would be inert, and probably not more than 22 per cent. was really active. It was therefore a rather dilute agent to deal with; and, in practice, it was necessary to use about 6 cubic yards of this material per 100 tons of coal—the exact quantity varying with the quality of the coal and other circumstances. When quite new, it was not very sensitive to the action of sulphuretted hydrogen, owing to the high percentage of moisture. It was in its best condition when the moisture was reduced to about 25 per cent.; but if much drier than this, it was dusty, and ran through the sieves. To prevent this it was often wetted; and this was sometimes carried too far. The stuff should be just damp enough not to pass through the sieves. After being saturated with gas in the purifying process, it would be found on removal to be black—in fact, to be no longer ferric oxide, but ferric sulphide; but, as the sulphur replaced the oxygen when in contact with sulphuretted hydrogen, so, if exposed to the air, the oxygen of the atmosphere replaced the sulphur, which was thrown out in the free state, and the material again became ferric oxide. Theoretically, this alternating process could be carried on indefinitely; but practically the limit was about 16 times. After this the free sulphur accumulated in the material, perhaps to the extent of 55 per cent.; and it then might become of value for the manufacture of sulphuric acid. The practical limit of efficiency was often reached long before 16 times—sometimes in four or five times. This might occur when the gas was led into the oxide purifiers direct from the scrubbers, or from the condensers, without having gone through a lime purifier.

In conclusion, Mr. Wright pointed out that there were many circumstances which might affect the choice of any particular method of purification. Where only lime was used, there would be a large quantity of spent lime produced; and where this proved to be a nuisance to the neighbourhood, the system might have to be abandoned. But the spent lime arising from the combined lime and oxide system was not inoffensive; it contained sulphur compounds, which, on oxidation by exposure to the air, liberated sulphuretted hydrogen and carbon disulphide. It was possible to ventilate these purifiers, or blow air through them, so that the lime when discharged should be free from offence; the oxidation being effected by the air sent through, which was afterwards purified in some suitable manner. Where this plan was adopted, however, precautions must be taken with regard to the temperature, which otherwise would rise so high as to destroy the apparatus. This was a matter that deserved careful attention, so as to avoid any possible complaint arising from the escape of sulphuretted hydrogen into the air.

In the concluding lecture, the composition of coal gas after the technical impurities had been removed was first dealt with. It was then, Mr. Wright remarked, a mixture of hydrogen, carbonic oxide, and certain hydrocarbons which were gaseous at ordinary temperatures—prominent amongst them being marsh gas, a small quantity of nitrogen, and certain hydrocarbons, which, if isolated, would not be gaseous at ordinary temperatures, but which existed in the gas in a state of vapour. The presence of oxygen in any quantity was evidence of atmospheric contamination; it not being produced by the distillation of coal. There were also some traces of sulphur, and minute traces of carbon, hydrogen, and oxygen compounds. Hydrocarbons were generally divided by chemists into two classes—those capable of absorption by fuming sulphuric acid or bromine, and those not capable of such absorption. Hydrocarbons of the latter class belonged to the paraffin series; and in ordinary gas analysis they were all put together under the head of "marsh gas," the first member of the series. Ordinary 16 or 17 candle gas, made from caking coal, would have something like the following composition:—

Hydrocarbons capable of absorption (the exact formula not known—C _n H _m)	Per Cent.
Paraffins (treated as marsh gas, CH ₄)	38
Carbonic oxide	6
Hydrogen	48 to 50
Nitrogen	2

The greatest interest, the lecturer remarked, centred round the first class; though the paraffins were also of some importance. A just conclusion as to the quality of a gas could not be obtained from its analysis, conducted in the usual way; for it might happen that a 16-candle gas would have a less proportion of absorbable hydrocarbons than that above shown, and, on the other hand, a gas having 6 or 7 per cent. of such hydrocarbons might not be of much higher luminosity. Until lately, it was usually supposed that the entire luminosity of the gas was due to these constituents; but this was not the case, for if they were all removed the remaining gas would have a luminosity of 7 or 8 candles. Assuming this to be the case, as it could not be derived from the hydrogen, nitrogen, or carbonic oxide, it must be due to the other hydrocarbons included under the name of "marsh gas." This gas itself, however, would not account for more than 2 candles; but it was practically impossible to distinguish in such an analysis between the paraffins themselves and mixtures of paraffins and hydrogens. This classification, therefore, was somewhat conventional; and the percentage of hydrogen was to some extent hypothetical. The exact quantitative analysis of coal gas was a matter requiring such great care and skill, that it was rarely attempted in gas-works; but it was interesting to know that there were other paraffins present besides marsh gas, because they might vary in amount in different coals, and this would help to explain why some gases containing a relatively small proportion of absorbable hydrocarbon had a very respectable illuminating power. The proportions of carbon and hydrogen in the first class of constituents—the C_nH_m—might be considered roughly as C₂H₆, though the figures varied somewhat with different samples. Amongst these hydrocarbons, the benzene series was included, and was of great

importance; and advantage was now being taken of this fact to obtain benzol from coal gas, which was, of course, thus deprived of the greater portion of its luminosity. This, however, was not an objection in the case of a colliery owner seeking to obtain by distillation all the valuable constituents of the coal; and a great deal of coal was now distilled, not to produce gas for lighting, but for its other products, tar, ammonia, and the valuable hydrocarbons—the residual gas being utilized simply as fuel. One of the hydrocarbons present, generally in very small quantity—naphthalene—was sometimes exceedingly troublesome, when the gas was saturated with it, because any lowering of temperature led to its deposition in a solid form, and thus to the choking up of the service-pipes, and sometimes even of the smaller mains. Naphthalene seemed to be born at a high temperature, and appeared amongst the decomposition products of many organic substances when submitted to great heats; and it was very prominent in some coals, such as those of Newcastle and South Yorkshire, which yielded on distillation thick tars and a considerable quantity of water. It seemed as if water vapour in the retort had some protective action on this hydrocarbon. Any coal could be distilled at such a low temperature that no naphthalene would appear; but when the heat was increased, this substance made itself manifest, and after certain temperatures were reached it increased more and more. The question of dealing with gas saturated with naphthalene was sometimes very difficult. If one could always ensure that the gas should be made and treated in the works at a lower temperature than it would ever be subjected to in its after-history, there would be no trouble; but it would often happen that gas was made during the hotter part of the day, and purified and dealt with at temperatures much higher than it was submitted to in the mains and services laid within a foot of the surface of the ground; those buried deeper than this undergoing no appreciable variation in temperature. The cure for this evil would consist in some method of artificially cooling the gas before it left the works. It did not necessarily follow that the gas was saturated with the vapour of naphthalene or any other hydrocarbon. Some portion of every hydrocarbon found in coal tar probably lasted, but to an extent depending in some measure on their vapour-tensions, at ordinary temperatures, and to a certain extent on the solvent power of tar on these vapours. There was a wide field of research open in the study of these various hydrocarbons, and their behaviour under different conditions.

The next subject referred to was the percentage of leakage, or unaccounted-for gas, due in great measure to the imperfection of the numerous joints, and practically varying directly with the pressure. It was pointed out that the difference between the quantity made, as measured at the works, and that sold, as arrived at by totalling the consumption at the consumers' meters, was not necessarily entirely due to leakage; the conditions of temperature and pressure not being the same. It had been calculated that a difference of 1½ per cent. was occasioned by such variations, which made the leakage appear so much larger than it really was. The cause of the luminosity of gas-flames was explained to be the incandescence of solid particles of carbon, raised to a high temperature by the combustion of the hydrogen. Thus the object to be aimed at was twofold—first, to ensure the presence of carbon capable of being raised to incandescence; secondly, a sufficiently high temperature. Modes of attaining the second object, by heating the air for combustion, were explained; and attention was then drawn to burners in which some extraneous substance was raised to a state of incandescence. One advantage in this case was, the lecturer said, that the light did not depend on the amount of carbon in the gas, but only on the temperature attained; and thus a gas of very low illuminating power might be made use of. Considerable developments of this principle might probably be looked for in the near future. The general habit of attributing all blackening of ceilings and walls to gas lighting was mistaken; for, wherever there were currents of air in a dust-laden atmosphere, the dust would be carried and deposited on obstructing surfaces. At the same time, there was no doubt that badly constructed burners occasioned smoke which might be avoided.

After referring very briefly to the different elements which had to be taken account of in calculating the cost of gas manufacture, the lecturer concluded with a few remarks on the utility of the jet photometer as a practical test of the illuminating power of gas.

THE COST OF THE OIL STREET LAMPS AT WINCHESTER.—From a letter recently written by the Town Clerk of Winchester to the lighting inspectors of York Town, it appears that the experience at Winchester for the past twelve years has been that at the contract price for the oil (namely "Royal Daylight" or "Tea Rose")—viz. 6½d. per gallon—the cost per lamp per annum is £2 5s. This includes the lighting, cleaning, and extinguishing, as well as repairs and renewals. The lamps are kept alight from an hour after sunset to an hour before sunrise.

THE LINCOLNSHIRE FEN WATER SCHEME.—The Engineer of the new Company which proposes to supply water in the Spalding, Deeping, Holbeach, and Sutton districts, has lately been making inquiries in the south of the county as to the reception of the Bill which has been before Parliament this session; and last Friday week the scheme was under discussion at the monthly meeting of the Long Sutton Local Board. All the members, except one, expressed themselves favourable to the scheme, and considered it desirable to encourage the Company in their project, since there is no water supply in the district, and in the case of a fire no facilities exist for extinguishing one. It was decided, after a long discussion, to hold a special meeting to further consider the question.

DISCOVERY OF A SURREPTITIOUS CONSUMPTION OF GAS AT BIRMINGHAM.—A few weeks since the inhabitants of Birmingham were startled by the announcement of the discovery of a surreptitious distillery in a railway arch; and hints were thrown out that others might be in existence. Further investigation has led to the unearthing of a larger and more important private still in the vaults underneath a house in Albert Street, Dale End; and, curiously enough, it has been found that it was being worked at exceptionally low cost, with fuel and light stolen from the Corporation gas-mains by an elaborate set of contrivances, so that the owners would be able to put the spirit in the market, if they chose, at a price that no honest distiller could compete with. The upper part of the premises is occupied by Messrs. Stephenson and Son, who are described as spirit merchants and general dealers; but both members of the firm have denied all knowledge of the stills. The cellars, they said, were rented by a man named Thompson, of whom they knew nothing, but who described himself as a cider merchant, and had paid six months' rent in advance. The Stephensons declared that they had never been in the cellars since they were let to Thompson, and they knew nothing of the means which had been adopted for lighting it and heating the stills with gas drawn from the Corporation pipes, some of it with piping 45 feet in length. Another part of the gas supply, used to light the upper and smaller cellar, appears to have been drawn from the pipe that supplied the meter in Messrs. Stephenson's own office, though the connection was severed at the time the examination was made. The offenders have not yet been discovered by the police.

MANCHESTER CORPORATION GAS SUPPLY.

REPORT OF THE GAS COMMITTEE FOR THE YEAR ENDING MARCH 31, 1888.

We have been favoured by Mr. Charles Nickson, the Superintendent of the Gas Department of the Manchester Corporation, with a copy of the report and statement of accounts of the Gas Committee for the year ending the 31st of March last. The Committee report as follows:—

The manufacture of gas, the condition of the works, and the efficiency of the department have been maintained; and the Committee have pleasure in giving the following particulars as to the year's working and revenue.

The quantity of coal and cannel carbonized was 293,348 tons, with an average production of 10,383 cubic feet of 19·96-candle gas. The use of improved carbonizing appliances has, during several years past, resulted in a steady increase in the yield of gas per ton, while the illuminating power of the gas has been well maintained. A considerable saving has been effected in the cost of coal and cannel.

The quantity of gas transmitted from the works was 3,45,727,000 cubic feet; being an increase of 0·85 per cent. over the previous year. The quantity of gas measured and accounted for was 2,897,933,000 cubic feet; leaving 147,794,000 cubic feet, or 4·85 per cent., of gas unaccounted for, owing to leakage and condensation, as compared with 6·34 per cent. last year. This result has been brought about by careful attention to the pressures, and the renewal of many old service-pipes.

The amount received for gas-rents, meter-rents, and stove-hire within the city was £277,464 8s. 3d.; and beyond the city, including public lamps, £103,775 5s. 8d.—a total of £381,239 13s. 11d., being an increase of £10,041 19s. 11d. over last year. The sales of coke, tar, and ammonia water amounted to £60,659 16s. 9d., or £2 8s. 4d. over the amount for last year. It is satisfactory to report that the prices at which recent contracts for tar have been let show a considerable increase on the prices which have been obtained during the past few years. The total cost of street lighting within the city was £29,471 18s. 2d., as compared with £28,955 8s. 9d. last year.

The result of the year's working, after writing off £33,623 0s. 9d. for depreciation, is a gross profit of £106,072 9s. 3d. After deducting therefrom the fixed charges for interest, £29,832 16s. 11d., street lighting, wages and repairs, £8528 19s. 4d., sinking fund, £26,454, and £23,331 paid to the city fund account during the year, there remains an amount of £17,925 13s., which has been transferred towards the liquidation of the adverse balance on profit and loss account in past years; thus reducing such balance from £45,857 7s. 3d. to £27,931 14s. 3d.

The question of depreciation has had the attention of the Committee for many years, and is still receiving their careful consideration.

Accompanying the Committee's report is the usual one by the Medical Officer of Health and Analyst (Mr. J. Leigh). He states that the average illuminating power of the gas during the year ended March 31 last was equal to 19·96 standard candles. With regard to its quality, the ammonia contained in it was less than 0·1 grain per 100 cubic feet; the carbonic acid, 2·9 feet per 100 cubic feet (being a little less than 3 per cent.); the sulphur, 37·34 grains per 100 cubic feet. Sulphuretted hydrogen was present to a slight extent on 18 days.

The accounts, audited by Messrs. Lees and Graham, follow the reports. Our usual extracts therefrom will be given next week.

THE TRANSFER OF THE EDINBURGH AND LEITH GAS-WORKS TO THE CORPORATIONS.

APPOINTMENT OF THE NEW GAS COMMISSION.

The Edinburgh and Leith Corporations' Gas Bill having received the Royal Assent last Tuesday [see our "Parliamentary Intelligence"], meetings of the Town Councils of both places were held on Thursday afternoon, to elect representatives on the Gas Commission to be constituted under the terms of the measure.

The Lord Provost (Sir T. Clark), presiding over the Edinburgh Council, said it was not necessary that all the members of the Gas Commission should be elected from the Council, but he presumed it would be their desire that on this, the first occasion, they should be all members of the municipal body. He had prepared a list which had only one defect—it nominated one name too many. He had put down all the members of the Gas Sub-Committee, and then he endeavoured to nominate members from the wards that were not represented upon that Committee. He would read the list, and if anyone would decline to act, the whole matter might be settled in that way; but, of course, this was merely a suggestion. He was a member *ex officio*; and the list he proposed was: Bailie Turnbull, Bailie Cranston, Bailie Roberts, Bailie Walcot, the Dean of Guild, Treasurer Boyd, and Messrs. J. C. Dunlop, M'Intosh, Colston, Younger, Robertson, and Pollard, all members of the Gas Sub-Committee, to whom he proposed to add Bailie M'Donald and Messrs. Drybrough, Kinloch Anderson, and Macdougald.

Mr. M'LACHLAN said it occurred to him that this was giving too much work, and it might be too much honour, to members of the Council who were Water Trustees. He thought those who were on the Water Trust should not be members of the Gas Commission. It was putting too much upon one set of men, and leaving the others outside. He moved that they take one member from each of the 13 wards of the city; and that, as far as possible, they should leave out members of the Water Trust.

Mr. BRYDEN seconded the motion.

Bailie RUSSELL considered it would be an advantage to have the same gentlemen on both Trusts, because they would then have only one set of people dealing with their streets.

Mr. SMITH CLARK said he should have been extremely glad if he could have given even a general support to Mr. M'Lachlan; but he confessed he could barely demur to his Lordship's proposal, because in the first set of Commissioners to be appointed there ought to be a preponderating representation of the Committee who promoted the purchase. He said so for the reason that upon that Committee and its leading members, would mainly lie, during the next few years, the responsibility of the purchase they had entered into—the blame if the purchase should turn out to have been an unfortunate one; the credit if it should be the other way. He would just make one other observation—that while the general majority of the Council should have a preponderating voice on the Commission, it would be of considerable benefit to the new body if the minority in the Council who disapproved of the purchase should also, to some extent be represented.

Mr. MACPHERSON was surprised that the Committee should desire to have the matter left entirely in their own hands. They were just the stage of promoters; and he thought that the gentlemen who had succeeded so far, should now be glad to be assisted by the critics of their former conduct. ("Hear, hear," from Mr. Smith Clark.)

The Lord DEAN OF GUILD (Sir J. GOWANS) was sorry to see the question of minority and majority brought forward. He thought they had buried that dagger in London; and he was surprised that Mr. Smith Clark should bring forward the idea of separation.

The Lord PROVOST thought the Dean of Guild had mistaken Mr. Smith

Clark's idea, which was to elect members of the minority in order to heal old sores.

Treasurer BOYD and Bailie TURNBULL both expressed their readiness to retire in favour of Mr. Smith Clark.

Mr. SMITH CLARK deprecated anyone retiring to let him in; and suggested that the matter should be put to the vote.

After a great deal of conversation, it was decided that those members who were present should hand in marked lists from which the votes could be counted. This was done; and the following was declared to be the result:—Mr. Colston, 28; Dean of Guild Gowans, 26; Mr. M'Intosh, 26; Mr. Pollard, 24; Mr. J. C. Dunlop, 24; Bailie Walcot, 23; Mr. C. Robertson, 23; Bailie Turnbull, 22; Mr. Macdonald, 21; Treasurer Boyd, 20; Mr. Smith Clark, 20; Bailie Roberts, 19; Mr. Kinloch Anderson, 19; Mr. Younger, 18; and Bailie Cranston, 16.

The Town Clerk intimated the meeting to be held next day in virtue of the Act, for the constitution of the Commissioners, the election of a Clerk, and the appointment of a Committee to meet with the Directors of each of the Gas Companies for the purpose of carrying out the details of the agreement.

At the meeting of the Leith Town Council, Bailie GARLAND, who presided, said they were to have seven representatives on the Commission, of whom one (the Provost) was an *ex officio* member. He thought that he himself, as Convener of the Lighting Committee, should also be a member; and he moved that the following be the Commissioners:—Bailie Archibald, Bailie Garland, Bailie Gosman, Treasurer Waldie, Mr. Fisher, and Mr. Robertson. Bailie Gosman declined to take office; and Bailie Scott was nominated instead. The gentlemen nominated were then elected. It was resolved to place on record the Council's high appreciation of the services of Mr. T. B. Laing, the Town Clerk, in connection with the purchase negotiations.

FIRST MEETING OF THE COMMISSION.

The first Meeting of the Edinburgh and Leith Gas Commissioners was held in the Council Chamber, Edinburgh, last Friday. On the motion of Treasurer Boyd, Bailie Turnbull took the chair, in the absence of the Lord Provost. Of the 23 Commissioners, 18 were present. The Town Clerk (Mr. W. Skinner) laid on the table a copy of the Corporations Gas Act, and read a minute of the Town Council meeting of the previous day, electing the Commissioners for Edinburgh, and an extract from the minute of the Leith Council intimating the election of their representatives to the Commission. He also read a telegram from Mr. Smith Clark regretting his inability to attend the meeting, but expressing his intention to take office. The Town Clerk then administered the statutory declarations to the Commissioners, after which each Commissioner signed a form of the declaration, which was to the effect that they would faithfully and impartially discharge the duties of the Commission to the best of their skill and judgment. On the motion of Bailie Turnbull, the Town Clerk was appointed Clerk to record the proceedings of the Commissioners until another Clerk should be appointed. The Town Clerk then asked the Commissioners to resolve whether their business was to be conducted in public or in private. Mr. Colston said there could be no doubt on this point. They were statutory Commissioners appointed for the public good; and he moved that all their business, with the exception of legal matters, be conducted in public. Bailie Turnbull seconded, and the motion was adopted. Bailie Turnbull called for nominations for the clerkship; intimating that the appointment would, in the meantime be an interim one. Bailie Archibald nominated Mr. James M. Jack, S.S.C., who was proposed for the clerkship of the Water Trust. Bailie Turnbull seconded. Mr. Kinloch Anderson suggested that the appointment should be delayed till the next meeting, when they would probably have a number of applications before them. After some conversation, it was decided to delay making an appointment till Monday; Mr. Skinner to act in the meantime. Mr. Colston then said that one of the first duties of the Commissioners would be to find money to pay away; and as the Commercial Bank had been the bank of the Edinburgh Gas Company, he proposed that it should be the bank of the Commission. This was agreed to. Replying to Bailie Archibald, Mr. Colston said that their first operation was to be an overdraft for £60,000. The Town Clerk next read a letter from Mr. Blair, W.S., in which the writer said the Commissioners would probably visit the Company's works on the 1st of August to formally take possession. Mr. Colston said it would be necessary to appoint three Committees. He proposed the following:—Works Committee: The Lord Provost, Bailie Roberts, Bailie Archibald, Bailie Walcot, the Dean of Guild, and Messrs. Colston, Robertson, Leith, Fisher, and Dunlop. Finance Committee: Bailie Turnbull, Treasurer Boyd, Provost Aitken, Treasurer Waldie, and Messrs. Pollard, Kinloch Anderson, and Macdougald. Law Committee: Bailie Cranston, Bailie Garland, Bailie Scott, and Messrs. M'Intosh, Smith Clark, and C. Robertson. This list was adopted, but it having been suggested that Mr. Waldie was acquainted with the coal trade, it was agreed to transfer him to the Works Committee, and to transfer Mr. Robertson to the Finance Committee. Mr. Pollard was added to the Law Committee to make the number an odd one; and, on Mr. Colston's suggestion, it was agreed that the Conveners should be members of all Committees. Provost Aitken was appointed Convener of the Finance Committee, and Mr. M'Intosh of the Law Committee. Bailie Walcot proposed that Mr. Colston be appointed Convener of the Works Committee, and this was agreed to. Mr. Colston, in acknowledging the compliment, said he might not go on for long, because he thought there ought to be a much more practical man in the position; but that during the progress of the negotiations he would be very pleased to act. Messrs. Colston, M'Intosh, Bailie Turnbull, Bailie Archibald, and Mr. Pollard were appointed a Committee to meet the Directors of the Companies on the 1st of August. The Town Clerk remarked that, at their next meeting, one of the duties of the Commissioners would be to fix the price of gas—whether they would adopt the Companies' price or alter it. Mr. Colston observed that it would be very foolish to alter the price. On the motion of Mr. Colston, it was remitted to the Law Committee to prepare a code of Standing Orders for the Commission, and to the Finance Committee to make financial arrangements for the transfer.

THE WATER SUPPLY OF LIVERSEDGE.—On Monday evening last week, at a meeting of the Liversedge Local Board, it was decided to ask the Bradford Corporation to receive a deputation for a friendly discussion on the question of water supply, with special reference to a proposal made by the Corporation to take over the Liversedge water undertaking, and distribute water to consumers in Liversedge on the same terms as the consumers in the borough. Strong opposition was raised by the proposal, it being the opinion of some members that the Corporation did not intend to serve the manufacturers of Liversedge on the same scale of charges as those within the borough, but would only do so by special contract; and it was upon this point chiefly that the interview was solicited.

LINCOLN CORPORATION GAS AND WATER SUPPLY.

THE WORKING IN THE PAST FINANCIAL YEAR.

The accounts of the Lincoln Corporation, in their capacity as the Urban Sanitary Authority, for the year ending March 25 last, have lately been issued by the Solicitor (Mr. E. P. Dalton), acting for the late Treasurer (Mr. T. G. Dale).

With regard to the gas undertaking, the capital account shows a total indebtedness of £191,340 2s. 3d.—viz., capital value of gas annuities, £171,450; loan on mortgage, £15,900; and balance advanced by bankers, £3990 2s. 3d. On the credit side, the cost of the undertaking is put down at £191,196 15s. 4d.; and the expenditure on new mains, services, and meters, £143 6s. 11d. The revenue account for the year gives a total of £36,813 18s. The cost of the manufacture of gas was £13,070 3s. 6d.—viz., coals, £8012 18s. 1d.; purifying, £642 0s. 7d.; salaries of officers at the works, £459 16s. 8d.; carbonizing wages, £2066 1s. 4d.; and repairs and maintenance of works and plant (including renewal of retorts, &c.), £1889 6s. 10d. A sum of £977 9s. 1d. was paid for the distribution of gas. Rents, rates, and taxes swallowed up £1013 11s. 3d. A sum of £836 17s. 8d. was expended in the purchase of gas cookers. For law costs £29 10s. 8d. was paid; and £35 5s. 9d. was awarded as compensations. The management expenses were £871 17s. 2d. Interest on loans required £305 16s. 4d.; and bank interest, £477 16s. 1d. The annuities paid amounted to £5071 9s. 5d.; and £1639 10s. 3d. was required to meet current liabilities—viz., for the proportion of interest on loans and annuities. There was transferred to the sinking fund a sum of £1647 3s. 5d.; and the balance was £10,837 7s. 5d. The credit side showed a balance from last year's account of £9562 0s. 7d. The sale of gas brought in £20,738 10s. 2d.—viz., £18,910 7s. 11d. for 141,828,000 cubic feet of gas supplied to consumers at 2s. 8d. per 1000 feet, and £1828 2s. 3d. for public lighting. The rental of meters yielded £1044 12s. 6d.; and of gas cookers £125 19s. 4d. For residual products a total of £4739 16s. 9d., was obtained—viz., £2746 1s. for coke and breeze, £866 1s. 4d. for tar, £1007 8s. 7d. for ammoniacal liquor, and £120 5s. 10d. for refuse lime. The sum of £576 11s. 7d. represents the value of gas cookers on hire and in stock, after allowing for depreciation at the rate of 20 per cent. The sinking fund account for the redemption of £185,795 17s. 10d. in 50 years, at 3 per cent., shows that since 1886 a total sum of £4966 3s. 9d. has been transferred from the revenue account, and that £77 12s. 2d. has been received as interest on the amount invested; making a total of £5043 15s. 11d. The general balance-sheet gives a total on the debit side of £205,420 3s. 3d., made up as follows:—Capital value of annuities, £171,450; loan on mortgage, £15,900; amount due to bankers, £351 2s. 5d.; sinking fund, £5043 15s. 11d.; balance at the credit of the revenue account, £10,837 7s. 5d.; proportion of interest on loan and annuities, £1639 10s. 3d.; and amounts owing for coal, £198 7s. 7d. The credit shows: Cost of works, £191,196 15s. 4d.; additions to works, £143 6s. 11d.; value of coals, tar, coke, and stores in hand, £495 18s. 6d.; value of cookers (after allowing 20 per cent. for depreciation), £576 11s. 7d.; book debts, £8934 4s. 3d.; Consols, £3368 6s. 8d.; and annuities redeemed, £705. There were 15,635 tons of common coal, and 97 tons of canal coal carbonized during the year. On March 25 there were 72,900 gallons of tar in stock, as against 86,720 gallons at the beginning of the year.

The revenue account of the water undertaking shows a satisfactory state of affairs. After providing for the expenses of working and interest on loans, there is an actual gain on the year of £502 10s. 2d. The water-rents yielded altogether £8530 3s. 11d.; £31 15s. 4d. was allowed by the bankers as interest; and £10 was received from the Corporation for rent of land—total, £8571 19s. 3d. The maintenance and working expenses amounted to £2177 12s. 3d.; the rents of reservoir, ballast-pits, &c., were £159 9s. 8d.; taxes and rates absorbed £558 12s. 5d.; and £24 0s. 11d. was needed for law costs. Interest on loans required a sum of £3326 1s. 11d.; and £1024 18s. 1d. represented the amount repaid on account of loans. These and two or three small items brought up the total expenditure to £8036 13s. 9d.; and at the end of the year a balance of £1633 19s. 6d. remained in the hands of the Treasurer, increased from £1098 14s. during the year. The capital account of the same undertaking shows that the purchase of the water-works originally cost £63,827, and that £42,608 8s. 2d. has since been expended in the purchase of land, the erection of new buildings, additions, and extensions. The gross amount of loans raised on the undertaking is £105,000, of which £10,378 5s. has been repaid by instalments; leaving a total of £94,621 15s. still owing. The general district rate account has also had a sum of £3200 repaid out of revenue.

THE DUBLIN CORPORATION AND ELECTRIC LIGHTING.

A Special Meeting of the Dublin Town Council was held on Friday, the 20th inst., to consider and take action on the letter of the Board of Trade, notifying that it is proposed to proceed to issue to the Corporation a Licence for electric lighting, subject to conditions as assented to by the representatives of the Corporation at the meeting at the office of the Board on the 3rd inst. These conditions were alluded to in the JOURNAL last week (p. 173). Mr. Robinson opened the proceedings by remarking that the business they had to discharge was of a purely formal nature. On the previous occasion, owing to the house being counted out, the letter of the Board of Trade could not be dealt with. He begged to move—"That the conditions contained in the letter of the Board of Trade, dated the 10th of July, be accepted, and that they be requested to issue the Licence in accordance with the conditions." Alderman Mulligan seconded the motion. Mr. Mayne said, in reference to the terms of the letter from the Board of Trade, an expression was used which might cause trouble in the future. They put in the condition that the works should be completed within 2½ years. These were not exactly the terms in which the representatives of the Corporation consented to this restriction; because, though the works might be completed so far as the lighting was concerned, if they wanted to extend, or do any more lighting that would involve the erection of additional plant, they would have to go to the Board of Trade again. He was sure this was not the intention of the Board of Trade in giving their decision. Mr. Dennehy said, although the Corporation had power to undertake electric lighting, there were difficulties in the way which it would be well for the Council to consider. If it turned out that they were losing £2000 a year by the electric lighting, each member would be personally liable for it; and they should also remember that what cost £16,000 to Mr. Mayne and his fellow-Directors of the late Electric Light Company was sold for £3000. Mr. Healy observed that Mr. Dennehy might make his mind perfectly at ease as regarded financial loss. Nearly every town in America was using the electric light, and it was employed in a great many towns in England; and everywhere it was a success, both as an illuminant and financially. There would be no rivalry between the electric light and gas, because gas would eventually be valuable for cooking and other purposes. Alderman Dillon suggested that steps should be taken to have the Licence extended so as to include private lighting. After some further remarks, Mr. Robinson moved the adoption of the following addition to the resolution:—"And so far as the completing of the installation at present contemplated, within 2½ years, the Council desires that the clause of the Licence should be so framed as to leave it open to the Council to make subsequently such further extension of this

system in the streets as from time to time they may consider advantageous." He said they had thought that by limiting their application to using the light for public purposes, it would meet with no opposition from the Gas Company. They considered that at least the Company would recognize the right of the Corporation to light their own streets; yet they had lodged a petition with the Board of Trade. Under these circumstances, they were not under any obligation to the Company; and Mr. Courtenay Boyle had stated that the taking of this Licence would not prevent the Corporation from applying next November for a Provisional Order for private lighting. The motion was agreed to.

THE MALVERN LINK GAS COMPANY AND THE LOCAL BOARD.

ADOPTION OF OIL FOR PUBLIC LIGHTING.

In the JOURNAL last week (p. 176) we announced that the Malvern Link Local Board had decided to light the roads in their district by oil-lamps during the coming winter; and that this decision had been come to as the result of a dispute with the local Gas Company. The dispute was not of the Company's seeking; and during its continuance they endeavoured to meet the views of the Local Authority, but in vain. It appears that early in April last, the Secretary of the Company (Mr. F. G. Underwood) wrote to the Clerk to the Local Board (Mr. G. H. Foster) submitting the following alternative terms for the public lighting:—" (1) The Company to supply the public lamps at 4s. 6d. per 1000 cubic feet; the quantity of gas consumed to be measured by meters fixed by the Local Board, say, at every fifth lamp; or (2) they will light the public lamps at such times as the Local Board may require, at a price to be fixed by arbitration in the usual way; or (3) if the Local Board is desirous of having the gas supply in its own control, the Directors will use their best endeavours to induce the shareholders to sell their undertaking to the Board on the like arbitration terms." To this the Clerk replied on June 8, to the effect that the Board were prepared to accept the offer of the Company to light the public lamps from Sept. 1, 1888, to April 30, 1889, at the price of 4s. 6d. per 1000 cubic feet, provided the Company agreed to allow the Board the discount, and adopt the terms and conditions set forth below, and provided also that the Company agreed to allow to private consumers in their district the discount mentioned. The terms and conditions above referred to were as follows:—" (1) That a discount of 6d. per 1000 cubic feet be allowed in respect of each account rendered by the Gas Company to the Board, provided such account be paid within a month after its delivery to the Clerk of the Board. (2) That the quantity of the gas consumed shall be measured by meters to be provided by and at the expense of the Local Board, and to be affixed to every tenth lamp; and the average amount of the indications of all such meters shall be deemed to be the amount consumed by each lamp. (3) That the indications of the meters shall be taken monthly jointly by a representative of the Board and a representative of the Company; and that in the intervals between such takings the meter shall be kept locked. (4) That each lamp shall be furnished at the expense of the Gas Company with a governor burner to be approved by the Board, and so constructed as to limit the consumption of the gas in each lamp to a quantity not exceeding 5 cubic feet per hour. (5) That the illuminating power and quality of the gas and the mode of testing the same shall be in accordance with the provisions of the Gas-Works Clauses Act, 1871. (6) That the lamps shall be lighted, extinguished, cleaned, and repaired at the expense of the Local Board. (7) That a discount of 6d. per 1000 cubic feet be allowed by the Gas Company to all the private consumers in their district who shall pay their account within a month after delivery thereof." The letter was laid before the Directors of the Company on the 10th inst.; and the reply sent thereto was that they did not see any reason to alter the terms of their previous letter. To this the Clerk of the Board rejoined that the Board were not prepared to alter or amend the terms of their letter, which they considered to be "fair and reasonable." There the matter ended; and the Board are now taking steps to light the district with oil.

DEVONPORT GAS COMPANY.

The Forty-fourth Annual Meeting of this Company was held last Tuesday—Mr. R. C. SMITH in the chair.

The report presented by the Directors showed that the gross revenue for the year ending the 31st of May was £23,022, as compared with £22,338 in the previous year; being an increase of £684, due exclusively to the increased sale of gas. Residuals, although slightly improved in price, had not, it was stated, recovered from the late serious depression. Sales of coke and breeze had realized £2803, and other residuals—tar and sulphate of ammonia—had produced £1420, as compared with £2492 derived from these products three years since. The total expenditure for coals, wages, materials, wear and tear, rent, rates, taxes, and other incidental expenses, amounted to £18,472, as compared with £17,976 in the preceding year; leaving a balance of £4549 to be carried to the net revenue account. After payment of the interim dividend authorized at the last meeting, there remained a balance of £5450, from which the Directors recommended dividends at the rate of 10 per cent. on the original and 6 per cent. on the guaranteed shares.

The CHAIRMAN, in moving the adoption of the report, congratulated the shareholders upon the revival of trade, not only in that part of the country, but throughout the kingdom. The Company had, he said, been in existence 40 years; and during the first half of that period, with the exception of the first five years, Devonport suffered from the paralysis consequent upon the diversion of its trade. It took 25 years to recover from the effects of that change; but that they had recovered from it in many respects was shown by the report presented that day. During the past year they had fixed 103 new services in the borough, which was about the average of the last ten years. During that period upwards of 1000 new houses had been built, and the builders found it to their advantage to have the gas laid on in the houses they built; for if they took the gas into the houses, they not only found purchasers more readily, but had a better class of tenants. As a rule, gas was laid on in all the new houses and this would account for the continually progressive increase in their supply, more particularly during the last ten years. No large structural works had been carried out last year, as had been the case in former years, when they were erecting new buildings and new holders, with the object of increasing their productive power and their storage. The past year was the first in which they had had the advantage of these increased appliances; and, though not quite up to their expectations, they were satisfactory in so far that they showed the Company was progressing, and he had no doubt would continue to progress in the future.

Mr. HONEY seconded the motion.

The CHAIRMAN having replied to several motions on the various items in the accounts,

The report was adopted, and the dividends recommended by the Directors were declared.

A vote of thanks was then passed to the Directors and officers, and the proceedings closed.

THE PROPOSED REFORM OF PRIVATE BILL LEGISLATION. THE PROCEEDINGS OF THE SELECT COMMITTEE.

In the JOURNAL last week (p. 155) we gave a summary of the report recently presented to Parliament by the Joint Committee of the two Houses appointed to examine into the present system of Private Bill Legislation. In view of the importance of this matter to a large number of our readers, it will be of interest to give the principal portions of the document. It may be stated, by way of introduction, that on the 12th of March last the House of Commons ordered the appointment of a Committee of six members to join a Committee of the Lords on the question; and a message was conveyed to the Upper House to this effect. On the 16th, a reply was returned that a Committee of Lords had been nominated. As finally constituted, the Committee consisted of the following members:—Earl Bathurst, Lord Monk Bretton, Lord Colville of Culross, Lord Balfour of Burley, Lord Kensington, Lord Stalbridge, Sir John Mowbray, Sir Joseph Pease, Mr. Raikes, Mr. J. Morley, Mr. Craig-Sellar, and Mr. T. M. Healy. The first meeting took place on Friday, April 20, when Lord Monk Bretton was appointed Chairman; and the Committee adjourned for a week. On the 27th it was decided that the proceedings should be open; and evidence was then taken. The sittings were generally held twice a week; and extended (with an interval at Whitsuntide) till July 12. The first witness was Mr. J. H. Warner, the Counsel to the Chairman of Committees of the House of Lords. Following him came the Counsel to the Speaker of the House of Commons, the Hon. Chandos Leigh, Q.C., and Sir Theodore Martin, K.C.B., President of the Society of Parliamentary Agents. The other witnesses (taken in the order in which they appeared before the Committee) were: Mr. J. Colquhoun, solicitor; Mr. R. Vary Campbell, Edinburgh; Mr. S. Pope, Q.C.; Mr. J. S. Beale; Mr. E. H. Pemher, Q.C.; Sir G. Rickards, K.C.B.; Lord Grimthorpe; Mr. Pembroke Stephens, Q.C.; Mr. A. Bonham-Carter; Mr. J. D. Marwick, LL.D., Town Clerk of Glasgow; Mr. J. Colston, Edinburgh; Rt. Hon. J. H. A. Macdonald, the Lord Advocate for Scotland; Mr. J. Beveridge, Town Clerk of Dublin; Dr. A. Bennett McGrigor; Sir W. Kaye, C.B., Q.C., Clerk of the Privy Council in Ireland; Mr. J. Gray; Mr. W. Hay, Town Clerk of Dundee; Mr. F. W. Pim, Dublin; Mr. J. McEvoy, Dublin; Mr. J. Berry, Aberdeen; Mr. J. Wilson, Greenock; Rt. Hon. E. Stanhope, M.P.; Mr. J. C. Bolton, M.P.; Mr. W. A. Ferguson Davie; Mr. J. F. Symons-Jeune; Mr. L. H. Courtney, M.P., Chairman of Committees of the House of Commons; Rt. Hon. Sir J. R. Mowbray, M.P., Chairman of the Committee of Selection of the House of Commons; the Duke of Buckingham and Chandos, Chairman of Committees of the House of Lords; Mr. W. Campion; and Mr. J. F. Rotton. On Thursday, July 12, two reports (one prepared by the Chairman and the other by Lord Balfour) were submitted to the Committee; the former being adopted with a few slight amendments, and ordered for presentation to both Houses of Parliament. This was done the same day. The following is the text of the principal portion of the report:—

The present system of Private Bill Legislation had its beginning in 1837, when the House of Lords determined to constitute the Committees on Private Bills of a small number of members having no interest in the measures submitted to them, and entrusted the nomination of such members to a Committee of Selection. The House of Commons adopted a similar procedure in regard to Railway Bills in 1844, but did not fully apply it to other opposed Bills till 1855. The establishment of these quasi-judicial Committees is admitted to have been a great improvement upon the former "open" or other large Committees, however composed, in which members having a local or personal interest, took part and voted. The system was further improved in the House of Commons by the creation in 1851 of a "Chairmen's Panel," a Standing Committee which supplies the Chairmen of all Committees on Railway and Canal Bills. Again, in 1882, the House of Commons, with the view of securing greater consistency between Bills dealing with police or sanitary matters, promoted by municipal and other local authorities, instituted a Standing Committee—the Police and Sanitary Committee—to which all such Bills have since been referred.

The establishment of the *Locus Standi* Court in 1865 tended to give greater harmony of action to the tribunals of the House of Commons, in some measure to abridge the labours of Committees, and perhaps to diminish the expenditure of suitors. Conflicting opinions have from the first been expressed as to the policy of maintaining this tribunal, but it is generally recognized that, to a considerable extent, it effects the first, and though in a less degree the second of the above objects.

The general supervision of Private Bills exercised by the Chairman of Committees in one House, and by the Chairman of Ways and Means in the other, and the Reports of Government Departments directing the attention of Committees to particular points in the Bills brought before them, contribute to maintain some community of action between these separate tribunals.

In further proof of the importance now attached to a tribunal of a stable character, it is to be noted that, with hardly an exception, every witness whose attention was directed to the point, whatever his view upon Private Bill Legislation in other respects, expressed or implied a preference for the Committees of the House of Lords, as composed of less fluctuating elements, and possessing a higher degree of quasi-judicial training and experience.

The resolutions of various public bodies in Scotland and of the Dublin Chamber of Commerce which have been brought before the Committee, condemn in strong terms the present system of Private Bill Legislation. The Committees of both Houses are, however, generally stated by witnesses to command confidence; and this view is expressed by several of those who wish to see them in whole or part superseded or supplemented by some other tribunal. On the other hand, it seems to be more or less reluctantly admitted, even by some of the supporters of the present system, that, whether owing to the greater demands of public and local business upon the time of members or to other causes, the Committees of the Lower House have of late years been less strongly manned than formerly. Several witnesses have referred to the circumstance that the character of Parliamentary Committees differs; and that their action and decision is uncertain, some viewing this as an objection, others as an advantage.

Irrespective of the merits or demerits of Committees, the centralization of all Private Bill inquiries in London is objected to, as attended with expense and inconvenience to suitors from a distance, by witnesses from Scotland and from Ireland. A central inquiry is also, in some cases, complained of on the ground of liability to error on the part of a tribunal which has not the opportunity of inspection on the spot. The feeling in favour of local inquiries for what are deemed to be essentially local questions, is intensified by national sentiment, and by a natural desire that the necessary expenditure should, as far as possible, be incurred in the locality interested.

The arguments for local inquiry are most strongly urged in regard to schemes concerning a particular community or district, such as various kinds of Municipal Bills, Bills for the alteration of boundaries, or for constructing or otherwise dealing with works affecting a strictly limited area. In regard to schemes of a more comprehensive scope and bearing, directly

or indirectly affecting an extensive area and widely-spread interests, such as many Railway Bills, and some large water supply and other schemes, it is not denied, or hardly denied, that a centralized inquiry is preferable, if not unavoidable. Even in such cases it is represented that Westminster should not necessarily and always be the centre selected; but that Edinburgh, Dublin, or some other centre might, according to circumstances, be more eligible. It is also contended that, in the case of an extensive undertaking, particular portions of it might, not unfrequently with advantage, be made the subject of a local investigation on behalf of, or a local inspection by the tribunal charged with the examination of the whole.

The expense incurred by promoters and opponents of schemes in Parliament is undoubtedly great. Many statements from Scotland and from Ireland have been laid before the Committee illustrating the actual cost of Private Bill Legislation, particularly of Municipal Legislation, and the items into which it may be resolved. It is asserted that it has the effect not only of preventing poor opponents from coming forward, but also of suppressing proposals for small undertakings.

Complaint has been made that the Borough Funds Act, 1872, does not apply to Ireland; and that Irish corporations are thus denied the facilities for promoting improvements possessed by other municipalities.

The principal causes of expense involved in the system of Private Legislation as at present conducted are alleged to be:—(a) The compression of the work of Committees of the two Houses not merely within the limits of a session, but in reality, owing to the intervals of time necessarily allowed between the stages of Bills, or other causes, within a part of a session. This congestion of business compels the engagement of several counsel, in the hope of securing the attendance of one. (b) The short daily sittings of Committees—especially of House of Commons Committees—added to the fact that Committees only sit five days in the week; and the uncertainty as to the day on which the hearing of a case will be commenced. These circumstances involve the detention of witnesses, depositions, and solicitors for a much greater number of days than would otherwise be required. (c) The liability of promoters to a repetition before a Committee of the second House of the contest they have encountered in the first, at the will of an opponent. (d) The cost of bringing up local witnesses, depositions, and agents, and keeping them in London. In regard to this item it is keenly disputed whether, if inquiries were held elsewhere, the expense would not be equalled or exceeded by the cost of conveying skilled witnesses and counsel to the locality, and many accounts and estimates, especially concerning Scotch municipal schemes, have been offered to your Committee by witnesses in support of their different contentions. Whether a local inquiry would or would not increase the expenditure upon the item in question in any particular case, seems to be a matter depending upon the nature of the scheme, and also in great measure on the discretion of promoters and opponents and their agents.

Suggestions for mitigating the evils complained of will be found in the evidence taken by the Committee, and more particularly in a paper presented by Mr. Warner, Counsel to the Chairman of Committees of the House of Lords; and in a memorandum submitted by the Society of Parliamentary Agents through their President, Sir Theodore Martin. The principal suggestions are: (a) The appointment of a Joint Standing Order Committee for both Houses, whereby one inquiry would in certain matters answer the purpose now served by two. (b) A reduction of the House fees imposed upon suitors. The annual sum of the fees of the two Houses has, on an average of the last ten or twelve years, amounted in round numbers to £58,000—viz., £28,000 for the Lords, and £30,000 for the Commons. At the same time, the expense of both Houses in relation to private business is variously estimated at from £16,000 to £20,000 a year. (c) A diminution of the number of Committees sitting simultaneously, by spreading their work over the session. No great room for improvement seems to be here afforded; and no effectual proposal has been made on the subject, except to put pressure on promoters and their agents. To do this to any purpose, certain amendments of the Standing Orders are pointed out as requisite. (d) Putting a check upon the repetition of a contest in the Second House, by requiring the opponent to show and to confine himself to special grounds on which he claims a re-hearing; at the same time enlarging the power of Committees to award costs, and perhaps requiring the opponent to give security for costs. (e) It has also been pointed out that the form of the notice to be given to parties affected by proposed schemes, and the number of advertisements thereof, required by the Standing Orders, might be curtailed, and a saving to promoters thus effected. It will be seen that these suggestions in no way tend to satisfy or allay the desire for local inquiries, and that they afford no scope, or hardly any, for economizing the time and labour of Members of the Legislature, especially of the House of Commons.

The number of Private Bills varies greatly from year to year, or in short cycles of years. The work of a year is not, however, to be altogether measured by the number of Bills, because it may happen that in any year a few important measures may give rise to protracted contests, and render its duties heavy. The last three years have been light years in contrast to the years 1882, 1883, 1884 immediately preceding them. The year 1887 was almost exceptionally light. In that year, 102 members of the House of Commons were employed upon Committees upon opposed Bills and Provisional Orders, which held in all 190 sittings; the average service of each member so employed amounting to less than eight days. On the other hand, it appears from Sir C. Forster's Annual Returns as to Private Bills, that in 1882 176 members were employed on such Committees, and the average service of each member amounted to 10 days. Without anticipating a recurrence (though that is by no means impossible) to the state of things which existed in 1865 and 1866—in each of which years more than 600 Bills were presented, of which 377 became law in one year, while in the other 392 Private Acts were passed, and 200 members of the House of Commons sat on Committees on opposed Private Bills—it is obvious that the mass or the weight of such business which Parliament on assembling at the commencement of any session may find awaiting it is a most uncertain element. Even the lightest years, and with the increasing disposition of the House of Lords to take a full share of the burden, it has now become most difficult to provide in the House of Commons for the discharge of the duties of Private Business Committees. If the House of Commons at its meeting in any year found itself confronted with an amount of private business approaching to that of some former years, or if the pressure of public business, or policy, induced it to add to the number of or to enlarge its Standing or other Public Committees, the private business of the Session might be brought to an absolute standstill. In such a case a large part of the Bills would have to be abandoned at a heavy sacrifice to the promoters and probable inconvenience to the public, or practically the entire burden must be thrown upon the House of Lords.

It remains, then, for consideration whether the time has not come when some more comprehensive reform of private business than any that has been adopted since the introduction of the present system of Committees in 1837 should be undertaken without delay. Broadly, three proposals have been put before the Committee. Each may be said to have been proposed and discussed on former occasions, but, submitted as they now are in altered circumstances and accompanied in many instances by

material modifications, they claim consideration. These proposals are as follows:—

(A) The establishment of Commissioners entrusted with the powers and functions of Private Bill Committees (and perhaps with some other duties in relation to private business) who should hold central or local inquiries according to the character of the scheme and the interests of suitors; the ultimate decision being always, in some form, reserved to Parliament. Various proposals for a Commission, fully and clearly set forth, will be found in the evidence of the Lord Advocate, Mr. Stanhope, Mr. Courtney, Mr. Pember, Q.C., and others. The plan described by the last-named witness was in the main embodied in a Bill introduced in a former Parliament by Mr. Craig-Sellar. General approval of, and a desire for inquiries not confined to Westminster, by some other tribunal than Parliamentary Committees, has been strongly expressed by a majority of the witnesses from Scotland, among others by Mr. Vary Campbell, Chairman of a Committee of Public Bodies, Municipal, Legal, and Commercial, 64 in number, extending over Scotland, and by Mr. E. Wilson, deputed to represent the Convention of the 79 Royal and Parliamentary Burghs of Scotland; by witnesses deputed to represent the Town Councils of Edinburgh, Glasgow, and of other Scotch cities; by Mr. Pim, delegated by the Dublin Chamber of Commerce, and in other evidence from Ireland. Objections to a Commission, more particularly to a permanent Commission, are stated in the evidence of the Duke of Buckingham and Chandos, Chairman of Committees of the House of Lords; Lord Grimthorpe; Mr. Warner; Mr. Chandos Leigh; Sir T. Martin, representing the Society of Parliamentary Agents; Mr. Beale, Solicitor to the Midland Company, and one of the Solicitors to the Railway Companies' Association, Mr. Pope, the senior practising Counsel at the Parliamentary Bar; Mr. J. C. Bolton, M.P., Chairman of the Caledonian and of the Callander and Oban Railway Companies; and some other witnesses.

(B) Joint Committees would, no doubt, effect a considerable saving of time and expense in the case of those Bills (apparently amounting on an average to one-fifth of the total number of opposed Bills in the year) that are made the subject of a second contest in the second House; but, like the minor suggestions for improvement of the present system they fail in any degree to meet the desire for local inquiry. Moreover, they would afford a less measure of relief to members of the House of Commons than is commonly supposed. That House would, no doubt, be called upon to supply only three, or perhaps only two, of its members to each Committee, instead of four as at present; but this gain would be in a degree neutralized by its being required to furnish members to more Committees—viz., to Committees on opposed Bills originating in the House of Lords, as well as on those introduced in the Commons. On the other hand, the House of Commons would have some compensation in not having, as at present, to man Committees on Bills sent down from the Lords and then opposed in the Lower House.

(C) Some witnesses have expressed themselves in favour of an extension of the system of Provisional Orders to all subjects of Private Bill Legislation, leaving it to the option of Promoters to proceed in any case by Provisional Order or by Private Bill, as they judge expedient. It seems to your Committee that this extension would, on the whole, be attended with advantage, especially if the opposition to Provisional Orders in Parliament were limited to one before a Joint Committee. Provisional Orders, having undergone one inquiry before coming to Parliament, might reasonably claim to be exempt from the ordeal of a threefold trial. The adoption of this plan would, however, afford only partial relief to Members of the House of Commons.

The Committee are then brought to the conclusion that, although a Commission must necessarily be an experiment, it presents the best hope of an adequate solution of the difficulties of the situation. The cost of a tribunal of a calibre to command confidence may, no doubt, be considerable; it being recognized as an essential condition of success that men of a high order of ability should be placed at its head. On the other hand, it must be remembered that the annual surplus (£40,000) of the fees imposed by Parliament on suitors over the expenses of the two Houses in connection with Private Bill Legislation, is such as to afford an ample margin for the cost of a Commission; and that suitors may fairly expect that, in return for the payments they are called upon to make, they should be supplied with the most efficient and convenient tribunal that the country can provide. The precise method of giving effect to such a change, and the amendments in law and in parliamentary procedure involved in the establishment of a Commission with the powers and functions contemplated, are matters which can best be determined and carried through by a Government with the machinery at its disposal and on its responsibility.

The Committee would, nevertheless, in closing their report, express the opinion that, of the different schemes laid before them, that submitted by Mr. Stanhope affords a ready basis on which to proceed, as combining a substantial accomplishment of the chief objects immediately aimed at with the least disturbance of existing interests and arrangements. In the event of such a scheme being adopted and of its operation proving satisfactory, it would admit at some future time, if it were thought fit, of being simplified and extended on the lines of the proposals that have been made by Mr. Courtney and others.

RISE OF WATER IN WELLS DURING RAINLESS SEASONS.]

A few weeks since our contemporary, *Nature*, published a letter from a correspondent who called attention to the (to him) mysterious fact that the water in two wells at Fareham rose several feet in the month of March, as he states, "after a continuance of north-easterly wind, without rain, but with half a gale blowing." Writing on the subject in a later issue of our contemporary, Mr. Baldwin Latham points out that the rise of water in the wells in question was nothing more than the ordinary rise due to percolation. For twelve years past, says Mr. Latham, I have been carrying on constant observations of the underground water-supplies in different parts of the country; and it is quite true that ordinarily the water in wells rises in the winter and falls in the summer. But this is by no means an exceptional rule; for in the present season there have been two low waters, the last of which occurred in the southern counties on the 8th of March in the present year. After that date commenced a very wet period; and before the end of the month over 2½ inches of rain had absolutely passed through the ground, as measured by my percolation gauges. The water in a well on the Surrey hills, which had been falling up to March 8, rose before the end of the month over 30 feet, which rise was entirely due to the replenishment from rainfall. I may point out that there are many wells at the present time in which the water is still rising, while in others in the same districts the water is falling. The simple reason for this is that, as a rule, underground water follows the same law as water flowing in a river—the floods or high waters descend from the highest to the lowest districts; so that at present in wells situated in high positions the water is falling, while the crest of the wave of high water in the same watershed has not yet been reached in the lower levels of the district. That the water in wells does fluctuate under certain conditions of the wind there is no doubt, as I have already drawn attention

both to the fluctuations which take place in the water-levels of wells under barometric pressure, and also in the volume of water discharged from the ground with a fall of the barometer. It should be noted that the rise of water in wells when due to barometric changes coincides with the fall of the barometer. Now a north-easterly wind as a rule is accompanied by a high barometer; and therefore is not likely to influence the rise of water in a well. During the month of March the rainfall was above the average, while there were comparatively few days with easterly winds—the only time when it could be termed a half-gale from the north-east occurring on the 19th of March, by which time the water in all the wells had made a considerable rise, simply due to ordinary percolation. Thus there is no mystery attaching to the rising of the water in these wells at Fareham. The rise simply took place from the replenishment of the springs, which this year occurred at a period somewhat different from ordinary years.

EDINBURGH CORPORATION WATER SUPPLY.

PROSPECTIVE EXTENSIONS OF THE WORKS.

It has become apparent that steps will require to be taken shortly to augment the water supply of Edinburgh, Leith, Portobello, and the adjoining districts. The existing works comprise the North and South Pentlands, which are estimated as giving between 7 and 8 million gallons of water per day. The supply from the North Pentlands is wholly spring water of the purest quality, and averages about 5 million gallons a day. From the South Pentlands—the Glencorse district—the Crawley main discharges 300 cubic feet per minute; being equal to about 2½ million gallons per day. With the exception of the Crawley spring, which averages about 75 cubic feet of water per minute, the remainder of the supply from this district is impounded water. Then there is the Moorfoot supply, which is estimated as capable of giving 9 million gallons per day. These works were authorized in the session of 1874; and the first supply from Gladhouse was turned on in June, 1879. Since that time the demand for water in Edinburgh, Leith, and Portobello has enormously increased, and in addition, Musselburgh, Dalkeith, Bonnyrigg, Roslin, Corstorphine, Juniper Green, and other places have been supplied by agreement; so that at present the quantity of water drawn from the Moorfoot sources is about 8 million gallons per day—showing a margin of only 1 million gallons per day. Should the demand for water continue at the same rate as for the last nine years, this supply would be used up in the course of rather more than a year; and as it requires at least five years to construct new works, it will be seen that the Water Trustees, who have to maintain, under penalties, a constant service in Edinburgh, Leith, and Portobello, have no time to lose in looking out for additional sources. In the former water controversy St. Mary's Loch was put forward as a source of inexhaustible supply. The Bill to sanction the works, after a severe contest, passed the Select Committee of the House of Commons in 1871, but was rejected by a Committee of the House of Lords, presided over by Lord Wharcliffe, on the ground that, with additional storage, for utilizing the water drawn from the then existing (Pentlands) source of supply, and with greater care and regulation as regards waste, Edinburgh could obtain all that was necessary for its wants. The rejection of the Bill was attributed at the time to the evidence of certain engineers, particularly Mr. T. Hawksley, who held that for £100,000 he could construct reservoirs in the Glencorse Valley, and that there was sufficient water to supply Edinburgh with 50 gallons per head per day. Up to this time, however, not a single extra gallon has been obtained from the Pentlands sources; and although the Trustees took powers, under their Act of 1874, to construct an additional reservoir at Glencorse for storing up the water that was alleged to run to waste, this reservoir has never been constructed. Looking to the future, the Trust has before it the Heriot, the Manor, and the Fala waters, as well as St. Mary's Loch, as sources of supply. The Heriot water was analyzed in 1869 by Dr. E. Frankland, and pronounced to be good. It lies near the Moorfoots, and was estimated as capable of supplying 9 million gallons per day; but it has always been felt that to touch the Heriot would raise such a storm of opposition from Galashiels and the landed proprietors, that the Trustees never ventured to face it. As to the Manor water, it is perhaps the finest water supply within the United Kingdom. Mr. Leslie, C.E., reported to the Trust in 1870 that it was capable of yielding about 13 million gallons per day for town supply, and that the water seemed to be pure and good. A suitable site for the reservoir was Posso, four miles from the junction of the Tweed. Mr. Leslie's estimate for the works at that time was £390,000. After the rejection of the St. Mary's Loch Bill in 1871, and the interdict upon the Trustees, a private Company, called the Midlothian Water Company, applied to Parliament in 1873, and obtained powers to construct works capable of yielding for the supply of the county—and for Edinburgh, should the Trustees choose to avail themselves of it—five million gallons of water per day. This scheme was somewhat different from Mr. Leslie's, as it only proposed to intercept the springs in the valley at the higher levels, so as to draw the water over the Tweed and Leadburn without tunnelling. In his evidence before Parliament regarding the water at that time, Dr. Frankland stated that the analyses showed both samples to be of excellent quality. They could not be surpassed in any respect for domestic purposes, and were palatable, clear, and soft, and probably there was no better water in the Kingdom. The Corporation of Edinburgh, in prosecution of the Moorfoot scheme in 1874, came into conflict with the Midlothian Water Company in regard to the supply of the outer districts; and eventually the Company was bought up for a sum of £10,000, which was given to them to pay their expenses. So that, as a matter of fact, the water supply of the Manor Valley and the property thereto, belongs to the Edinburgh Water Trust. A recent visit of the Trustees to this valley will no doubt bring out the fine quality of the water which the valley produces. There is scarcely any peat in the district, and the hills are bare, and really act as stores and filters for the water; moreover, it is essentially a valley of springs. As is well known, the quality of the water from the Moorfoots is decidedly peaty; and the fact that £10,000 has had to be expended at Alnwick Hill in the construction of filter-beds to make it fit for use, is the best proof that it is not of the finest description.

LEEDS WATER SUPPLY.—The Water Committee of the Leeds Corporation have lately inspected the work in process for the conveyance of water from the Eucup reservoir to the filter-beds. They found that operations were progressing in a satisfactory way—no untoward or unexpected difficulties have been experienced. For the new Blackmoor Tunnel a distance of more than 100 yards has now been excavated, at the Seven Arches end of the tunnel. The 42-inch mains, between the filter-beds and the old tunnel at the Seven Arches, will be laid in the course of a few weeks; after which the maximum carrying capacity of the old tunnel, of more than 15 million gallons per day, may be utilized. The average daily consumption of water in Leeds throughout the year is about 11 million gallons; but in exceptionally hot and dry weather the quantity used reaches 13 million gallons. Thus in a short time there will be available a daily supply of 2 or 3 million gallons more water than is required by the largest consumption so far recorded.

NOTES FROM SCOTLAND. (FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

This has been an eventful week in my neighbourhood. The great event which has so frequently cast its shadow over this page of the JOURNAL during the past two years has been at last accomplished; and before I see these "Notes" in type, the gas undertakings of Edinburgh and Leith will have passed into the hands of the Corporations. As your readers are aware, I have not hesitated to speak whenever I thought the Commissioners in charge of the negotiations were wrong; but now it is a pleasure to me to be able to place myself alongside them, and to record my satisfaction with the present position of affairs. The negotiations are past; and I homologate the terms agreed to—as why should not I, when the terms were what I had all along pressed the Commissioners to offer? Now I look to the Commissioners, when once they settle down to work, to conduct the gas supply in as enlightened a way as their predecessors have done. The Commissioners selected are able men; and every one must be pleased to see that the good sense of the Edinburgh Council prevailed over the rather narrow-minded policy of the Lord Provost. Mr. Smith Clark has obtained a place. His Lordship's list did not include Mr. Smith Clark; and, in fact, would have made the minority be represented on the Commission by their very weakest member. This is not the first occasion on which the Lord Provost has stood in the way of Mr. Smith Clark; for it is an open secret that but for him Mr. Smith Clark would have been on the Joint Committee from almost the very beginning. It was a mistake that he was not, because if he had been, a great deal of the speaking with which he occupied the time of the Council would have been expended in Committee. It is just possible, too, and even likely, that many of his objections would have been removed by reasoning in Committee; and in that way the negotiations might have proceeded much more harmoniously than they did. He has, however—thanks to the wisdom of the Councillors—gained a seat "among the prophets" at last; and it remains with himself to show whether he has any knowledge of gas manufacture and supply, or whether he has been trading upon an empty reputation. The Commissioners set to work in a thoroughly businesslike way, without bombastic utterance or self-glorification of any sort, for which they are much to be commended. They well know that they have much and exceedingly delicate work before them; and evidently until they are out of the wood, they are resolved to restrain their halloo. One of their first duties will be to appoint officers; and, in this, much tact will be required. They have already discussed one—the clerkship; and the appointment will be made on Monday of a gentleman who it may be expected will hold the office permanently. On that head I cannot help feeling that the Commissioners might have considered whether a better way than the appointment of a legally qualified Clerk would not have been to have appointed a Law Agent separately, and to have given the post to one of the existing officers of the Gas Companies. Both Companies were able to carry on under these conditions; and why should not the Commission? After the transfer is completed, the legal business cannot be much; and indeed point is added to my suggestion by the circumstance that whatever of directly legal business there may be to perform, will, even with a lawyer for Clerk, be performed by a separate Law Agent. Another reason why I think the Commissioners should not have gone outside their own office for a Clerk, is that there will undoubtedly be a plethora of *employés*, all of them trained to the work, for whom posts will have to be found, and some of whom, I fear, will, if not set to lower-class work, at least find their expectations of promotion barred by the appointment of outsiders over their heads. I would not have written thus but for a rumour that, in addition to the clerkship, the treasurer'ship is also to be given away to an outsider. There is but rumour on the subject, however; and I shall be heartily glad, for the sake of the Commissioners themselves, if it should turn out to be no more. Besides the Clerk and Treasurer, the Commissioners must have an Engineer, and likewise a Manager for both works. In these appointments they have material before them for much anxious deliberation; and it is to be sincerely hoped they will see their way to making the appointments on perfectly fair and just lines. In addition to these appointments, the Commissioners have before them the ticklish work of carrying through the transfer of the stocks—certainly a matter of detail, but one which will require their attention and close consideration.

The Commissioners had their first taste of work yesterday afternoon, and began to feel some of the difficulties which are likely to beset their path for some time, and make them realize that their position is not altogether a bed of roses. The Works Commissioners held their first meeting as soon as the public meeting was concluded, and indeed within half an hour of their appointment. There were submitted to them about 100 tenders for the supply of coal to the Edinburgh works of the Commission during the current year. The Committee felt themselves unable, without professional advice, to proceed with the consideration of the tenders; and the subject was deferred till Monday, when it is expected that the Engineer to one of the Gas Companies will be present to advise them.

Consequent on the transfer of the gas undertakings of Edinburgh and Leith to the Corporations, the Stock Exchange has made a change in the method of stating their quotation of the gas stocks. The Gas Act only received the Royal Assent on Tuesday; and on Wednesday the quotation appeared under the heading of "Gas" for the last time. Since then it has appeared under the heading of "Corporation and Municipal Stocks and Annuities." Formerly the price was quoted at so much per share of £25; it is now quoted at so much per £100—the Corporation annuities being calculated on this basis. To-day the quotation is £305 for £100 of the 10 per cent. stock, and £287 for £100 of the 9½ per cent. stock.

The Oban Police Commissioners, who are the lighting authority for the burgh, have had submitted to them by the Defries Safety Lamp and Oil Company a proposal to light and maintain the public lamps at much less cost than is paid at present. The Lighting Committee, like cautious Scotchmen, did not jump at the offer, but wisely sent a request that one or two of the Company's lamps should be lent for their inspection. On a subject such as this, the thought naturally arises that, if the Defries Company can confer such benefits on communities as they hold out here, they do not act with much public spirit in proposing to confer the benefit on such a small place as Oban. The cost of public lighting in Oban cannot be great. It is one of the worst-lighted of the small towns of Scotland I have ever been in; and as the charge for public lighting in such places as Edinburgh is very large, it is a pity that the Company cannot see their way to make an offer to light its streets "at much less cost" than is incurred for gas. Can there be any notion on the part of the Company of making the Oban scheme an advertisement, which, on account of the smallness of the town, would not be a costly one?

The works and plant of the Stromness Gas Company have been sold by auction for £800, to the Manager of the Company, on behalf, it is stated, of a new Company which is about to be formed.

The Edinburgh and District Water Trustees held a meeting to-day, at which the accounts of the Trust for the year to May 15 (a summary of

which was published in my "Notes" on the 3rd of July) were presented. Mr. Colston, in moving approval of the accounts, said it was satisfactory to know that there was a balance in the hands of the Treasurer of £7641; and, as to what they proposed to do with the money, he would let them know at a future meeting. They had spent £3000 more during the past year than in any former year on the renewal and distribution of pipes—the total spent being £4217, as against little over £1000 formerly. It was right also to state that, through the energy and zeal of Mr. Oliver, their interim Treasurer, they had £300 less poor-rates to pay than the previous year; and he also succeeded in getting the money in quicker and much more thoroughly than in any former year. Mr. Oliver was appointed Collector for the Trust.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

Dr. Wallace, Gas Examiner for the city of Glasgow, has contributed a letter to one of to-day's papers on the question discussed on Thursday in Mr. Hislop's excellent paper read to the North British Association of Gas Managers. After admitting that Mr. Hislop had clearly established his position, Dr. Wallace goes on to say that, in regard to Glasgow gas, he is not permitted to use either the description of burner or the pressure of gas best suited to the quality of gas produced in the Glasgow Gas-Works. By the Act of 1860, it is clearly defined, he says, that the gas shall be tested by a union-jet, burning 5 cubic feet per hour at a pressure equal to a column of water 5-10ths of an inch in height. This was for gas of a minimum quality of 25 candles, and expected to average about 27 candles; and it was a suitable burner for gas of that quality. The Act of 1882 lowered the minimum illuminating power to 20 candles, but retained the burner formerly in use. In his evidence before the Parliamentary Committee, he clearly pointed out that the burner would not develop the full amount of light which the gas was capable of yielding; and that it would be necessary to manufacture gas which, tested by a burner adapted for that quality, would give about two candles more. He concludes by saying that, while his weekly returns show an illuminating power averaging 23 candles, the gas would, in any town not restricted in the choice of a burner and in regard to pressure, be stated to be of 25-candle power.

The most important event in connection with gas matters during the past week in this part of Scotland has been the annual meeting of the North British Association of Gas Managers; but next in importance to it is the announcement of a probable reduction in the price of gas in this city. A meeting of certain prominent members of the Corporation Gas Committee was held on Wednesday; and after the financial statement had been considered—which I referred to in last week's "Notes"—there was a sort of informal agreement resolved upon to recommend that a reduction in price of 2d. per 1000 cubic feet should take place; and that the recommendation should be submitted to the Gas Committee. This means that the price is to be reduced from 2s. 10d. to 2s. 8d. per 1000 feet. A meeting of the Committee was held on Thursday; but it was agreed to hold over, in the meantime, any formal resolution on the subject—partly, it is said, because of the announcement of the prospective reduction of price having got into one of the local papers without the matter having been brought up in an orderly way. There is every probability, however, that the proposed reduction in price will eventually be agreed to. In connection with this matter, I may mention that it has been agreed to recommend that depreciation on works should be written off at the rate of 5 rather than 7½ per cent., which was the rate fixed upon at the last balance; and that in addition the sum of £12,000 shall be written off the value of the Tradeston works, where important alterations and extensions are about to be undertaken. The net balance, together with the balance carried over a year ago, will make a sum of about £5000 to the good to enter the new financial year with. It is stated that the reduction in price is due in a great measure to the favourable terms on which the coal purchases have been made for the year 1888-9. There is also a very large expansion reported in the consumption of gas during the past year; no mean proportion of the consumption being due to the increased and increasing use of gas cooking and heating appliances, more especially during the summer and autumn months. The net balance in the accounts of the Gas-Stove, &c., Department is reported to be very favourable. This, it should be mentioned, is after making liberal allowances in various directions. This subject of the expected reduction in the price of gas has already excited considerable attention in many parts of Scotland—indeed, one of the Ayrshire newspapers of yesterday refers to the circumstance as an example which is commended to the Ayr Gas Company.

A Hawick newspaper of to-day is devoting attention to the subject of gas supply undertakings being in the hands of the corporations or special trusts; and quotes the instances of Edinburgh and Leith, where the works are just being transferred to a Gas Commission, and refers to the examples of Glasgow, Paisley, and Greenock. In these three cases the results, according to the writer, have been advantageous to the respective communities, by giving good and cheap gas to the inhabitants, while making handsome yearly profits, which have been applied for town improvements. The writer refers to the fact that a movement was made in the Hawick Town Council some years ago for the purpose of taking over the Hawick Gas Company's stock and works; the proposal, however, was not proceeded with, the Council not being generally in favour of it. Another arrangement was made between certain persons and the Gas Company, whereby the Company became bound not to divide more than 10 per cent. per annum, and to give the public the benefit of the surplus profit by reducing the price of the gas when it could be sold cheaper. This arrangement has worked very satisfactorily for the past 15 years; and the inclusion of representatives of the Town Council at the Gas Company's Board has done much to make the Hawick Gas-Works what they are—for, everything considered, this concern is as well managed as anything else of the kind in Scotland. The low price charged for gas in Hawick is sufficient proof of the works being well managed. It is affirmed by the writer, however, that the same advantages could all have been obtained, and a considerable annual surplus made and applied to the improvement of the town, if the whole gas concern had been bought up at the time the thing was first proposed in the Town Council. He goes on to show what might have been done in that direction, and illustrates his position by stating what Greenock and Paisley have done in the way of supplying cheap gas, and at the same time providing votes from the gas surpluses for various public improvements. But what is now reduced to a regular system in those two towns is not likely to become the rule in Glasgow—at least so long as the Corporation Gas Committee remains of the same description as that now in office.

The Scotch pig iron market has been animated this week, with a rapid advance in price during the last few days—up to 39s. 7d. per ton cash being reached by Scotch warrants. The outside public seem to be now more disposed to buy; and there is a better demand for iron all round.

There is an improving tone in the local coal trade; the business doing in the shipping department causing an air of briskness where formerly a dull state prevailed. Most of the collieries are busy with orders on hand; and these keep the workers in steady employment. Quotations are much harder than a few weeks ago; and in some instances small advances are being claimed outside the usual run of orders.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, July 28.

Sulphate of Ammonia.—The momentary quietness of the Continental demand seems to furnish dealers with an opportunity to attempt once more the promotion of a downward course. It will probably prove a fruitless effort, unless conditions more favourable to such a task are imported. Against the realization of this object is, first, the firmness of makers, who can calmly look on while their small stocks do not increase, and the make remains limited as at present; and second, the probability (not to say assurance) of large requirements during August, when those consumers who, disappointed by the firm prices, have been holding back, cannot delay their purchases any longer, independent of such orders as have been taken and have to be fulfilled by speculators. So even a temporary decline looks doubtful; and quotations are at any rate still well maintained. Parcels at Hull and Liverpool are especially scarce; and there is not too much offering at Leith. Some large enquiries have been in the market this week for Southern Ports and the Colonies. To-day the quotations are: £11 15s., Hull and Liverpool; £11 12s. 6d., Leith.

LONDON, July 28.

Tar Products.—The chief feature of the week has been the continued and improving demand for anthracene. Ninety per cent. benzole is also in fair request, and the price advanced 1s. per gallon. On the other hand, fifty per cent. is neglected at the old rates. Creosote oil stocks are low; and this article looks better than it has done for some time—chiefly owing to new uses for it. This is satisfactory to distillers, as the old time-honoured outlet for pickling timber is gradually but surely dying out before the steel sleeper, which the railway companies seem to prefer. Prices: Tar, 15s. to 20s. per ton. Benzol, 90 per cent., 2s. 10d. per gallon; 50 per cent., 2s. 4d. per gallon. Toluol, 1s. 8d. per gallon. Solvent naphtha, 1s. 2d. per gallon. Crude naphtha, 30 per cent., 1s. per gallon. Light oil, 3½d. per gallon. Creosote, 1½d. per gallon. Pitch, 12s. to 13s. 6d. per ton. Carbolic acid (crude), 3s. 5d. per gallon. Cresylic acid, 10d. per gallon. Tar salts, 15s. per ton. Anthracene, 30 per cent., "A" quality, 1s. 4d. per unit; "B" quality, 1s. 2d.

Ammonia Products.—Sulphate is decidedly firmer. The improved prices quoted last week have been fully maintained; and the make now being small, it is not unlikely that higher prices may be seen. Business during the week has averaged: Sulphate of ammonia, £11 12s. to £11 16s. 3d. per ton, less discount. Gas liquor (5° Twaddell), 8s. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 2d. per lb. Carbonate of ammonia, 3½d. per lb. Muriate of ammonia, brown, £18 per ton; white, £28. Sal ammoniac, £30 per ton.

[From the *Chemical Trade Journal*, July 28.]

Sulphate of Ammonia.—The sulphate market still keeps up its firm tone, though business is somewhat quieter than it was a week ago. Business has been done during the week at £11 15s., f.o.b. Hull; and some makers have refused this price, hoping to see values go still higher. The fact that so little is offering would, at first sight, seem ample argument for a further rise in prices; but when it is known that a "bull" movement is contemplated in certain quarters, makers should be certain that they are not aiding others to get rid of their purchases while they are left with considerable stocks. Beckett price is £11 15s.; while outside, London makes are fetching £11 16s. 3d. Leith and Liverpool values stand at £11 10s. to £11 12s. 6d., with a fairly active demand.

Tar Products.—Benzol prices retain their firmness noticed last week; and 2s. 6d. for 50/90's may be quoted as to-day's value, 90's remaining as last week. The demand for solvent naphtha is very good; and 1s. 2d. is about the price for 90 per cent., distilling at 160° C. Still the demand for creosote keeps increasing, mainly for use in the Lucigen; and tar distillers will do well to make themselves acquainted with the exact qualities required for the different lamps. Crude carbolic remains *in statu quo*; while business has been done in anthracene at slightly improved prices over those of last week. Pitch sales have been made at 12s. 6d. to 13s.—probably the latter price is the more correct for normal business.

DARWEN CORPORATION GAS AND WATER STATISTICS.—The Darwen Borough Treasurer (Mr. J. H. Elleston) has just issued his abstracts of the Corporation accounts for the past financial year. Those relating to the gas undertaking show that the sale of gas realized £16,595 2s., the rent of meters was £136 13s., and residual products returned £1844 18s.; making a total of £18,829 8s. The manufacture of gas has cost £8254 4s.; and its distribution—viz., inspectors, repairs and maintenance of pipes, public lamps, &c., £779 11s. There is an item of £371 9s. for management; and rents, rates, and taxes reached £1189 6s.—making a total of £1059 11s. There is a balance of £8188 13s. carried forward. There were 752,000 cubic feet of gas purchased from the Blackburn Corporation during the year. The net profit was £1768 9s. The capital account shows that during the year £12,087 10s. was expended in the erection of new works. The Blackburn gas purchase mortgages sinking fund account shows a balance of £338 6s. The water-works revenue accounts show:—Receipts, £6850 2s.; expenditure, £6850 2s. There was a balance against the water-works last year of £2907 14s.; but this has now been extinguished by the amount being appropriated from the gas profits. The balance on the water-works sinking fund account is £3402 4s.; and on the water annuities sinking fund account, £4077 14s.

THE CONVEYANCE OF THE VYRNWY WATER TO LIVERPOOL.—At the Surveyors' Institution, Westminster, last Thursday, the inquiry instituted by the Board of Trade to determine whether the pipes in connection with the Vyrnwy scheme of the Liverpool Corporation should be carried underneath the River Weaver in a tunnel, walled passage, or culvert, or be placed in the bed of the river (see *ante*, p. 176), was resumed before Sir Douglas Galton. The Corporation were again represented by Mr. Pember, Q.C.; and the Weaver Trustees by Mr. Higgin, Q.C. Among the witnesses called were Mr. Lionel B. Wells, Consulting Engineer to the Weaver Trust, and Mr. Leader Williams, Engineer of the Manchester Ship Canal. The former gentleman considered that to lay steel pipes in a trench in the bed of the river, as proposed by the Corporation Engineer (Mr. G. F. Deacon) would be a constant source of danger to navigation, would be less economical than a tunnel such as he suggested, and was not the best mode that could be adopted. Mr. Williams would not go so far as to say it would be impossible for Mr. Deacon to float large flexible steel pipes across an important navigation, but it was an experiment he had never known to be tried. He thought it would result in delay to the trade during construction, and when it was completed would be a work not satisfactory either to the Corporation or to the Weaver Trustees. The only way to his mind would be to adopt a cut-and-cover arrangement, so that an examination internally and externally might take place periodically. By this arrangement he was satisfied that the work might be efficiently done for £4000, without any undue risk to the navigation, and with absolute safety to the water-pipes after they had been put in. Speeches by Counsel closed the proceedings; and Sir Douglas Galton will present his report in due course.

THE DANGERS OF ELECTRIC LIGHT INSTALLATIONS IN THUNDERSTORMS.—The residence of Sir Albert Sassoon, in Eastern Terrace, Hove, narrowly escaped destruction by fire on the night of Sunday, the 22nd inst. During the heavy thunderstorm which occurred that night, one of the maids, who had been roused by the storm, was startled by a smell of fire coming from the entrance hall, which is lighted by incandescent electric lamps. The girl called the butler, who found that flames were flickering near one of the lamps. He poured some water upon the spot; and in this way the outbreak was checked. One of the lamps was broken, and the woodwork near it scorched. It is supposed that the wire was struck by lightning, which was thus conducted into the house.

LANCASHIRE WATER SUPPLIES.—The heavy rain which has fallen recently has largely increased the stock of water in the reservoirs of the Lancashire towns, which suffered most severely from the effects of the drought. In Liverpool, the latest report is that the stock of water in Rivington Reservoir has increased by 223 million gallons during the past fortnight. The restriction of the supply to six hours a day is, however, maintained; the stock being still 940 million gallons below that of the same period last year. At Bolton the full supply of water was resumed last Wednesday. The restriction dated from the 20th of June, when there were 304 million gallons in store, against 620 millions at present. The Darwen Corporation have also found their reservoirs replenished; and it is estimated that the supply will last throughout the summer, independently of the purchases from the Blackburn Corporation.

CAMBRIDGE GAS COMPANY.—The half-yearly general meeting of this Company was held last Friday—the Rev. Dr. Phelps in the chair. In their report, the Directors recommended a dividend at the rate of 10 per cent. per annum on the original consolidated stock, and at 7 per cent. per annum on the consolidated stocks of 1880, 1882, and 1885, and on the new £10 shares. This was agreed to. The report of the Manager (Mr. J. Weeks) showed that the whole of the works are in good repair, and that the increase in the consumption of gas during the half year ending June 30, had been equal to the average increase of former periods; while the illuminating power, pressure, and purity of the gas had been maintained. The report was adopted. The retiring Directors (Dr. Phelps and Mr. C. Balls) and the Auditor (Mr. G. W. Fitch) were unanimously re-elected, and a vote of thanks to the Chairman closed the proceedings.

THE NORTHERN COAL TRADE.—There has been a slight fall in the demand for steam coal in the North; but it is believed to be temporary only, and it still leaves most of the chief collieries well employed. The price varies a little more—from 7s. 6d. to 7s. 9d., less a slight discount at times, and with a proportionate price for second qualities. Gas coal sells much more freely just now, not only on old contracts, but there is a larger shipment; and the inland gas companies are beginning to feel the increased consumption of gas through the lengthening of the nights. In the course of a few weeks much larger quantities will be sent to the greater companies; but it is already evident that the range of the freights for carriage by sea will be higher than last year. Household coal is only slow of sale. But manufacturing coal is more in demand; and, with the greater trading activity, there is the expectation of higher prices for this class of coal. Gas coke is in demand, and is now very scarce.

THE LEAKAGE OF THE HEYWOOD RESERVOIR.—During last week a large staff of workmen was employed, under the immediate direction of Mr. J. Diggle, the Engineer, opening down to the coal workings under the east embankment of the new reservoir at Clay Lane. Portions of the workings have been bored; and, as was expected, the recent leakage is entirely attributable to the end of the workings not having been sufficiently packed with rubble stone as ordered by the Engineer when the embankment was in course of construction. It is expected that the expense of making good the defect will not be great; but, to prevent any mishap, the Engineer has directed investigations to be made in other portions of the workings beyond those points where the leakage actually occurred, with a view of ascertaining beyond doubt whether there are any other defects in the stone packing. This will necessarily occupy some time, as the operations can only be proceeded with slowly. There is no settlement whatever in any portion of the embankment, and, so far, the Engineer has not any reason to fear that serious damage has been done to any portion of the embankment by reason of the recent leakage.

SKIPTON WATER SUPPLY.—About a month ago, the Skipton Local Board received the report of the Engineer (Mr. Hill) who had been engaged to investigate the subject of an increased supply of water to the town, and since then several discussions on the schemes recommended have taken place at the Board meetings. The report contained three suggestions for the augmentation of the supply—the first, to take additional drainage-ground to the east of the existing works, which would provide a supply for 10 or 14 years, the cost, exclusive of the land, being estimated at £5000; the second, to extend the present works into the Cowder district, the water from which should be conveyed to the Winny Gill reservoir, which would last 12 or 13 years, and would cost £5700 exclusive of land; and the third and most important, to construct a reservoir at High Skibeden, to contain 80 million gallons, with a drainage-area of 295 acres, capable of supplying 380,000 gallons per day, the cost being set down at £14,500. At a meeting last Friday week, the Chairman (Mr. J. B. Dewhurst) moved that the Board adopt the last-mentioned scheme, which had been recommended by the Water Committee. An amendment in favour of carrying out the Cowder scheme, but at a cost of £2000 only, was moved by Mr. J. Hogg; and this was carried.

THE NEW WATER-WORKS OF THE SOUTHAMPTON CORPORATION.—The Southampton Town Council, at their meeting last Wednesday, had a long discussion on a communication received from the Water Engineer (Mr. W. Matthews, Assoc. M. Inst. C.E.) relative to the work of driving the headings at Otterbourne, in connection with the new water-works. It appeared that Mr. Matthews had, at his own expense, caused an additional length of heading to be driven for his special information and guidance, and this fact he admitted he had kept from the Council. He submitted, as an explanation of his conduct, that a heavy physical and mental strain had been imposed upon him in carrying out the new works; and this had been terribly augmented by the uncharitable comments of a section of the outside public. The new works had, he said, been pointed out as a complete failure; and he had been held up to contempt and ridicule by those whom he had no chance of answering. The effect had been to greatly upset his mind; and in over-anxiety to strengthen himself with additional information, and thus protect, as he thought, his reputation and judgment, he privately carried on the heading, with the view of ascertaining beyond doubt the best course to advise the Council to pursue in seeking an augmentation of the available water supply. Of the ultimate success, neither he nor the many engineers of repute who had visited the works had ever felt a doubt, though he admitted that in a similar case he should not again adopt the same type of wells. He asked the Council to accept his apologies and regrets; and expressed the hope that he might by his future conduct and energies in their service regain that measure of confidence which he could not but feel he had temporarily and deservedly lost. Mr. Matthews's apology was accepted.

THE CHELSEA ELECTRICITY SUPPLY COMPANY, LIMITED.—This Company has been formed with a capital of £100,000, in 20,000 shares of £5 each and 500 founders' shares of £1 each, to establish a central station for the supply of electricity for lighting and other purposes in Chelsea.

THE LIGHTING OF CHARTERS TOWERS (QUEENSLAND) WITH GAS.—By advice just received from Australia, we learn that the gas-works at Charters Towers, a town of about 10,000 inhabitants in Queensland, were started with great success on the 2nd ult. They were put up by Messrs. J. Coates and Co., of London and Melbourne.

THE THIRLMERE WATER SCHEME.—The Manchester Corporation have just let the fifth contract for the Thirlmere water scheme, which will bring the watercourse to within a mile of Lancaster; Messrs. McCreagh and McFarland, of Belfast and Londonderry, being the successful tenderers. This length of the aqueduct will be 16½ miles altogether; and the amount of the contract is £141,424 11s. 3d.

THE YEADON LOCAL BOARD AND THE WATER COMPANY.—At a recent meeting of the Yeaddon Local Board, it was reported that Messrs. Watson, Dickens, and Watson, the Solicitors of the Yeaddon Water Company, were about to make an application to the High Court of Justice for the setting aside of the award of the Umpire in the arbitration proceedings between the Company and the Board. After some discussion, the Clerk (Mr. C. J. Newstead) was instructed to take such steps as he thought necessary for proving the validity of the award.

LONDON WATER-METER COMPANY, LIMITED.—A Company has been registered under this title, with a capital of £18,000 in £10 shares. They intend "to carry on the trade of engineers, smiths, machinists, and manufacturers, patentees, vendors, and lessors of water-meters, water-motors, blowers, and fans, and all descriptions of engines, plant, and machinery; to purchase or otherwise acquire English, colonial, and foreign patent rights and privileges, improved or secret process, for or in respect, or in any way relating to all or any of the objects aforesaid, or any objects, and to use, exercise, develop, or grant licenses in respect thereof, sell, or otherwise deal with any property and rights so acquired."

THE LIGHTING OF THE TEES BY GAS.—Last Wednesday, Mr. Vivian, a representative of the Elder Brethren of Trinity House, London, visited the Tees, in accordance with the request of the Tees Conservancy Commissioners, to inspect the lighting arrangements of the river, in view of the change in the system of lighting proposed by the Commissioners—from oil to compressed gas. Mr. J. H. Amos (Secretary), Mr. J. Fowler (Engineer), and Mr. Joplin (Resident Engineer), with several members of the Tees Conservancy Commission, met Mr. Vivian, and explained the proposed scheme, which is similar to that now in use on the Clyde and other rivers. Its adoption, it is expected, will render the lighting more efficient; and will eventually be much more economical, although the change will involve an outlay at first of, it is estimated, about £3000 or £4000.

CREDITON WATER SUPPLY.—Mr. S. J. Smith, C.E., one of the Local Government Board Inspectors, held an adjourned inquiry at Crediton last Wednesday with reference to the application of the Improvement Commissioners for power to borrow £10,000. The Inspector stated that the adjournment was caused through his requiring further and more exhaustive tests to be made of the source at Walsen; also to consider a competitive scheme by Mr. J. Carthew, and that analyses from the two supplies might be made by the authorities in London. Mr. Moon submitted a long report, showing that the minimum at shaft No. 1 was 56,000 gallons, and 51,414 gallons at No. 2. Mr. Appleton stated that he had reckoned the population at 4200; and, allowing 15 gallons per head, there was ample margin for all contingencies. The Four Mills scheme was then gone into. Mr. Marten, C.E., presented a long report, contending that there was sufficient power to convey the water to all parts of the town, with the exception of a few months during the year. Further evidence was taken; and it was stated that the cost of this scheme would be something like £4000 less than that of Walsen, and with a most ample supply. The Inspector stated he had been to Crediton three times to investigate this matter, had carefully taken notes of the evidence, and would report to the Local Government Board. The authorities would be informed of the result in due course.

CROYDON WATER SUPPLY.—At the last meeting of the Croydon Town Council, it was reported that the new water reservoir and other works at Addington were nearly finished; only a little rendering inside and asphalted over the arches on the outside being required for the completion of the former. Alderman Coldwells, in moving the adoption of the report, said that the new pumping station at Addington was a great success. There was no doubt they would have from there a splendid water supply; and from its elevated position all the higher parts of the town, including Norwood, would derive very great benefit. When, therefore, they had a fair chance of severing their connection with the Lambeth Water Company, they had the means at their disposal. Hitherto it had not been practicable; but the Addington Hills reservoir would render it possible to supply the whole of the borough on a future occasion. Arrangements have been made for opening the new works on Thursday next, when the Archbishop of Canterbury will attend at the Addington Wells with the Mayor and members of the Water Committee, and set in motion the engine which will pump water from the well into the new reservoir. The Mayor will afterwards entertain the Archbishop, members of the Town Council, the County and Borough Justices, and others to luncheon in a large marquee erected on the top of the reservoir, after which His Grace will be asked to open the valves of the reservoir which will admit the water into the main to supply the town.

THE KIRKCALDY WATER COMMISSIONERS AND THEIR RESERVOIR CONTRACTORS.—In the Court of Session (Outer House) last Wednesday week, Lord McLaren gave judgment in the action brought by Mr. John Ross and Mr. John Ross, jun., partners in the firm of Messrs. Ross and Son, against the Kirkcaldy Water Commissioners and Mr. A. Leslie, C.E., of Edinburgh, the Arbitrator between this firm (who were the contractors for the Commissioners' new reservoir at Harperlee) and the Commissioners, asking the Court to reduce and set aside a decree arbitral, pronounced by Mr. Leslie in certain questions that arose between the parties. By contract dated Feb. 27 and March 5, 1886, pursuers undertook to construct a storage reservoir, with its appliances, filters, &c., for the sum of £31,739 18s. 10d. Under the contract, the late Mr. J. Sang, C.E., of Kirkcaldy, and Mr. Leslie were appointed Arbitrators. Pursuers stated that when the contract was entered into, they were not aware that Mr. Leslie was also to act, in the execution of the work, as one of the Commissioners' Engineers. Pursuers began operations in March, 1886, and the decree arbitral which they wished to have set aside, applied to the ninth monthly account of work done up to Dec. 1, 1886. Mr. Leslie found that pursuers had been overpaid by defenders on that date by the sum of £148 10s. The ground of reduction was "corrupt behaviour" on the part of Mr. Leslie in his duty as Arbitrator. This his Lordship found had not been shown; and he decided in favour of the Commissioners, with costs.

DARWEN WATER SUPPLY.—For a long time the Darwen Corporation have been on the look-out for a good source of increased water supply, and a short time ago they forwarded to Dr. Frankland a number of samples of water for him to analyze and report upon. The report was read at the meeting of the Gas and Water Committee, on Monday last week—Alderman T. Lightbown presiding. Dr. Frankland proposed a number of schemes for the supply. He stated that in his opinion the water in the Dean reservoir was absolutely pure, as it contained both peaty or surface water, and drift or mineral water. According to Dr. Frankland's report, a mixture of these two ingredients is the best and purest water, as the one quality neutralizes the other, and renders the water free from all impurity. What is termed the Sunnyside Hey, or "top" reservoir, is almost entirely composed of the peaty or surface water, and requires mixing with mineral or drift water. A number of other schemes were suggested; but this met with the most acceptance. It was, however, impossible to get through all the schemes proposed, and the matter was finally deferred to a future meeting; the Gas and Water Sub-Committee being instructed to consider and report upon Dr. Frankland's statement in the meantime. It may be remembered that a short time ago a number of cases of lead poisoning were reported in the town, and this seems to have been the cause of the present action of the Gas and Water Committee.

SALES OF SHARES.—At the Mart, Tokenhouse Yard, last Wednesday, Messrs. Fox and Bousfield sold £14,500 of 4 per cent. debenture stock of *The Gaslight and Coke Company* and £10,000 of 4½ per cent. debenture stock of the *East London Water-Works Company*, together with an annuity of £2000 payable by the *New River Company*. The prices realized were as follows:—*The Gaslight and Coke Company's* stock, £7100 at £119 10s. per cent.; and £7400 at £119 5s. per cent. Of the *East London Water Company's* stock (which was sold in lots of £200 each), five lots were sold at £287; five at £286; five at £284 10s.; five at £281 10s.; five at £281; five at £280; ten at £279 10s.; five at £279; and five at £278 10s. The annuity payable by the *New River Company*, terminable in 1911, and which was put up in four lots, was sold for £31,800.—Some £10 shares in the *Croydon Commercial Gas Company* were recently sold at £22 and £22 2s. 6d. per share. A parcel of 10 per cent. £5 shares was disposed of at £11 7s. 6d. per share; and a number of £5 13 per cent. shares were sold at £14 10s. and £14 5s. per share.—Mr. A. Smith lately sold at the Snssex Hotel, Bognor, 200 fully paid-up £5 shares in the *Bognor Water Company*. A spirited contest took place, and resulted in all the shares being sold at an average price of £3 17s. 6d. each. This, we learn, is a considerable advance in value since any of the Company's shares were last submitted to public auction.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST. (For Stock Market Intelligence, see ante, p. 198.)

Issue.	Share	When ex-Dividend.	Dividend of Divd. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.					£ s. d.
GAS COMPANIES.								
590,000	10	12 Apr.	10½	Alliance & Dublin 10 p. c.	10	183-191	..	5 7 8
100,000	10	"	7½	Do. 7 p. c.	10	134-14	..	5 7 2
800,000	100	2 July	5	Anstralian (Sydney) 5½ p. c. Deb.	100	109-111	..	4 10 1
100,000	20	30 May	10	Bahia, Limited	20	23-25	..	8 0 0
200,000	5	11 May	7½	Bombay, Limited	5	7-7½	..	5 0 0
40,000	5	"	7½	Do. New	4	5-5½	..	5 9 1
380,000	Stock.	15 Feb.	11½	Brentford Consolidated	100	225-230	..	5 2 2
110,000	"	"	8½	Do. New	100	165-170	..	5 2 1
220,000	20	14 Mar.	10½	Brighton & Hove, Original	20	43-45	..	4 13 4
320,000	20	12 Apr.	11½	British	20	45-47	..	4 15 9
50,000	10	14 Mar.	11	Bromley, Ordinary 10 p. c.	10	20-22	..	5 0 0
99,000	10	"	8	Do. 7 p. c.	10	134-144	..	5 10 4
328,750	10	30 May	8	Buenos Ayres (New) Limited	10	134-144	..	5 10 4
200,000	100	2 July	6	Do. 6 p. c. Deb.	100	106-109	..	5 10 1
150,000	20	29 Feb.	7	Cagliari, Limited	20	25-27	..	5 8 8
50,000	Stock.	12 Apr.	13½	Commercial, Old Stock	100	268-278	..	4 18 10
130,000	"	"	10½	Do. New do.	100	205-210	..	5 0 0
121,234	"	28 June	4½	Do. 4½ p. c. Deb. do.	100	120-125	..	3 12 0
557,820	20	14 June	12	Continental Union, Limited	20	44-45½	..	5 5 6
242,680	20	"	12	Do. New '69 & '72	14	294-304	..	5 10 0
200,000	20	"	9	Do. 7 p. c. Pref.	20	35-37	..	4 17 3
75,000	Stock.	28 Mar.	10	Crystal Palace District	100	205-215	..	4 18 0
234,060	10	27 July	13	European, Limited	10	244-254	..	5 1 11
120,000	10	"	13	Do. New	7½	173-184	..	5 5 3
354,060	10	"	13	Do. do.	5	13-13½	..	5 0 0
5,468,350	Stock.	15 Feb.	13½	Gaslight & Coke, A, Ordinary	100	256-260	..	4 5 0
100,000	"	"	4	Do. B, 4 p. c. max.	100	98-103	..	3 17 8
665,000	"	"	10	Do. C, D, & E, 10 p. c. Pf.	100	263-268	..	3 14 7
30,000	"	"	5	Do. F, 5 p. c. Pf.	100	127-132	..	3 15 9
60,000	"	"	7½	Do. G, 7½ p. c. Pf.	100	185-190	..	3 18 11
1,900,000	"	"	7	Do. H, 7 p. c. max.	100	170-175	..	4 0 0
463,000	"	"	10	Do. J, 10 p. c. Pf.	100	261-266	..	3 15 2
1,061,150	"	14 June	4	Do. 4 p. c. Deb. Stk.	100	119-122	..	4 5 7
294,850	"	"	4½	Do. 4½ p. c. do.	100	123-130	..	3 9 3
650,000	"	"	6	Do. 6 p. c. do.	100	175-178	..	3 7 5
3,600,000	Stock.	11 May	10	Imperial Continental	100	205-208	..	4 16 1
75,000	5	14 June	6	Malta & Mediterranean, Ltd	5	42-54	..	5 14 3
560,000	100	3 Apr.	5	Met. of Melbourne, 5 p. c. Deb.	100	114-116	..	4 6 2
541,920	20	14 June	6	Monte Video, Limited	20	20-21	..	5 14 3
150,000	5	30 May	10	Oriental, Limited	5	9½-9½	..	5 2 7
60,000	5	28 Mar.	7	Ottoman, Limited	5	6-7	..	5 0 0
People's Gas of Chicago—								
420,000	100	2 May	6	1st Mtg. Bds.	100	104-109	..	5 10 1
500,000	100	1 June	6	2nd Do.	100	95-100	..	4 6 0
100,000	10	26 Apr.	10	San Paulo, Limited	10	16-17	..	5 17 8
500,000	Stock.	29 Feb.	15½	South Metropolitan, A Stock	100	319-324	..	4 15 8
1,350,000	"	"	12	Do. B do.	100	245-250	..	4 16 0
141,500	"	"	13	Do. C do.	100	255-265	..	4 18 1
550,000	"	28 June	5	Do. 5 p. c. Deb. Stk.	100	185-190	..	3 11 5
60,000	5	29 Feb.	11	Tottenham & Edm'ton, Orig.	5	11-13	..	4 4 0
WATER COMPANIES.								
717,467	Stock.	28 June	9	Chelsea, Ordinary	100	250-255	..	3 10 7
1,720,500	Stock.	12 Apr.	7	East London, Ordinary	100	194-199	..	3 10 10
700,000	50	11 June	9	Grand Junction	50	123-127	..	3 10 4
708,000	Stock.	29 Feb.	10	Kent	100	269-274	..	3 16 7
1,048,800	100	28 June	9	Lambeth, 10 p. c. max.	100	353-358	..	3 9 9
406,200	100	"	7½	Do. 7½ p. c. max.	100	200-205	..	3 13 2
200,000	Stock.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	117-120	..	3 6 8
600,000	100	27 July	12½	Now River, New Shares	100	343-348	..	3 9 8
1,000,000	Stock.	"	4	Do. 4 p. c. Deb. Stk.	100	131-126	..	3 9 6
902,300	Stock.	14 June	6	S'thwick & V'hall, 10 p. c. max.	100	161-166	..	3 12 3
126,500	100	"	6	Do. 7½ p. c. do.	100	151-156	..	3 16 11
1,155,066	Stock.	14 June	10	West Middlesex	100	264-269	..	3 14 4

* Ex div

† Next dividend will be at this rate.

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TITLE AND INDEX TO VOL. LI.

In consequence of several inquiries as to the above, we call our readers' attention to the paragraph which appeared in our issue for the 24th ult., (p. 157), and remind them that a Title-page and Index to Vol. LI. of the JOURNAL—January to June, 1888—have been prepared, and will be forwarded by the Publisher post free on receipt of a post-card.

TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion; but as the Advertisement sheet of the JOURNAL is sent to Press the first thing on Monday Morning, Advertisers will please bear in mind that Orders for Alterations in or Stoppages of PERMANENT Advertisements should be received Not Later than Two o'clock on SATURDAYS.

Telegraphic Address: "GASKING LONDON."

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, AUGUST 7, 1888.

THE REPORT AND ACCOUNTS OF THE GASLIGHT AND COKE COMPANY.

The report of the Directors and the accounts relating to the past half-year's working of The Gaslight and Coke Company have been issued; and it is therefore possible to see whence comes that startling amount of £277,563 which remains to be carried forward, according to the preliminary notification of the Board, after providing for the increased dividend of

13 per cent. The term which we employ to characterize this result will not be regarded as exaggerated when it is remembered that the price of gas to private consumers was reduced at the beginning of the year by 3d. per 1000 cubic feet, which is an apparent loss of revenue of about £100,000; besides which there is the additional £20,000 required to pay the extra $\frac{3}{4}$ per cent. dividend, and that eighteen months ago, with gas 3d. per 1000 cubic feet dearer, the Company were apparently not earning their smaller dividend of 12 per cent. The question that naturally arises in the mind of an observer of the Company's career is how these kaleidoscopic changes in the accounts can be explained; but this is precisely the query which we cannot pretend to answer. It may be perfectly right and reasonable for a Gas Company's unappropriated balance to dance up and down, half year after half year, in this bewildering fashion. We do not pretend to lay down a rule upon such a subject; but if for a year or two a Gas Company go on eating into their cash reserve in order to pay dividends until it is within an ace of disappearing altogether, and at the same time demands for a reduction of price are met with a *non possumus* from the Chair, and then, by a stroke of the pen, a sweeping reduction of price and an increased dividend appear in conjunction with great additions to the undivided balance, we simply confess that the case is beyond our comprehension. How is a critic to ascertain the real position of such an undertaking? No sooner does he shake his head over a disappearing reserve and the pessimistic observations of a Chairman who professes disbelief in the efficacy of reductions of price to increase business, than the situation changes with the rapidity of a dissolving view, and the "winter of his discontent" is made "glorious summer" by some occult means. When this matter was discussed in February last, Colonel Makins, M.P., the Governor of the Company, admitted that the Board had been applying the undivided balance to purposes that might have been secured by calling up fresh capital. It now appears, however, that the need for this proceeding has ceased, for the reserve is going up again "by leaps and bounds," and yet the capital account has not been swollen by fresh subscriptions. It must therefore be understood that in setting out the various items of the accounts of The Gaslight and Coke Company according to custom, we do not draw any particular lessons therefrom with respect to the financial position of the concern. The figures must speak for themselves.

The report is, as usual, brief, not to say curt. It recites the principal figures relating to the results of the half-year's working; showing that the undivided balance has been increased from £230,294 to £277,563. The shortest possible reference is made to the prospective lapse of the coal dues next year, the effect of which upon the business of the Company is not discussed in any way. The withdrawal of the Bill by which the Metropolitan Board of Works sought to regulate the position of gas-mains in London thoroughfares is noticed; and there is a paragraph explaining, and at the same time defending, the action of the Board in carrying to the House of Lords their litigation against the South Metropolitan Gas Company. They say that this extreme step was forced upon them by the legal advice which they took in the interest of the Company. Upon this it might be remarked that it is no trouble to lawyers who happen to have rich clients to recommend the pushing of litigation to the uttermost. For the shareholders and the public, on the other hand, one may repeat the well-known expression of gratitude for the existence of a House of Lords, because here the matter must stop. The customary official reports relating to the condition of the works and plant are given. Mr. G. C. Trewby, the Engineer-in-Chief, reports that the last of the Beckton retort-houses is being fitted up, to come into use next winter, when it is expected to be wanted to cope with the increased demand. It is a curious question, although it may be an idle one, but where does the money for this extension of manufacturing plant come from? Is it all included in the large sum of £539 which is the whole allowance for "buildings and machinery" in extension of works appearing in the capital account? It is miraculous; but, on the face of it, we must credit Mr. Trewby, of whose merits as an engineer and gas maker we have a sufficiently high appreciation, with the ability to provide carbonizing plant for an additional output of $5\frac{1}{2}$ million feet per day at a cost of not exceeding £1 per million!

According to the revenue account, it appears that the Company received for common gas, sold at 2s. 9d. and 2s. 5d. per 1000 cubic feet, the sum of £1,090,735, as compared with

£1,161,625 for the corresponding half of 1887, when the price was mainly 3s. per 1000 cubic feet. Thus the loss of rental by the reduction was £70,890. Taking the total gas revenue of £1,205,433, and comparing it with the £1,289,751 for the corresponding period of last year, the diminution is £84,318, which is £20,000 less than is shown by a calculation disregarding increase. Stove and meter rental shows an expansion; and residuals have improved by £27,452, notwithstanding a disappointing falling off in ammoniacal liquor and sulphate. Altogether, the revenue stands at £1,576,301, as compared with £1,632,335 for the corresponding date last year. On the other side of the account, it will be seen that there is a further saving in coals, which cost £538,353, as compared with £546,650. The coal bill has remained about the same, or rather has fluctuated within the same range, during several years past. Wages and salaries have slightly increased, in consequence of there having been a greater weight of material to deal with. Purification is also a little more; but repair and maintenance is again less. Under the head of distribution, there is evidence of strict economy—salaries and wages and repairs and maintenance alike showing reduction of expenditure. The other entries on this side do not call for particular comment. The total expenditure on revenue account, notwithstanding the increase of nearly 2 per cent. in the quantity of gas sold, has been diminished from £1,030,406 to £1,010,389, or by nearly £20,000. The net result of these decreased expenses and revenue is a balance of profit of £565,911, as compared with £601,929 for the corresponding half of last year. The other accounts may be quickly dismissed. The coal account shows that 896,802 tons in all were carbonized, including 9804 tons of cannel. For the June half of 1887 the weight was 884,650, including 18,422 tons of cannel. This is a great improvement, upon which we heartily congratulate the Company's Engineers. The total quantity of gas sold was 8,707,896,000 cubic feet; showing an increase for the year of 1.95 per cent. This rate of growth, although not large, is in a manner satisfactory under the circumstances. It only remains to be stated, in evidence of the demand for coke for general consumption, that the value of the stock of this residual in the general balance-sheet is only taken at £4530. When the Governor meets the proprietors on Friday he will not have much to tell them, unless he goes considerably outside the figures of the accounts; for these are of the quietest, not to say most humdrum, aspect as they stand. There will, of course, remain for him the central mystery of the Company's fluctuating reserve; and he may be expected to say something about the success of the attempt now being made by the Company to win patronage from cottage occupiers. This latter is a subject upon which curiosity widely prevails.

THE REPORT AND ACCOUNTS OF THE SOUTH METROPOLITAN COMPANY.

THE report of the Directors and the accounts of the South Metropolitan Gas Company for the past half year are in the hands of the proprietors to-day; the ordinary general meeting being called for to-morrow week. The report is not very long; but the matter of it is a sufficient indication of what the Chairman, Mr. George Livesey, will talk about when he meets his constituents. The Company's rate of increase is 4.7 per cent., compared with the consumption for the corresponding period of last year. Either building is progressing more rapidly on the south than on the north side of the Thames, or the South Metropolitan gas is more popular than that of the Chartered, to account for the more rapid growth of the smaller Company. We incline to the former opinion, as being a better explanation of the facts. The South Metropolitan Company's revenue from residuals has improved by £22,061; but they still burn 39 per cent. of the total make of tar for fuel. Reference is made in the report to the district gas exhibitions which have been held under the auspices of the Company during the past winter and spring, leading to an increased demand for gas-stoves. The opportunity is taken for saying a good word for regenerative and other improved kinds of gas-burners for lighting purposes. The prospective lapse of the coal dues is commented upon in a congratulatory spirit. The Directors lay claim to a share in the successful opposition to the renewal of the dues; and declare that when the unjust tax is removed they "intend to give the entire benefit of the saving thereby effected to the consumers." The dividend of 13 per cent. has been earned upon the revenue account; leaving a balance of £11,085 to be carried forward. From the revenue account, it appears that the gas-rental for the half year amounted to £337,979, as compared with £329,868; showing an increase of £811,

as stated in the report, notwithstanding the effect of the reduction in price since March, 1887. The question therefore arises: Will the Directors take off another 1d. per 1000 cubic feet now, or wait for the expiry of the coal dues to take off 2d.? Coals stand the Company in £158,527, which is £5000 more for the half year; and repairs and renewals are considerably higher. So that, altogether, gas manufacture costs the Company £245,801, as against £228,932. Distribution also rose from £18,146 to £21,291. Most of the other items on the debit side are heavier; and consequently the total expenditure is £310,694, as compared with £288,457. Yet the balance carried to the net revenue account is £144,763, as compared with £136,956 a year ago. The other accounts are nowise remarkable. The Company have only £291 worth of coke and breeze in store. They carbonized during the half year 291,967 tons of coals, including 1982 tons, or 0.67 per cent., of cannel. This is a falling off from a year ago, when only 594 tons of cannel appeared in the accounts. Possibly Mr. Livesey will lay the blame for this upon his aversion, the "Tower" photometer. The general meeting will not find much to complain about in these accounts, which, as the report justly remarks, present the working of a period that may be truly described as "uneventful but satisfactory."

RESIGNATIONS FROM THE GAS INSTITUTE.

A SPECIAL meeting of the Council of The Gas Institute was held on Tuesday last, when, as we anticipated a fortnight ago, the resignations of twelve gentlemen were received, including all the Trustees, all the Vice-Presidents, all the Finance Committee, and the ex-President. The notification of this portentous secession was conveyed to the members on Saturday last by circular from the President, Mr. Henry Woodall, who now finds himself in a position more extraordinary than that occupied by any of his predecessors in office. To all intents and purposes he is now the Institute. It is a position of peculiar difficulty and responsibility, but also of unrivalled opportunity. It was a wise man who said that difficulties are opportunities; and Mr. Woodall has now an exceptional chance for showing the stuff of which he is made. Fortunately, the members of the Institute have the satisfaction of knowing that Mr. Woodall is a man in whom they can implicitly trust. He is not one to leave difficulties to settle themselves; and his interest in the Institute is such that he will study to preserve it, while committed to his charge, from the wreck that seems to threaten it. He does not lack courage, moreover, to persevere in any course that may appear to him to be right, in defiance of what envy and malice may do to hinder him. He has already taken the first step towards grappling with the evil that has overtaken the Institute, in asking for the confidence of the members. In the same circular in which he announces the resignation of so many of his former colleagues, he requests the members generally to refrain from taking similar action until he has had an opportunity of laying before them, in an extraordinary general meeting, the proposals which he has to submit for dealing with the situation. This is a very reasonable demand, and it is to be hoped that it will be granted. The first impulse of a great many members, upon hearing of the withdrawal of the gentlemen named in the circular, would naturally be to follow their example. But in an emergency of this kind, personal inclination should give way to consideration for the general good; and, in holding their hands for a time, until they learn the President's solution of the difficulty, members will not forfeit their right of action, while at the same time they may save the Institute. The undertaking has now been definitely given that an extraordinary general meeting of the Institute will be convened in the autumn, at which it may be presumed that the President will take serious counsel with the members respecting the position of the organization. Upon the transactions of that meeting will depend not merely the success of the ordinary meeting which should be held next June, but also the future existence of the Institute. The President is deeply committed to remove the crisis by his request to members to suspend their own action until he can explain his views. If the extraordinary general meeting should reject his recommendations, he will have no other course open to him than to leave the chair and the Institute. The gravity of the issue will therefore ensure well-considered action upon Mr. Woodall's part, as it should inspire members in general with an earnest resolve to help him in the performance of his difficult and delicate task. If he is only properly supported, there is little reason to fear for the President; and we trust that evil influences have not prevailed

so far as to render doubtful his obtaining from a body of professional colleagues and fellow-countrymen that help and countenance which any man in his position has a right to expect.

MR. BRAY AND THE ROCHDALE GAS ENGINEER.

It is to be hoped that anybody who may have allowed himself to fancy that Mr. George Bray is an injured innocent, a pattern of magnanimity oppressed by a vile combination, a man with an honest grievance which he only wants to ventilate in a legitimate way and to see disposed of, for or against himself, in a fair manner by competent authority, will attentively peruse the letters reprinted in another column, which Mr. Bray has addressed to the Editor of a Rochdale paper with reference to Mr. T. Banbury Ball, the Engineer of the Rochdale Corporation gas undertaking, and for the past three years a member of the Council of The Gas Institute. Mr. Bray's last pamphlet, in which he accuses the Council of the Institute of aiding and abetting corruption, and participating in malpractices of a kind which need not be further particularized, so familiar are Mr. Bray's "charges" to readers of the JOURNAL, was, as is well known, carefully sent to all directors of gas companies and members of local authorities owning gas-works throughout the United Kingdom on the eve of the last Gas Institute meeting. At Rochdale, unfortunately for Mr. Ball, it also chanced that a question of raising his salary by £100 a year, in acknowledgment of the good service he has done to the town by his successful management of the gas undertaking, was then before the Council; and, as usual, there was a lack of unanimity upon the point. Mr. Bray's pamphlet came as a welcome aid to the opponents of Mr. Ball's rise; and, after a sharp struggle, he only obtained £50 instead of £100 a year additional pay. The Mayor of Rochdale may be an amiable and right-thinking, but he appears to be a decidedly weak gentleman; for, after declaring in public clearly enough what he thought of Mr. Bray's conduct in this matter, he seems to have been rather frightened when turned upon by this redoubtable pamphleteer. Finding the Rochdale people softer than were the Widnes Local Board when he attempted to make Mr. Isaac Carr suffer in his official position for daring to express his opinion in a Gas Institute meeting, Mr. Bray proceeded to worry Mr. Ball shamefully, as appears in the letters in question. He could not allege that Mr. Ball had anything whatever to do with the matters that constitute his old grievance; but he "charges" him, as with a deadly crime, that he has not taken his part! That is the sum and substance of Mr. Bray's complaint against Mr. Ball, for which he, a wealthy manufacturer with nothing material at stake, assails his victim through the means whereby he earns his bread. These may be practices which honour a person who is said to be an ornament to the best Leeds society; but it remains for members of The Gas Institute to reflect whether they will be content to sit in company with the individual who thus persecutes one of their own order and number. It must be remarked that this onslaught of Mr. Bray on Mr. Ball, and his attempt to bully the Rochdale Gas Committee into making an inquiry, not merely into the conduct of their own paid official—they have done this, and are content, to Mr. Bray's disgust—but also into everything he has to say about the Electric and Gas Exhibition with which Mr. Ball was not connected, is not to be excused as an irrepressible ebullition of temper on the part of a down-trodden man. It is after the Council of the Institute had consented to the perpetual injunction restoring Mr. Bray's name to the list of members that he thus assails Mr. Ball, because he happened once to be a member of the Council. In view of these proceedings, the question has now become a personal one for every gas manager in the kingdom who does not happen to be in Mr. Bray's list of supporters. He now finds that he cannot touch Mr. G. Livesey. After so many years of vilification, it must be gall and wormwood to Mr. Bray to learn of Mr. Livesey's appointment to the honourable office of sole arbitrator and valuer in connection with the Edinburgh gas-works transfer. He has tried his little utmost to persuade the world that Mr. Livesey is something undistinguishable from a thief and a liar, by formulating and reiterating for years, at great expense, a farrago of "charges," in which this imputation is conveyed as explicitly as is consistent with the observance of a particular degree of caution in keeping on "the windy side of the law;" and now, after all, the object of his abuse is selected as the administrator of the most important affair of recent years, as far as the gas supply of the United Kingdom is concerned. We have maintained all along that Mr. Bray's venom was too stale and his shafts too weak to

really hurt Mr. Livesey; and this news is proof in point. After this, it would be impossible for Mr. Livesey to go into Court and swear that Mr. Bray has done him any particular injury up to the present time. Failing in his old line of attack, therefore, Mr. Bray has turned to objects of resentment which he has reason to believe are more within his reach. It is a bad look-out for the poor gas manager, if, whenever he asks for an increase of salary, he is to have Mr. Bray's pamphlets and letters thrown at his head, in addition to the stock objections of cheeseparing Bumbledom.

Water and Sanitary Affairs.

THE opening of the new storage reservoir of the Grand Junction Company at Ealing, of which a full account will be found elsewhere, is one instance among many others, showing the spirit of progress which animates the Metropolitan Water Companies. At the same time that the Company were seeking authority from Parliament to carry their intake higher up the Thames, they were expending a large sum of money in the construction of the splendid reservoir inaugurated last Friday. It may, indeed, be questioned whether any public authority, in the absence of a general complaint alleging deficiency in quantity or quality, would have been found equally willing thus to expend capital for the improvement of their supply. No doubt there are cases in which Municipalities have devoted large sums to the construction of water-works; but it has frequently happened that they have waited until pressed to this performance by dire necessity. The London Water Companies are not in the habit of waiting, but have anticipated the time of need, although checked rather than encouraged by Parliament in their efforts for this purpose. The miserable suspicion has been fostered that the Companies were less anxious to fulfil their duty to the public than to increase their capital account, in view of a coming day when they would have to be bought up. The idea is absurd, and altogether unworthy. The Companies are by no means sure they are going to be bought up; and if they were, a sordid policy would induce them to starve their plant and pay high dividends, instead of improving and extending their means and appliances, so as best to serve their customers. It is to be hoped, if occasion should require, that Lord Knutsford will be able to enlighten the Cabinet as to the real position and policy of the London Water Companies. It will be seen that Sir Roper Lethbridge, who represents North Kensington, predicted in his speech at Ealing that the transfer of the London Water Supply to a public authority was probably not far off; and his chief hope of fair treatment for the Companies was founded on a right understanding of the subject being arrived at—both in and out of Parliament. All that the Companies ask for is fair play. Baron Dimsdale spoke somewhat in the same vein as Sir R. Lethbridge, and anticipated a struggle. Dr. Tidy's opinion was that if ever the London Water Companies were superseded by a public authority, there would be an end to the construction of extensive works for the purpose of improving and enlarging the supply. It may be thought that these remarks are somewhat controverted by that which appears in connection with the opening of the new water-works at Croydon—an event which took place the day before the inauguration at Ealing. But it should be noted that, while the Croydon Corporation (or the Local Board which preceded the incorporation of the borough) were supplying the lower levels, the Lambeth Company were giving a supply to the higher and outlying portions of the district. After the lapse of many years, the local authorities are smitten with a zeal to give a supply where one is already bestowed. The Lambeth Company were first in the field; and, having statutory rights, will have to be bought out, or else be allowed to remain. But for the Company, a considerable area where the land is high would have been left for a long time without any water supply except what could be obtained from private wells. As for the higher charges levied by the Lambeth Company, it is quite possible that some explanation may be forthcoming. The case is probably exaggerated; and it is tolerably certain that the facts are not fully told. One thing is clear, that the high-level service was given by the Lambeth Company when the local authorities were wholly unable to offer it. So far, the inhabitants are debtors to the Company, rather than to the Local Board or the Corporation.

A report by Dr. Percy Frankland on the bacteriological character of the London Water Supply during the year 1887

has just been published in the monthly report of the Metropolitan Water Examiner, General A. de Courcy Scott. The elimination of micro-organisms, as effected by the filtration processes of the Water Companies, is found to vary from 93.9 per cent. in the East London supply, to 99.6 per cent. in the West Middlesex. The New River samples are not included in this statement, as there are complications affecting the supply which render it unsuitable for comparison. The differences shown may be taken to indicate different degrees of excellence in the mode of treating the water after its reception at the intake. Dr. P. Frankland intimates that the comparison is important, and so it undoubtedly is, as pointing to the best modes of storage and filtration. Necessarily, the Kent supply, as taken from chalk wells, is excluded from the comparison. In that case it generally appears that there are more micro-organisms in the supply than in the source. The annual average is to this effect, the three wells having respectively 16, 18, and 27 organisms per cubic centimetre, while the supply averages 106. But the average number of organisms in the Kent supply is less than that in any other, except the New River and the West Middlesex. These last two have an average of only 81 and 87 organisms. The highest average occurs in the East London supply; the number being 806. Accompanying the annual report, we have Dr. P. Frankland's statement for the month of June last. This shows 219 micro-organisms per cubic centimetre in the Kent supply, which exceeds the number in all the other supplies except the East London. Even the Kent wells are rather abundant in microbes, the Garden well having 71, which exceeds the number in all the river supplies except two. But we have only to consider the thousands of micro-organisms contained in a cubic centimetre of unfiltered river water, in order to be persuaded of the admirable effect of filtration as practised by the London Water Companies. Dr. P. Frankland's researches are thus of very special value.

THE TRANSFER OF THE EDINBURGH GAS-WORKS.—The Works Committee of the Gas Commission of the Edinburgh and Leith Corporations, which has just been constituted to manage the two gas undertakings recently acquired by the Corporations, have arranged with the Directors of the two Gas Companies concerned that Mr. George Livesey is to be sole arbitrator and valuer, under the 20th section of the Corporations' Gas Act, as far as regards the valuation of the stocks, stores, &c., in hand at the date of the transfer.

THE GAS INSTITUTE AND THE RESIGNATIONS FROM THE COUNCIL.—Under date of Aug. 2, the following letter (signed by Mr. Henry Woodall, President, and Mr. W. H. Bennett, Secretary) has been issued to the members:—"At a special meeting of the Council held on the 31st ult., resignations were received from the following gentlemen:—

G. C. TREWBY	H. HACK	R. MORTON
W. FOULIS	C. HUNT	C. GANDON
G. LIVESEY	J. L. CHAPMAN	T. MOORE
F. LIVESEY	C. WOODALL	T. NEWBIGGING.

And it was resolved—"That notification be made to the members generally of the resignations which have taken place in the Council, and that they be requested to refrain from acting similarly until they be called together in General Meeting." An extraordinary general meeting will therefore be convened in the course of the autumn."

THE PROPOSED CONSTANT SUPPLY OF WATER IN THE CITY.—The Gas and Water Committee of the Corporation of London, having had interviews with the Superintendent of the New River Company (Mr. Collins) and Mr. Archibald Dobbs, have come to the conclusion that it is not expedient to take any steps for obtaining a constant supply of water to the City. In a report lately presented to the Common Council, embodying this recommendation, they say that the constant supply to the parish of St. Pancras was estimated to cost the owners or occupiers at least £5 each for the requisite fittings; and that in the City, owing to its exceptional circumstances, the expense would probably be considerably more. There was also danger of pipes bursting under the high pressure, and causing much damage to property. In connection with the foregoing, Mr. J. Hauser, the Honorary Secretary of the Mansion House Council on the Dwellings of the People, has written to *The Times* to point out that the expense alluded to was incurred only by the owners or occupiers of houses situated in that part of the parish of St. Pancras which is supplied by the New River Company, and that the owners or occupiers of houses situated in the area of the West Middlesex Company, and to which constant supply has been given, have only exceptionally been compelled to incur the outlay. He says the difference appears to be that the former Company have proceeded on the assumption that the water-fittings in every house were defective, while the latter only required alterations of fittings when they were found to be faulty. Hence the expense of constant supply to which a householder may be put is dependent rather upon the locality of his house than upon the condition of its water-fittings.

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(FOR STOCK AND SHARE LIST, see p. 259.)

THE course of business in the Stock Markets during the past week has not presented any very noticeable feature beyond slight fluctuations. These have been mostly in the Home Railway Department, and produced by the variations in the weather as affecting traffics. There has been nothing stirring abroad to agitate foreigners. Business throughout is beginning to get quiet; and in view of the Bank Holiday there was scarcely anything doing at the close of the week. The Gas Department has not, however, been without interest. On Thursday, advantage was taken of the issue of the prospectus of a new Electric Light Supply Company, to knock down the stocks of the Metropolitan Gas Companies in a fashion which calm reflection will show to be wholly unreasonable. We have nothing to say against the new project, which appears to be associated with names of respectability and of scientific eminence; and that is something in its favour. But the future is all *in nubibus*; and it remains to be seen what they can do, and whether they will be more successful than their predecessors and contemporaries in supplying a constant light at commercially remunerative rates. Anyhow, the "bearing" of gas stocks upon the mere announcement of the Company is a rig and a trick of the most transparently artificial character, and we trust too apparent to frighten even timid shareholders to throw their property on the market. Indeed, quiet as Saturday was, there was some recovery made from the fall. Gaslight "A" was done once for an exceptional amount at a special price as low as 250—a very enviable figure to purchase at, too. The closing transaction on Saturday, however, was 256. Altogether the stock has fallen 3½ in the week. The "B," which is a limited maximum stock, has risen 2; and comparing it with the "G," we are again confronted with the anomaly of a deferred stock commanding a higher value than a preferred one. All three South Metropolitan are lower, but not much; and Commercial old marks a slight fall. The other changes, though slight and unimportant, are in the upward direction. The Water Market has been quiet; and the stocks (especially Lambeth 10 per cents.) still move up.

The daily operations were: A quiet market on Monday; more being done in South Metropolitan "B" than anything else. Water was wholly neglected—all quotations were unchanged. Rather more activity on Tuesday. Imperial Continental rose 1, and European ½; but Gaslight "A" was 1 lower. Water was very stagnant; but Chelsea, East London, Grand Junction, and Kent advanced 1 each, and Lambeth 2. Gas was much busier on Wednesday, and prices were very fair. The only move was a rise of 1 in Australian. Water was as before. Thursday was the crisis in Gas, when Gaslight "A" fell 4½; Commercial Old, 2; and South Metropolitan "A," 4, "B," 1, and "C," 5. But Gaslight "B" improved 2. Friday was quieter; and Metropolitan Gas issues were steady; but Imperial Continental lost the 1 it had gained on Tuesday. There was more activity in Water, at existing figures. On Saturday there was a rally, and Gaslight "A" recovered 2. Water was very quiet; but Lambeth 10 per cents. rose 1 more, and New River debenture 1½.

ELECTRIC LIGHTING MEMORANDA.

THE PROSPECTUS OF THE METROPOLITAN ELECTRIC SUPPLY COMPANY—TWO MORE OF "GRANDFATHER BRUSH'S" PROGENY GONE—CHELSEA ELECTRIC LIGHTING SCHEME—ELECTRIC LIGHTING ENGINEERS IN COMPANY.

THE prospectus of the Metropolitan Electric Supply Company—which is the concern that has been repeatedly mentioned in this column of late, with the now meaningless prefix "South" omitted from the name—was issued last week, and the subscription list was open for Friday only. It is reported that the public "jumped" at the shares; the prospects of the Company being regarded as remarkably good. Much of this favour was, of course, due to the names on the Board. Any electrical speculation fathered by Sir John Pender, Admiral Sir George H. Richards, and men of similar standing, would be certain to go off well. The capital of the Company is to be £500,000, more than half of which was to be applied for by some of the Directors and their friends. The chief thing we can see against the Company is the presence of two electrical engineers upon the Board, and three others as consultants. If two of a trade ever did agree, in despite of the old saw, they were not electric lighting engineers identified with irreconcilable systems. The public are likely to be taken with the declaration with which the prospectus begins, to the effect that the Directors (who, as pioneers of submarine telegraphy, ought to know what they are talking about) have come to the conclusion that the time has at length arrived when "the great work of electric lighting may be undertaken on a scale which will largely meet the requirements now supplied by gas." The rest of the prospectus is couched in a similar strain; and the financial aspects of the proposed investment are compared with the condition of London gas stocks. The Directors kindly forbear from expressing an opinion as to the extent to which gas will be used in the future; but take the opportunity for declaring their conviction that electric lights will largely supersede all others. They state that Electric Lighting Companies in the United States are now actually paying 8 to 20 per cent. dividends; and we trust that this is correct. The first work of the new Company will be to acquire the undertaking of the Whitehall Electric Supply Company, who secured a promising "pitch"

for lighting sundry hotels and other blocks of buildings lying between Whitehall and the Thames Embankment, as well as a convenient wharf and site for a generating station near to Waterloo Bridge. After they have made a start, the Company promise to do wonders, of course; but it will be time enough to congratulate them when they can show something. Lest our reserve upon this point should appear to spring from prejudice, we will quote the opinion of the *Electrical Review*, which is to the effect that "the financial and speculative, rather than the truly commercial element is too strongly represented on the Board; and we therefore have misgivings as to the future of this Company which even the respected names of the distinguished men associated with the scheme as Consulting Engineers entirely fail to remove."

An extraordinary general meeting of the South-Eastern (Brush) Electric Light and Power Company was held last week, under the presidency of the Liquidator, to adopt the report and accounts relating to the winding up of the Company's affairs. It appeared from the statement submitted to the meeting that the total loss of the Company has been £45,958, after everything has been realized. The meeting was followed by another called in the name of the Provincial (Brush) Electric Light and Power Company, with the same Liquidator in the chair. The loss in this case has been £51,096. During the proceedings, a shareholder declared that "the inception and management of the two Companies had been a stain on the commercial morality of the City." Thus ended the life of two of the Brush spawn, of which such great things were prophesied. The shareholders would dearly like to prosecute the promoters, or directors, or somebody connected with these speculations; but the Liquidator has looked into the matter, and does not think that any good would come of such a step. Thus another example of robbery under the protection of the law of joint-stock companies has been placed upon record.

The Chelsea Electricity Supply Company has been launched; and we believe the Directors have received sufficient support to warrant them in proceeding to allotment. This is nothing more than an offshoot of the Brush Company, the Electrical Power Storage Company, and Callender's Bitumen Telegraph and Waterproof Company, who have all kindly agreed to take payment for their goods in shares. It is, of course, intended that the Brush Company should provide the machinery and lamps; the Electrical Power Storage Company, the secondary batteries; and the other concern, the cables. If independency of any particular company or system is the recommendation that it is made to appear in the prospectus of the Metropolitan Electric Supply Company already noticed, the reverse must be no advantage to this venture. It remains to be seen which principle the more commends itself to public favour; but, remembering what has happened before now to scions of the Brush stock, we should rather be disposed to doubt the advantage of ascribing the parentage of a new concern to this source.

Some time ago an attempt, in which our friend the *Electrical Review* was implicated, was made to form a kind of electrical trades union, or rather it should be described as a proposed "ring" of electric lighting apparatus manufacturers, with the object of regulating prices and stamping out unfair competition in trade. The attempt failed from the impossibility of formulating an acceptable scheme. But the other day the idea was in part revived; and this time the proposal was to form an Electrical and Allied Trades Section of the London Chamber of Commerce. A preliminary meeting has been held, under the presidency of Mr. Crompton; and a Provisional Committee of fourteen appointed to organize the proposed section. The project appears to be popular, at least among London members of the trade; but what the good of it is to be we cannot at present understand. The electric lighting engineers appear to be a very jolly and social set of fellows, at any rate; for although they are necessarily living in the sharpest competition with each other, and are always treading on one another's toes in the matter of patents, they are ever ready to meet formally or informally, at a dinner or in a lecture-room, and combine for pleasure or business purposes with a cheerful alacrity that might be emulated with advantage in other callings. The reason for this probably is that they are all educated gentlemen. It requires an underbred man to be spiteful and jealous in business relations.

THE issue of a small pamphlet on "Electric Lighting: Its Present Position and Future Prospects," by Messrs. Hammond and Co., has, according to the authors' preface, been called for by a desire expressed on the part of a number of friends of the firm to have a detailed explanation of the "advantages of the present methods of electric light supply, as compared with those which failed five years ago." In a book with such an object, it is only natural to expect that stress would be laid on what are called the "disadvantages" of the older form of illuminants; and this we find has been done. The superior qualities of the new form of illuminant are extolled, and the various appliances used for its production and use are explained by the aid of diagrams. Then the important question of the possibility of a remunerative return to capitalists starting central electric lighting stations is discussed; and the book closes with a number of estimates of the cost of different sized plants, from a 1000 to a 20,000 light installation. The authors refer to the difficulties which have hitherto stood in the way of house-to-house electric lighting; and these having, as they consider, been overcome, they are led to anticipate a successful future for the system they advocate.

NEW STORAGE RESERVOIR AT EALING.

ON Friday last, at the invitation of the Directors of the Grand Junction Water-Works Company, a numerous assembly of persons interested in the water supply of the Metropolis came together at Mount Park Hill, Ealing, to witness the opening of a new storage reservoir of great capacity. Among those present were Mr. E. Goodhugh Fox, the Chairman of the Company, and several of the Directors, including Mr. C. J. B. Hertslet, and Mr. F. Tagart. Among the visitors were Baron Dimsdale, M.P., Sir C. J. Palmer, Bart., Sir Roper Lethbridge, K.C.B., M.P., Sir Robert Rawlinson, K.C.B., Major F. S. Rasch, M.P., Mr. John Aird, M.P., Major-General A. de Courcy Scott, Professor Edward Frankland, Professor Corfield, Dr. C. M. Tidy, Dr. Percy Frankland, and Mr. Philip A. Scratchley, with most of the Secretaries and Engineers of the London Water Companies, and several Medical Officers of Health of Metropolitan districts, together with others from the neighbourhood.

The reservoir occupies a commanding situation on the rising ground to the north of Ealing. Being of a great depth, it was seen to advantage on Friday when empty, and was much admired as a specimen of engineering work. The Contractors (Messrs. John Aird and Sons, of Lambeth), have had a difficult task, owing to the generally unfavourable state of the weather, and the circumstance that the site is on a hillside. The net time consumed in the entire construction has been scarcely thirteen months—an astonishingly short period for so extensive and arduous an undertaking. When filled, the reservoir will have a surface area of six acres, with a depth of 45 feet, and will contain 51 million gallons of water, having a top level more than 100 feet above the surface of the ground at the Marble Arch. The floor of the reservoir is composed of one foot of Portland cement concrete, underneath which is the natural clay, puddled in places where requisite. The slopes on the sides are paved with vitrified bricks, backed by concrete 1 foot thick, and 1 ft. 6 in. of puddle. The Company's intake is at Hampton, whence water is conveyed to the Kew Bridge works. From Kew a supply will be pumped up for a height of about 160 feet, through a 30-inch cast-iron main, into the Mount Park reservoir. The purpose of this reservoir is to fulfil a supplemental part in relation to the others already existing. It is intended as a reserve in case of emergency, such as might arise in connection with a large fire, or in consequence of a season of unusual drought. The leading idea is to fill it by pumping up from Kew at odd times during the winter; the supply being taken out more especially during the summer. As the work will thus be intermittent, the water will be made to enter and leave the reservoir by the same main. The entrance from Kew is into a main valve-shaft, 50 feet deep, situated just outside the reservoir at the south-west angle. Thence the water will pass into a small pit under the floor of the reservoir, and rise through a grating into the reservoir itself. Outside the opposite extremity of the reservoir is an open filtering-shaft, circular in form, having a diameter of 65 feet, and a depth of 44 feet to the level of the sand. A portion of the area is occupied with gravel. Here the water will undergo a filtering or straining process on its way from the reservoir into the main on its outer course. The actual filtration of the water takes place before it leaves Kew; but this subsidiary process at Mount Park is intended to compensate for the circumstance that the reservoir there is uncovered.

The main which receives the water from the filtering-shaft is led back under the bed of the reservoir into the main valve-shaft; the water passing into the pipe by which it originally ascended. An alternating process will thus be set up, regulated by the valves in the shaft; but the intervals between will doubtless consist of hours, and probably days. The situation of the filtering-shaft outside the northern extremity of the reservoir adds to the strength of the external embankment, which slopes down at this point to a depth exceeding 60 feet. The brickwork of the shaft goes down through the embankment 12 feet into solid ground. We may further mention the fact that a short distance from the foot of the embankment the Company are having a boring made in order to reach the chalk, which is there estimated as being 320 feet below the surface of the ground.

The nature of the ground in which the reservoir is formed is what is termed a very short clay. Only one stone was found during the whole of the excavation; and this was evidently an erratic boulder or block, brought down from the northern regions during the glacial period. It was found embedded in the clay, about 9 feet below the surface. It was set up to view on the bank at the summit of the reservoir, and attracted much notice last Friday. Its composition is a very fine sand, consolidated under pressure, and extremely hard—forming a species of quartzite.

Having explored the works, the party began to gather for the ceremony of inauguration. The Chairman, Mr. E. G. Fox, took up his station at the southern end of the reservoir; and, after giving a brief address, proceeded to open the sluice. The apparatus provided for this purpose was composed partly of brass and partly of polished wood; the latter material being obtained from a wooden water-main supposed to be a hundred years old. A plated ball at the summit of the machine contained an inscription setting forth the occasion on which the contrivance was used. A moderate amount of movement in the apparatus—in effecting which the Chairman invited the assistance of Sir R. Rawlinson, Mr. J. Francis, and Mr. C. Horsley—was speedily followed by a rush of water into the great basin destined for its reception. The effect was striking, and elicited the cheers of those who witnessed it; but, as a matter of fact, the water will come another way when there is nothing ceremonial in the transaction.

The next step in the programme involved an adjournment to a

spacious tent, erected on the lawn appertaining to the residence of Mr. A. Fraser, M. Inst. C.E., the Company's Engineer. An excellent *dejeuner* was here provided; the chair being taken on the occasion by Mr. E. G. Fox, while the two vice-chairs were occupied respectively by Mr. E. O. Coe, the Company's Secretary, and Mr. Fraser. At the close of the repast, the Chairman gave the customary toasts; and several addresses were delivered, in the course of which the Chairman explained that the absence of Lord Knutsford (one of the Company's Directors) was due to the pressure of official engagements in connection with the Government. He was also in the receipt of a letter from Lord George Hamilton, who regretted that parliamentary duties so completely absorbed his time when the session might have been expected to close. In the absence of any representatives of the House of Lords, they were happily favoured with the presence of four members of the House of Commons. On the authority of Parliament, the London Water Companies had expended £13,000,000, for which the average return at the present time was not more than 7 per cent. Some of the Companies received no dividend during the first few years of their existence—the New River Company having to wait as long as fifteen years. He believed that no city in the world was so well supplied with water as London; and it could not be said that the Companies had received an extravagant return for their outlay, and for the risk they had encountered.

In the course of the subsequent proceedings, Sir Roper Lethbridge, M.P., referred to the extraordinary attempt made during the progress of the Local Government Bill to place the Gas and Water Companies of London at the mercy of the County Council, who it was proposed should have power to take over the property of the Companies, or to establish a competing supply. The proposal was not that the County Council should obtain possession of the property of the London Water Companies by a fair payment, recognizing due compensation, but that the new authority should obtain these undertakings at mere pittance value. For this he could not vote; and he believed the House of Commons would never consent to it, though he thought it probable that at some future date the property of the Companies would be taken over by some public body. The tendency of public opinion, he felt, made such a transfer probable at a measurable distance of time. But he believed the question had only to be laid properly before the public, in order to ensure that the transaction should be carried out on terms that would reflect no disgrace on the honour and honesty of Englishmen. If rightly informed on the subject, he was confident that public opinion would never sanction anything like confiscation, but would consent to a line equivalent.

Baron Dimsdale expected there would be some more fighting over the question of the London Water Companies. The House of Commons seemed to think it was wrong for anybody to hold any description of property. But "threatened men lived long;" and the Companies would find their best guarantee for safety in faithfully performing their duty to the public.

Dr. Tidy remarked how little the water consumer understood as to the amount of skill and trouble necessary to give him his daily supply. As a chemist, he would say that, while he could admire a magnificent engineering work, he yet contended that no engineer was justified in seeking to purify a bad water. But they were perfectly warranted in seeking to improve water that was already good. They were not trying to "doctor" the supply, but to improve a water previously excellent.

Major-General A. de Courcy Scott spoke of the satisfaction it had given him to witness the expansion and improvement of works connected with the London Water Supply. Referring to the Bill of the Grand Junction Company which had been rejected in the present session of Parliament, the speaker said that the proposal to go higher up the Thames for an intake was one of which he approved in the highest degree, and which he would support.

Mr. John Aird, M.P., expressed his acknowledgments to Mr. Fraser, the Company's Engineer, for the generous manner in which he had always come to the front to assist the firm in the various difficulties they encountered in carrying out their contract. He also testified to the good conduct of the workmen; and expressed the obligations of the firm to those ladies who had interested themselves in the well-being of the large staff of men employed on the works.

The Chairman, in responding to the toast of his health, spoke in high terms of their Engineer, Mr. Fraser, and alluded to the long period of time—57 years—during which their excellent Secretary, Mr. Coe, had ably filled his important post. Mention was also made of Mr. Basil P. Ellis, who, as connected with Mr. Aird, had taken an active part in the supervision of the works of which they had seen the consummation that day.

The proceedings then terminated.

The funeral of the late Mr. J. O. N. Rutter, whose death, at a very advanced age, was notified in the *JOURNAL* last week, took place on Wednesday last, at the Extra-Mural Cemetery, Brighton. The *cortege*, consisting of an open car and five carriages, left the residence of the deceased, at Black Rock, at noon, arriving at the cemetery gates at one o'clock. There it was met by the Engineer and Manager of the Brighton and Hove Gas Company (Mr. J. Cash, Assoc. M. Inst. C.E.) and several of the Directors, officers, and employees of the Company. The coffin was carried from the chapel to the grave by six of the men from the Black Rock works. It bore this inscription:—"John Obadiah Newell Rutter; born 19th April, 1799; died 27th July, 1888."

MR. BRAY'S ATTACKS UPON MEMBERS OF THE GAS INSTITUTE.

In another column will be found an abstract report of the discussion in the Salford Town Council last Wednesday on the motion of Mr. Mandley with reference to Mr. Bray's attack upon The Gas Institute in his last pamphlet. As a further indication of the spirit in which Mr. Bray is acting—no longer with regard to those members of the executive of the Institute who were identified with the management of the Gas Section of the Crystal Palace Electric and Gas Exhibition, but with reference to gentlemen who had nothing to do with that undertaking, the following reprint of two letters addressed by him to the Editor of the *Rochdale Observer* may be read with advantage. It will be remembered that a comment appeared in the *JOURNAL* for June 12 upon the attack made by Mr. Bray upon Mr. T. Banbury Ball, the Engineer of the Rochdale Corporation Gas-Works, merely because he happened to be a member of the Council of The Gas Institute, and which might have had some connection with the refusal of the Town Council to advance Mr. Ball's salary by more than £50 per annum, instead of £100 as recommended by the Gas Committee. It is to these and subsequent transactions of the Town Council that Mr. Bray's letters refer. It will be noticed that the second is dated subsequently to the legal proceedings which resulted in Mr. Bray's retention as a member of the Institute:—

THE PAMPHLET ON "CORRUPT PRACTICES IN THE GAS INDUSTRY."

To the Editor of the "*Rochdale Observer*."

Sir,—Referring to your issue of the 9th inst., containing report of Town Council meeting in which the above pamphlet, issued by me, was referred to, I beg to say that I have addressed a letter on the subject to His Worship the Mayor of Rochdale, of which I enclose you copy, and which I shall be glad if you will insert in your next issue.—I am, yours truly,

Blackman Lane, Leeds.

GEO. BRAY.

To His Worship the Mayor of Rochdale, Mr. Councillor Petrie.

Dear Sir,—On my return from London I find a copy of the *Rochdale Observer* containing a report of the meeting of the Rochdale Town Council in which my pamphlet on "Corrupt Practices in the Gas Industry" was freely mentioned. I am glad to find from that report that several councillors took the view that inquiry should be made in Rochdale, and that, pending such inquiry, judgment should be reserved. But I regret to find that your Worship, instead of awaiting the result of any inquiry, is reported to have said that my "pamphlet had been supplied to the Council at a critical time, and it had a suspicious appearance. The person who had printed it had not had the courage to put his name to it." The insinuations in the above quotation are not fair, as I will show; consequently, I submit, ought not to have been made by your Worship.

First as to the pamphlet being "supplied to the Council at a critical time." I was absolutely ignorant of the fact that there was going to be a Council meeting at Rochdale, or that Mr. Ball's salary was about to be discussed, otherwise the pamphlet would have been kept back for a day, so far as Rochdale was concerned. The pamphlet was sent to Rochdale at the same time that it was sent to the other corporations and gas directorates of the country whose officials were members of the Council of The Gas Institute.

Then as to your statements "that the pamphlet had a suspicious appearance, and that the person who had printed it had not had the courage to put his name to it," I will only say that I could not have published the pamphlet more openly than I did. It bears my name and address in prominent characters; and, that being so, it was not necessary, either according to law or practice, to allow a printer the advantage of advertising his name. I therefore respectfully submit, Sir, that by the reflection just quoted you supply another severe example to those contained in the 13th, 14th, and 15th pages of my pamphlet of the difficulties and dangers those have to encounter who attempt to expose malpractices in the gas industry.

Hitherto I have appealed in vain to the Council of The Gas Institute for an inquiry into alleged malpractices, and for having made charges against some of The Gas Institute officials I have been expelled, without inquiry, from the Institute, at the instance of the Council of which your Corporation Gas Engineer, Mr. T. Banbury Ball, is a member. As the gas engineers and managers derive the power mainly from the official positions they occupy, I have now determined to appeal to the public bodies by whom those gentlemen are employed; and if these bodies decline to assist in purifying the gas industry, they need not be surprised if honest trading has to retire into oblivion.

As your observations appeared in the *Rochdale Observer*, I am sending a copy of this letter to that paper.—I am, dear Sir, yours faithfully,

June 22, 1888.

GEO. BRAY.

MR. BALL, MR. BRAY, AND THE GAS INSTITUTE.

To the Editor of the "*Rochdale Observer*."

Sir,—I read in your issue of the 7th inst. the report of the second discussion in the Rochdale Town Council upon the Corporation Gas Engineer, Mr. Ball, The Gas Institute, and myself; and I shall be obliged if you will allow me to make some observations thereon. I should have asked this favour last week, but I deemed it desirable not to enter into any further public controversy on this business pending the decision of the Court of Chancery in the action which I brought against the Council of the Institute, and which was heard before Mr. Justice Kay on Friday last. As you may be aware, the Council put in no defence. They admitted that my pretended expulsion from The Gas Institute was illegal, volunteered to reinstate me, agreed that the hearing should be taken as the trial of the action, and submitted to a perpetual injunction with costs.

It appears that since the Town Council meeting in June, the Gas Committee had called upon Mr. Ball to explain, and that the Committee had passed a resolution that they "are perfectly satisfied with the explanation of Mr. Ball." A peculiar feature of this investigation is that I was not asked to be present, and that only Mr. Ball was called upon. What Mr. Ball said, I therefore cannot say; but if the speech made by Alderman Petrie, the Chairman of the Gas Committee, and reprinted in your columns, contains substantially Mr. Ball's explanation, then Mr. Ball has deceived the Committee.

According to Mr. Alderman Petrie, my complaints against the officials of The Gas Institute are entirely based upon the way in which the jurors at the Crystal Palace Exhibition performed their functions; whereas that feature is but a small fraction of the case. Some of my charges, upon

which Mr. Ball has apparently ventured to give no explanation, are these:—

That the Gas Section of the Crystal Palace Exhibition was not a *bona fide* project; and that it was launched under false pretences by officials of the Institute.

That a sum of over £6000 was obtained by false pretences from corporations and gas companies for the support of the Gas Section.

That grave malpractices took place in the management of the Gas Section.

That a fraudulent official report of the Gas Section has been published.

That the Council of The Gas Institute are, as an organized body, defending certain of its officials who have perpetrated these grave malpractices.

These charges affect the whole morals of the Council and of the Institute; and I submit that the conduct of any official who seeks to prevent these charges being investigated, or to expel the member who makes the charges (and who declines to withdraw them without investigation), is open to the gravest suspicion.

My charge against Mr. Ball is that he has been a member of the Council of the Institute during the past three years, and that as such, so far as I am aware, he neither spoke, wrote, nor voted in favour of inquiry into my charges of corruption, nor against my expulsion from the Institute for adhering to them. That being so, the Corporation and the ratepayers of Rochdale, as well as myself, have a right to know whether Mr. Ball's motive was to discourage corruption or to discourage the exposure of corruption. He must be judged by his action.

The Gas Committee's resolution of "perfect satisfaction with the explanation of Mr. Ball" carries with it, in my opinion, no weight, removes from him no onus, and is a direct blow to honest trading.

The necessity for caution in passing resolutions of "perfect satisfaction," and the possible smallness of their value, are strikingly illustrated by the fact that on the day following the passing of the resolution of perfect satisfaction with Mr. Ball's *ex parte* statements, a former Rochdale Gas Manager—Samuel Hunter—was sentenced to five years' penal servitude. When that gentleman was at Rochdale, charges of malpractices were brought against him; and the Gas Committee whitewashed him, after an examination with closed doors, by a vote of entire confidence. This motion has been recently referred to by Mr. J. C. Mandley in the *Manchester Guardian*.

Then in the case of the Metropolitan Board of Works, the Chairman—Lord Magheramorne—said on Tuesday last, regarding one of the tribe of officials convicted of corruption: "As to Mr. Goddard, I was never more surprised in my life than when I was informed as to what had transpired in respect to him. I could scarcely believe my ears." Just so, and all the guilty officials were whitewashed by the Board a short time since, and their accusers condemned.

The impropriety of whitewashing without proper enquiry might be illustrated *ad infinitum*.

For years persistent efforts have been made to prevent inquiry into my charges of malpractices against certain officials of The Gas Institute, and during the past twelve months the Council of The Gas Institute, of which Mr. Ball was then a member, has sought, by practices that may properly be termed infamous, to obtain my expulsion for persisting in making those charges. How much the accused feared exposure may be gathered from the recital of the proceedings in the first paragraph of this letter.

If the Rochdale Gas Committee wish to aid in purging the Council of The Gas Institute of its corruption, let them make a proper inquiry into my allegations affecting Mr. Ball's conduct. If they are true, let them censure him; if they are not true, let them censure me.

In conclusion, permit me to say that, whatever the Rochdale Gas Committee may or may not do, it is my intention to make every member of the Council of The Gas Institute concerned in the recent infamous attempts to secure my expulsion from the Institute personally responsible for his share in the transaction.—Yours truly,

Leeds, July 19, 1888.

GEO. BRAY.

Notes.

IGNITING GASEOUS MIXTURES BY INCANDESCENT LAMPS.

A series of experiments to determine the degree of danger to be apprehended from the breakage of incandescent electric lamp globes in explosive atmospheres, has been conducted by Lieutenant H. Hutchins, of the United States Navy. A mixture of oxygen and hydrogen was fired by a purposely broken Swan lamp; but a mixture of one volume of marsh gas to seven-and-a-half volumes of air was not exploded by similar means. When a lamp was broken in an atmosphere of coal gas, the filament continued to burn; the gas being probably decomposed and carbon deposited on the filament in a manner similar to that in the "flashing test" in the manufacture of incandescent lamps. In another experiment a mixture of one volume of coal gas to six volumes of air was used, and a lamp glass was broken in it; the result being a fairly violent explosion. As a result of these experiments it is concluded that the filament of an incandescent electric lamp, if it comes into contact with either a highly explosive gas, such as a mixture of oxygen and hydrogen, or a comparatively weak explosive mixture, such as coal gas and air, will ignite them. If the lamp filaments were so frail as to be always broken by the first inrush of gas these lamps might be safer; but unless this fact can be more clearly established, it appears that ordinary incandescent lamps must be classed as a dangerous means of lighting in an explosive atmosphere, because ignition of the surrounding gas would follow upon an accidental breakage of the glass.

THE ORIGIN AND UTILITY OF ELECTRIC WELDING.

It is stated in a lecture by Mr. O. K. Stewart, recently delivered before the Boston Electric Club, that the phenomenon of electric welding, which is now shown at the Glasgow Exhibition, was accidentally discovered about 11 years ago by Professor Elihu Thomson, who then held the Chair of Chemistry and Applied Mechanics at the Philadelphia Central High School. Professor Thomson was delivering a course of lectures before the Franklin Institute; and, among other experiments, he reversed an ordinary induction coil, and while so doing he brought the terminals of the coarse secondary winding of the coil into mutual contact, and was

surprised to observe that a high temperature was developed instantaneously at the point of contact—so high, in fact, that the ends of the wire melted and stuck together. Professor Thomson was, however, fully occupied for the next five or six years in teaching and lecturing, and perfecting the Thomson-Houston system of electric lighting; and it was not until he perceived the necessity, in the regular way of manufacturing electrical apparatus, for some means of jointing copper wire more perfectly than was possible by known methods, that his mind reverted to his old lecture experiment and the possibilities which it indicated. Copper wires were electrically welded long before the process was applied to any other purpose. It is now used for all kinds of welding, large and small, on account of its quickness, efficiency, and the avoidance of all risk of burning the metal or introducing impurities into it, as in the old method of welding iron. It is expected that boiler tubes and all kinds of metal tubes can be treated in the same way, including lead and composition pipes. The old-established "wiped" or plumber's joint will thus be superseded, as well as blow-pipe joints and burnt joints in lead work. The advantages of electric welding have been summed up as follows by Mr. Stewart:—Absolutely pure heat, with absolutely perfect means of regulation, with the heating constantly before the eyes of the operator, with a neatness to which ordinary methods cannot at all be compared, with an increased economy of (in all ordinary cases) at least 300 per cent., and with absolute safety of apparatus.

A VALVELESS PUMP.

A new form of valveless pump construction, calculated to do good service in pumping thick and dirty fluids, is described in the *Génie Civil* as having been invented by M. Monrichard, an inspector of forests at Montmedy. The pump consists of a horizontal cylinder, which is traversed longitudinally by a piston-rod capable of a reciprocating motion through stuffing-boxes at each end of the cylinder. Upon this rod is fixed a helicoidal piston, which forms as it were one complete turn of a screw-thread upon the rod. Two rollers project inside the cylinder, and engage with the screw-piston. The action of the pump is now obvious. The piston-rod is long enough, after passing through the cylinder, to carry a fly-wheel at one end and a crank-handle or pulley at the other. Rotary motion being given to the piston-rod (by hand or power), a reciprocating motion must also follow, which causes a suction and expulsion on the two sides of the piston, and consequently draws and expels fluid through suitable inlet and outlet pipes. The resultant of the two combined rotary and reciprocating motions is a curve bordering upon an ellipse. The pump acts in either direction, according as the wheel which drives the piston-rod is turned. Consequently, when mounted on a travelling tank, it can be made to fill or empty the vessel at will. The larger sizes of these pumps are provided with air chambers. Fluids charged with solid substances are easily pumped by these machines. The peculiar form of the piston has the effect of bringing all solid bodies into the current of the fluid, and these generally pass through the pump intact, although, in case of a jam, the working parts are strong enough to crush any ordinary floating bodies.

AN IMPROVED WATER FILTER.

A committee of the Franklin Institute have reported favourably on the Hyatt system of water filtration. The designer of this system proceeds upon the fact that simple filtration is not competent to arrest the extremely fine muddy silt held in suspension by some waters; and that some means of aggregating the impurity is called for before it can be removed. The Hyatt filter is simply a body of ordinary sand supported on a perforated false bottom, the whole being enclosed in a wrought-iron cylindrical vessel. A small portion of the muddy water to be treated—not more than a fraction of one per cent. of the total volume—goes through a compartment of the filter in which are contained lumps of alum. A minute proportion of alum is thus dissolved, and passes into the filter, where it is mixed with the main body of water; the quantity of alum used being less than one grain per gallon of water. The suspended clay and other earthy matter, which is of a basic nature, has the property of precipitating the alumina of the alum, causing it to separate all through the water in the form of gelatinous flocks. These minute particles bring together or coagulate the finely suspended matter, converting it into such a form that the filter will easily and completely remove it. The supply of water to this coagulation is governed by a valve regulated by a scale, every degree of which corresponds to the solution of a certain quantity of alum. In consequence of this arrangement, whereby the solution of alum is restricted to the quantity necessary to deal with the water to be treated, the minute amount of alum employed is entirely absorbed in doing the required work, and is afterwards removed from the solution. In this way the fine silt which could not otherwise be removed by filtration is converted into such a form as to be easily removable, and the resulting filtered water is perfectly bright and clear, no matter how dirty or muddy it may have been previously. The filter is easily cleaned by a reversal of the current of water; and it works with great freedom and rapidity when compared with filters in which the operation depends upon the closeness of the particles of the filter bed.

MR. NORMAN T. GRAY, nephew and pupil of Mr. J. W. Gray, Engineer of the Birmingham Corporation Water-Works, has been appointed by Messrs. Chamberlain and Hookham as Engineer of the central electric lighting station which they are establishing in Birmingham.

Communicated Article.

MANAGEMENT OF GAS-WORKS EMPLOYEES.

FIRST ARTICLE.

Except in the very smallest gas-works, the manager is not able to carry on the various operations without assistance; and in large works he becomes an employer of labour to a very respectable extent. But in approaching the labour question, it is well to remember, that for all practical purposes, we may regard the gas-works manager as really carrying on all the operations himself. He has not time, nor it is not worth while for him, to expend his energy in charging the retorts, keeping furnaces in order, and other manual labour; and therefore he employs qualified men to do the work in his place. The same in the purifying-house, in regard to the mains and services, and all the other departments incidental to the manufacture, purification, and supply of gas. On the large scale, each of these branches assumes sufficient importance to be placed in charge of a responsible and well-qualified superintendent; and so there is a further sub-division of labour. And some gas undertakings comprise several distinct stations or works, each placed in charge, perhaps, of a resident engineer. Still, whatever the circumstances, there is one person who is responsible for the whole; and although his assistants at the head of various departments may take a great deal of the detail off his hands, to a great extent it is necessary that every detail should be as clearly before his mind as if he was actually engaged in the performance of the same.

An important part of the duties of the manager of any gas undertaking of respectable size, then, is the engaging of thoroughly trustworthy and competent subordinates. Two things are necessary to this end. Suitable candidates must be within reach, and the manager must have sufficient discernment to recognize them when they offer themselves. Considerable experience and judgment are necessary in order to put the right man in the right place in each case; and the frequently-used phrase "management of men" carries a great deal more meaning than appears at first sight, and has more to do with the comfortable and satisfactory progress of operations than many would be inclined to believe. Experienced gas engineers are sometimes heard to complain because a board of directors or a corporation committee seem to suppose that any intelligent artisan can manage a gas-works; yet they not unfrequently exhibit a failing of a similar character, in putting any respectable person on who offers himself, as retort-house foreman or in other responsible position. Fortunately, in this country there is usually no difficulty in meeting with men well fitted to fill each and every vacancy; but this state of things does not extend to foreign parts. Sometimes considerable difficulty arises in these circumstances in making the best of the unsatisfactory material at disposal, and it may be necessary to send to the home country for suitable men.

It is well to bear in mind that, when once a man is appointed to a post with a prospect of permanent employment, he establishes a sort of vested interest in that post, rendering it difficult to take him from it, although it may be advisable to do so; and this increases with the period of time during which he has held the office. If he is a drunkard, or given to other bad habits which interfere with the proper fulfilment of his duties to the best of his ability, there is at once a tangible reason for discharging him. But he may be highly respectable in private character—for the student of human nature will find as much to respect and to admire in characters exhibited amongst the working classes, as amongst those moving in higher grades of society—and yet be utterly unsuited, in respect to natural ability, for the position to which he is appointed. Under these circumstances, the manager cannot remove him without incurring certain opprobrium. The reason for the change is not obvious to his fellows; and therefore the dismissal is said to be due to prejudice or other unworthy motive. A man of clumsy, slow, and awkward movements will never make a good retort-house hand; yet if he has been engaged as such for some years, and his mates have become used to him, his removal in favour of a candidate physically more suited for the work would be regarded as nothing else than an injustice. Some men will work with the shovel for years and yet never learn to use it properly. Even in such a simple operation as throwing up a load of coke, it will be observed that one man can do it in half the time, and apparently with the expenditure of less than one-half the labour, that is required by another to do the same work. One of the greatest difficulties in connection with taking over works that have been neglected or badly managed, is that of dealing with the men, who may not only have got into slovenly or idle habits, but in many cases are utterly unsuited for the positions they hold. The only real way of finding out whether a man is really qualified and fitted for any responsible post—such as retort-house foreman, captain of a gang, purifier-house foreman, &c.—is to let him try it for a time. In appointing a man to such a position, it is well, therefore, to let him begin *pro tem.*, on the understanding that he will not be permanently appointed unless he proves to be in every way equal to the post. The same principle may be advantageously applied in almost any case. One benefit gained by it is that the new-comer exerts himself to acquire the details of his duties; and becomes more competent than he would otherwise be after holding his post for half a lifetime.

But few of those who read these remarks are likely to be called upon to commence a gas-works *de novo*; the probability is that they will find the works already in operation, and that their pre-

decessors have carried them on with some degree of success. It is a great mistake to find fault with everything that has previously been done, or to set to work making sweeping changes before all the special circumstances of the undertaking have been thoroughly mastered; for to have to fall back again on the old plan, as being the best after all, is rather humiliating, and indeed a confession of failure. The first thing is to get thoroughly acquainted with the way in which operations have been carried on. If any abuses exist, such as the employment of incompetent men, or if any improvement or economy in working can be introduced, the matter can be plainly set before the workmen, who are usually amenable to reason, and their co-operation in the matter may be sought. They will apparently be quite willing to fall in with any new plans that offer prospect of improvement; yet the British workman possesses some degree of stubbornness and prejudice in favour of old customs and ways of working, which can only be overcome by watchfulness and determination.

It is only after everything else fails that the alternative of discharging a man should be resorted to—except, of course, in cases of offences against duty or discipline so grave as to call for summary punishment. There are times when it is necessary to be severe; but if this course is taken on the heat of the moment and in the absence of a really justifiable cause, public sympathy goes with the man, and a certain loss of influence is the result. The manager must make it clear that he is the master; but as a rule the men at once accept him as such—provided he shows himself competent to fill the position, and discharges all his duties in connection with them in a manner worthy of their respect. As such his course of action will be plain and clear. It should admit of those who carry out their duties faithfully, feeling secure and sure of receiving just treatment; but at the same time everyone who neglects his work should have a notion of what he has to expect as the result of such neglect. There is also much difference between ignorance or error of judgment, and intentional laziness or negligence, and this the employer of labour must be quick to appreciate.

These suggestions are not laid down as a guide that should be rigidly followed in dealing with workmen. As a matter of fact everybody has his own way of arranging these matters, which indeed are scarcely of a nature to admit of formulation in writing, and can only be acquired by experience. Still, a few remarks on the subject may not be altogether useless or devoid of interest. There should be a high standard for each *employé*. None, even the ordinary labourers, should be jeered at as "drunken rascals" if they take a drop too much at holiday time; nor should they be contemptuously termed "stupid" or "blockheads" if they fail to carry out their duties properly. Such a course only has the effect of driving them into a sullen, "don't care" sort of way of scamping through their duties, in a manner that seems to offer least trouble to themselves. They should rather be encouraged to set a high value on their work. Even the lowest of all should be made to feel that he is of some consequence in relation to the carrying on of the whole concern, that he is looked upon as being quite able to fulfil the allotted task comprised in his narrow and apparently insignificant field of labour, and moreover is expected to execute it heartily.

(To be continued.)

We understand that Mr. B. A. Lewis, who was formerly assistant to Mr. T. H. Martin, Assoc. M. Inst. C.E., at Barnet, and subsequently went to Wantage, has been appointed Assistant-Manager of the Cape Town Gas-Works, under Mr. A. Wilson, and will shortly leave England for the Cape.

An American physician—Dr. Donald C. Hood—has collected many facts relating to the use of salicylic acid for rheumatism. Of 728 patients treated with salicylates, 523 were relieved of their pains within seven days; whereas of 612 patients treated by other methods, only 140 were relieved within the same time.

We learn that Mr. F. G. Dexter, who has occupied a position on the gas engineering staff of the Great Western Railway Company, has been appointed Manager of the Wantage Improvement Commissioners' Gas-Works (for which post applications were invited by advertisement in the JOURNAL a fortnight since); and he will enter upon his duties to-day. It may be mentioned that Mr. Dexter took the first prize medal in both the Ordinary and Honours Grades of the City and Guilds of London Institute Examinations in "Gas Manufacture" in two consecutive years; and has obtained first-class honours, with second prize (£5 and a bronze medal) from the same Institute in the "Fuel" subject. Besides these, he is the holder of first-class certificates in some half-dozen cognate sciences. This book-learning undoubtedly told well in his favour; but without his eight years' practical experience and his testimonials, it, of course, would not have secured him the appointment. At the same time, his success is a testimony to the value of the City and Guilds Institute's Technological Examinations, and especially of those on "Gas Manufacture," to which reference was made in our editorial columns only last week. If this notification of what many may regard as a comparatively insignificant appointment has received rather more than the customary attention at our hands, it is with the view of stimulating and encouraging those who are entering the gas engineering profession to avail themselves of the opportunities placed in their way to make themselves thoroughly proficient members of it. It may be mentioned that there were about 70 applications for the Wantage appointment.

Technical Record.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

THE ANNUAL MEETING IN GLASGOW.

In the JOURNAL last week we gave the general report of the proceedings at the above meeting, together with the Inaugural Address of the President (Mr. David Terrace, of Dawsholm) and the paper read by Mr. G. R. Hislop, of Paisley, on "Gas-Burners for Photometrical Purposes." To-day we continue the publication of the papers; reserving the discussions thereon until the Official Report has been passed by the Revision Committee of the Association.

A YEAR'S EXPERIENCE IN THE MANUFACTURE OF SULPHATE OF AMMONIA.

By ROBERT COWIE, of Tillicoultry.

About two years ago, the Company with which I am connected decided to work up their ammoniacal liquor into sulphate of ammonia. They had from time to time received offers to take the tar and liquor for a year or term of years; but the amount offered was so small that they concluded it would be preferable to manufacture sulphate instead of selling the liquor. After having made a few experiments, it was decided to erect plant for the manufacture of sulphate; but before beginning its erection, I paid a visit to three gas-works where sulphate is made, to inspect the plant in use. I was well received by the managers; and all my questions were readily answered. The difference between their works and mine was very great indeed. Still, the information I obtained was very useful; and to these gentlemen I tender my warmest thanks. Here let me say that a remark which was made at the meeting of the Association held in Edinburgh in 1886, in the discussion on Mr. Dempster's paper,* made me think there was an immense amount of worry and anxiety connected with the manufacture of these residuals. I thought I had quite enough of this without any more. However, the decree had gone forth, and I was determined to face it.

By this time the season was getting advanced; so, with as little delay as possible, buildings and plant were erected. I must say that for nearly six months I had plenty of worry and anxiety; many little things occurring which I did not foresee, and which were troublesome. The chief cause of trouble was not having a proper saturator, and working with acid made from pyrites instead of sulphur acid. By using acid made from pyrites I could not get a white salt; and a great deal of skimming was necessary. Besides this, the condenser and purifier were too small.

The first thing to give way was the saturator, which was cast all in one piece, but was not of pure chemical lead, and consequently did not stand the acid for more than a month's working, when it was perfectly riddled with small holes. After this I had to work away as best I could with the box with which I had been experimenting, till a new one was made.

Let me here describe the plant I have been working with during the past twelve months. We procured a good second-hand steam-boiler (egg-ended), 20 feet long by 3 ft. 6 in. diameter, set in the usual manner. Placed near the boiler is the saturator—a wooden box lined with pure chemical lead, 15 lbs. to the foot, and all joints well burnt. Its dimensions are 4 feet long by 3 feet wide, with partitions running from side to side; the bottom of the saturator having an inclination, to allow the salt to be fished out during the operation. The saturator is connected to the boiler with a 12-inch wrought-iron tube, with stopcock and flange 2 feet from the top of the saturator, where it is bolted to the flange of the lead pipe which goes to the bottom of the saturator, along its whole length, and is perforated with a number of holes to allow the ammonia free exit into the acid contained in the saturator. Alongside the saturator is a wooden box, 3 feet long by 2 feet wide by 1 ft. 8 in. deep, lined with lead 4 lbs. to the foot. On the top of this box is placed the drainer, also lined with lead of the same weight, having an inclination to allow all the moisture to run into the box below. A few feet from the saturator is the storehouse, the floor of which is laid with lead 4 lbs. to the foot; the walls being of lead to a height of 4 feet. Above this are boards overlapping each other to near the roof. The floor has a fall towards one end, at which is placed a lead box to catch all drippings from the wet sulphate; also a false bottom of wood to preserve the lead from injury by shovels.

The operation of making the sulphate is as follows:—The liquor is pumped into a tank, 12 feet long by 4 feet square, above the boiler at one end, and allowed to settle. About 900 gallons are run into the boiler, and a fire is started under it. In about two hours ammonia begins to come over into the saturator, which is half filled with acid. The ammonia is arrested by the acid and formed into sulphate, which is fished out, and acid added as required; while the carbonic acid and sulphuretted hydrogen pass up a pipe at the other end of the saturator into the condenser, which is composed of a series of 4-inch pipes outside, on the wall of building. The last pipe is placed inside one much larger, through which runs a constant stream of cold water, which cools the waste gases before they pass to the purifier, which is much smaller than it would have been if I had had more space. It is only 3 ft. 6 in. long by 3 feet wide and 3 feet deep, and has two trays, which are covered with oxide of iron. The gas enters at the bottom, and passes up through the oxide. At the top of one of the

sides is a 5-inch pipe connected with the flues of the boiler. When the lid of the purifier is on, the gas passes through this pipe, round the flues, and up the chimney. There is no disagreeable odour whatever during the operation. I may here mention that if the fire under the boiler becomes too strong, causing the saturator to throw off the gases very rapidly, we have a good deal of steam. This I intend to remedy by increasing the condensing power. It takes about 12 hours to distil a charge. I have not as yet used lime or soda to liberate any fixed ammonia, but intend doing so this year. When the charge is finished, the waste liquor is run off, and the boiler refilled on cooling. Should there be excess of mother liquor in the saturator, I have a coil of lead pipe round the bottom, in front of the partition, through which steam is blown, and the liquor evaporated. After cooling, the excess of salt crystallizes, and is fished out before beginning again.

With the plant I have just described, I may say I have had no trouble or worry. The men know now all that is required to be done. I have not employed any additional hands to look after it; so that no extra wages have been incurred. During our heaviest make, the apparatus is at work once, and sometimes twice every week, as we are fairly well off for storage room for tar and liquor, including the boiler, which is no sooner emptied than it is filled again. Thus our sulphate making does not interfere very much with our ordinary work during the busy season.

From the 836 tons of cannel coal carbonized last year, I obtained 8 tons 17 cwt. of sulphate, or upwards of 23 lbs. per ton of coal. The following statement shows the result of our working:—

Sulphate sold, 8 tons 14 cwt.	£101 9 7
Do. in stock, 3 cwt., at 12s.	1 16 0
	£103 5 7
9 tons of acid.	£32 10 0
5 cwt. of coke, at 6s. 6d.	1 12 6
10 p.c. on capital (£100)	10 0 0
	44 2 6

Leaving a surplus balance of. £59 3 1

The sulphate was all disposed of in the district—I had no trouble with it. The farmers who bought it brought their carts and bags with them to take it away. I sold as much as 3 tons 6 cwt. to one farmer; to another, 1 ton 8 cwt.; to another, 1 ton; and to others, quantities as small as 1 lb., 3 lbs., and 7 lbs., to be used for flowers and vegetables. Some of the farmers to whom I sold sulphate last year told me they were pleased with the results; and they have taken more than double this year.

The plant I have described is equal to the requirements of a much larger works than the one of which I have charge. It is not very costly; and it works well. I am aware that there is the continuous process by various makers; which no doubt would be preferred in large works, as perhaps better results are obtained. My Directors are pleased with the past year's working. I hope, if possible, to make it more profitable; and I shall be pleased to receive any information that will help me to make it so.

COAL TAR AS FUEL FOR STEAM-BOILERS.

By JOHN M'CRAE, of Dundee.

About three years ago, when the sudden and serious fall took place in the value of the secondary products produced in gas-works, many gas managers—ever desirous of doing their very best for their employers—were forced to look around for some better market in which to dispose of the products which had so seriously fallen in value. This was no easy task; and even now it forms very uphill work indeed. A comparatively new market has been created for the disposal of boiled tar at several of the German ports; but the expense and difficulty of loading ships with tar in casks take very much from the saving derived from the new manner of disposal. It occurred to me, therefore, that we must look nearer home for a remedy.

In all gas-works of any magnitude, a considerable quantity of fuel must be employed for the purpose of supplying the works with steam for the exhausters-engines, chemical apparatus, thawing purposes, &c. Whether this fuel consists of coke or of coal will not in the least affect or alter my figures. I have no doubt if any manager discovers that he is working more economically by selling the coke and using a cheap small or other coal, he will adopt the cheapest process. In Dundee, where we get a good price for coke, I found, for the purpose of steam fuel, it would be far cheaper to buy small coal costing from 5s. to 5s. 6d. per ton delivered in the works, and dispose of the coke. The question of fuel then lay between coal and tar; and I have experimented somewhat extensively to ascertain the true relative values of the two classes of fuel. For the purpose of this paper, and within the last few days, I made a further examination into the question; and the results arrived at will be those here quoted. The coal we employed was what is known as Stravenhouse small coal, which costs 5s. per ton delivered. The experiment in each case lasted 48 hours. The tar employed was what is known as boiled tar; the naphtha having been previously removed, but the pitch oil left in the tar. The value of this tar in Dundee is about 4s. per ton. The following are the figures:—

Coal, 10 tons 16 cwt., at 5s.	£2 14 0
Tar, 1460 gallons (or 9 tons. 3 cwt., 160 gallons = 1 ton), at 4s.	1 16 7

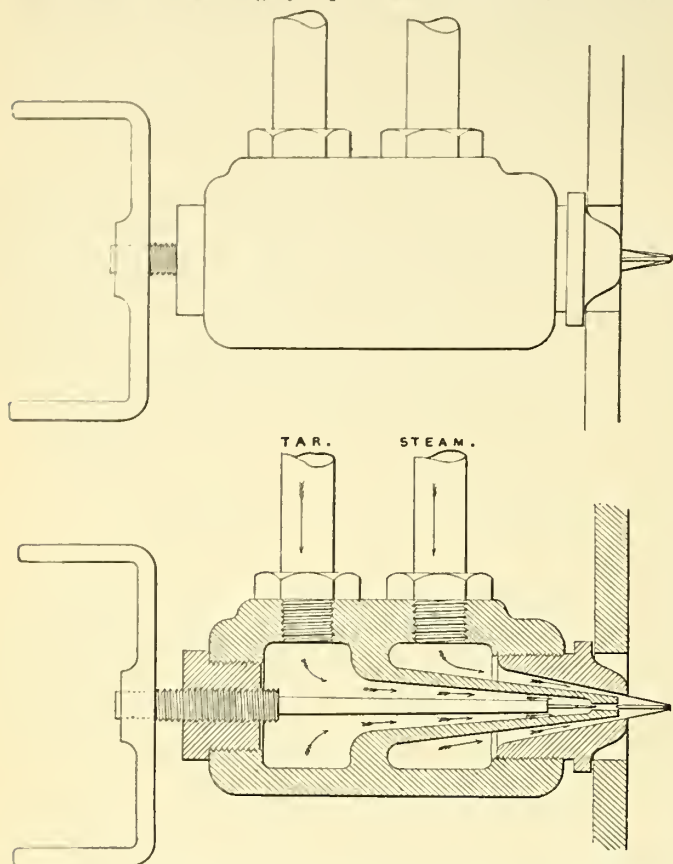
Saving per day by using tar £0 17 5

And this at the longest day, when we are using a mere fraction of steam, as compared with our winter requirements, and consequently

* See JOURNAL, Vol. XLVIII., p. 331.

the profit is proportionally less than it will be when we are in full work.

And now allow me to direct your attention for a short time to the appliance made use of in accomplishing this tar-burning. On the wall is shown a diagram giving in detail the injector known as C. and W. Walker's patent tar-sprayer burner; and it is supplied only by that firm. The tar, which has been brought forward to the boilers in a thoroughly liquid state, is discharged from the



centre of the injector into the furnace of the boiler. Surrounding the centre nozzle of the injector is an annular space through which high-pressure steam passes, also into the furnace. The meaning of this steam moving along with the tar is to force a draught, as well as to raise the temperature of the tar, and so partially convert the tar into vapour; thereby making the combustion more complete. The flow of the tar is regulated by the very delicate sluices attached to the injectors. These valves consist of elongated cones and plugs, and are constructed not only for the purpose of regulating the flow of tar, but also for removing any obstruction or incrustation which may accumulate in the nozzle. In order to keep the tar in a liquid state (which in the winter time is not an easy matter), a small steam-pipe is passed through the centre of the tar-pipe; but, of course, no steam is discharged among the tar, as the presence of water in the injector prevents its correct working. The steam-pipe is simply passed through the tar-pipe, and a steam-trap attached to its end. In changing from the coal or coke fuel to the tar, little or no difficulty is experienced, and very rarely is a shovelful of any kind of solid material required. The furnace-bars have only to be kept covered to prevent the waste of tar and the too-rapid ingress of air; and when the furnaces are in full work, and being well and carefully attended to, the tar will be found to have been nearly all consumed before reaching the solid material covering the bars. The action is very much the same as in the paraffin-oil lamp. The wick is the medium by which the oil is brought to the point of combustion, where it is developed into light; but the wick remains little injured, although in close proximity to such intense heat. The oil burns, not the wick. In the tar-furnace, the tar itself burns, and the tar only.

It will be easily understood that a little experience is necessary to enable the attendant to fully understand the quantity of tar by which complete combustion is to be obtained, and which in no case must be exceeded. The moment one atom of tar is sent into the furnace beyond that which can be thoroughly consumed, you have then the most hideous discharge of black smoke (carbon) which it is difficult to describe, but which can be easily understood, and, I believe, can be seen within a few miles of where we now sit. I should mention that the injectors are fitted on the furnace doors; but the connections are of such a nature that the doors can be opened without disturbing any of the permanent fittings.

And now I have told you that the results detailed in this short paper were those obtained in the Dundee Gas-Works. This is so; but were I to leave the matter here it might be inferred that I considered similar results might be obtained in any and every gas-works. I would not mislead you; and therefore must detain you for a few moments longer in order to show you how my town is different from many others. Dundee is very peculiarly situated in this respect. It is a long distance from any

tar distiller's works capable of dealing with the large quantity of tar we have for sale during the winter. A large portion of the value of our tar must, therefore, go to the railway company, to cover the cost of transit between the two points, and so the tar distiller can allow us but a small figure for it at the starting-point. Then again, Dundee being far distant from the coal-fields, the coal is exceptionally high in price. I quite believe that in many of the west-country towns the coal for which we are paying 5s. per ton could be had for 3s.; and the tar for which we are receiving 4s. per ton, they would get not much under the double of this. Therefore, you see, in a place so circumstanced, the figures I have given would be most misleading. Still, I doubt not there are places as badly situated as Dundee; and it is to such places that my remarks are directed. I believe also that, in many towns distant from collieries, the tar might be sold to manufacturers for use in their steam-boilers; and such an arrangement would, I think, prove advantageous both to the seller and the user of this liquid fuel.

I think that as much has been said in regard to my subject as is necessary; but permit me to add that I believe there is a future for liquid fuels. I do not say tar, but more concentrated fuels, such as crude naphthas, paraffins, and pitch oil. When you see one of our large steamers taking coal into her bunker, it must have appeared to you that there was great waste of power here. Every ton of coal laid in must require a certain amount of power to carry it; and every ton of coal so laid in reduces the cargo-carrying power to this extent. A few gallons of oil will give you the steam-producing power of a ton of coal; and this is a fact which the owners of non-paying steamships should note. Take our locomotives also. Everything I have said in regard to steamships applies to them; and the comfort to the stokers, and the general reduction in labour would be very marked indeed. Of course, it may be argued that if there were such a large demand created for oils for furnaces, the old-fashioned law of supply and demand might come into play, and so force up the price of the article for which the increased demand had taken place. But I think this state of matters is rather remote, when we bear in mind the great oil-wells only now becoming developed, and the oils from which can be run in bulk direct from the wells into ships, and brought to this country at very low rates.

AUTOMATIC GAS LIGHTING.

By GEO. KEILLOR, of Nairn.

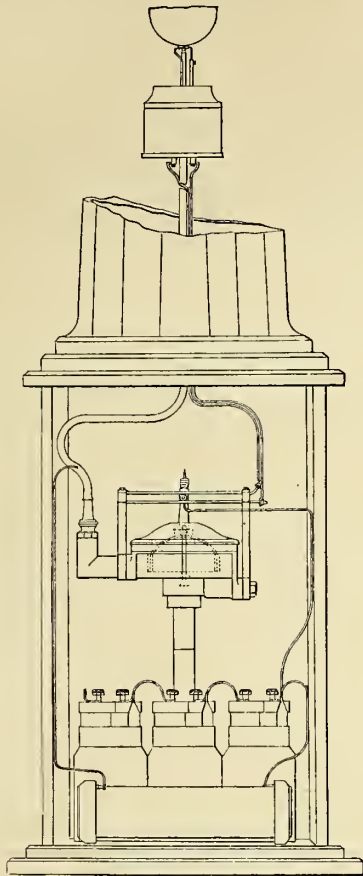
From the fact that the automatic system of gas lighting by means of an electric spark has been in practice for a few years and applied in many different ways, all with considerable success, and also from the fact that a considerable number of able papers have been read on the system at previous meetings of the Association, the subject is one which is well known, and one upon which it is difficult for me to add anything likely to be of more than passing interest.

At the outset, I wish to explain that it is not a lighter I have made, but an arrangement whereby these lighters can be used to much greater advantage than formerly. Before proceeding further I wish to emphasize the fact, in case of misunderstanding, that I have not come forward to read this short paper with the intention of making it appear that I can in the slightest degree improve these lighters so far as they are in themselves concerned. The Woodhouse and Rawson Company's Electric Lighter is a most complete instrument; and having had one in use during the whole of last winter, I can certify as to its unfailing accuracy in the lighting of public lamps, when fitted up in such a way as I am about to describe.

With your forbearance for a short time, I propose to describe a system of lamp lighting which I have had in practice during the past winter, whereby the pressure of gas by means of a governor combined with one of these electric lighters, operates as a complete automatic lighter; but before putting the model which you see before you in action, it may be interesting to the meeting if I were to give a short account of the circumstances under which I was led to make an experiment of the system under description, and the difficulties that I experienced in connection with the lighting of a pier-head lamp.

The pier at Nairn is about 200 yards long, and runs straight out into the Moray Firth. In 1884 the seafaring population of the town made application to the Police Commissioners for the erection of a lamp at the outer end of the pier, to serve the double purpose of helping the navigation of the Firth and lighting the entrance to the Harbour. In the following year the Commissioners, conscious of the necessity for the request, agreed to erect a lamp, and asked me for a probable estimate of the cost of extending the gas-main and furnishing and fitting-up a lamp. As requested, I submitted an estimate, at the same time informing them of the difficulties connected with carrying the gas-main along a pier, and the trouble likely to arise in lighting a lamp situated at a pier-head, owing to the sea being at times very stormy. However, I was entrusted to get the work carried out; and the lamp having been erected in October, 1885, was registered as a coast light. The light was all that could be desired; giving satisfaction to both the Commissioners and the seamen. All went well until the first storm, when, as I fully anticipated, my troubles in connection with the lighting of the lamp commenced. With the waves washing right over the structure, the lamp-lighter—I mean the animate lamp-lighter—dared not venture to the point of the pier to light the lamp; and yet it was just upon such a night as this that the lamp was most needed. To dispense with the necessity of going to the point of the pier

at all, I fitted up a burner with bye-pass, so as to burn at a low point all day; but, unfortunately, the jet of gas when lowered often got blown out during gusty weather. Another objection was raised to this system in respect of the waste entailed by the burning of gas during the daytime; and hence it was that I was induced to adopt the automatic system which I am now about to describe.



I purchased one of Woodhouse and Rawson's electric lighters with the necessary battery, &c.; and after experimenting with it at the gas-works, I contrived to combine the lighter with a governor constructed in the way shown in the model before you, which entirely obviated the necessity for laying a wire to the pier-head—a distance of about 500 yards. I need not comment on the difficulty which would be entailed by carrying a wire alongside a pier, further than to say that I was exceedingly pleased to get over the difficulty so easily. After affixing the wires to the governor in the permanent way shown in the model, I did not experience the slightest trouble; and as sure as the pressure at the gas-works is put on, so sure will all lamps fitted with this apparatus light up. The model, or rather the box and pillar shown is simply a rough-and-ready means of showing the apparatus combined; the battery and governor inside the box and the lighter on the top being actually the apparatus I had in use during the past winter. Now assume that I am at the present moment in the governor-house at the gas-works; the minimum or day pressure being (say) 10-10ths. The governor fitted inside the lamp-post is set at 12-10ths. Consequently it is down and the lamp out. Evening, however, comes on; and it is time to commence to load the station governor, so as to increase the pressure in the street mains for all purposes. We will accordingly now put on the first of the weights; and the moment the pressure reaches (say) 13-10ths in the street mains, all the lamps (unless the governor be loaded down to suit the time) fitted up on this system will immediately light up, as I will show by operating on the apparatus before you. Having now increased the pressure so as to raise the governor and connect the current—the lamps burning—we will suppose the pressure to be all on. Everything goes on as usual till the time for reducing the pressure; and if it is wished to extinguish any lamp (say) at 11 o'clock, or at any given hour, it is accomplished simply by loading the governor at the lamp so as to suit time and elevation. But this one being, we will suppose, a night-lamp, goes on burning till day-break; and seeing that the pressure has been reduced during the night and morning from the maximum to the minimum, the last of the weights will now be taken off; and you will observe that the moment the pressure is reduced to its minimum, the lamp will instantly go out and remain so till evening. Although the model before you only shows one lamp lighted up, I wish to explain that rows of lamps can be lit by means of one governor and battery, and that it matters not from what main the different lamps may get their supply; but there must be a lighter on each lamp, so as to convey the current, and turn the gas on and off. For a row of ten or more lamps, it is simply a matter of battery strength; and it makes no difference what the number of lamps may be, so far as the governor is concerned—it being there solely for the purpose of connecting the current.

I am confident that this is a system of gas lighting which will commend itself to all in charge of public lights. It is specially suitable for pier-head signal and night lamps as well as for town, steeple, and public building clocks—in fact, wherever gas is used. For town and steeple clocks, the system is exceedingly useful, and will entirely supersede the rather antiquated practice prevalent at the present time of setting the clock from time to time to turn up and down the gas according to the season of the year, and it also effects a saving of the gas burnt in these clocks during the daytime. In short, I am of opinion that there can scarcely be a more accurate system of automatic lighting than the one which I have shown. When night approaches, the pressure at the gas-works will be put on to suit the season of the year according as the day shortens or lengthens. Hence, by means of an apparatus fitted in connection with the gas supply of any public clock, building, or lamp, set to a certain pressure, the time of lighting and extinguishing would be wholly regulated by the man in charge of the station governor at the gas-works—thereby making the system completely automatic and thoroughly satisfactory.

Of course the electric lighter with battery can do all I have mentioned without the aid of a governor, if a push-button can be conveniently placed, and a wire carried to the required place, so as to perform by hand the duty which the governor does automatically; but in all cases such as I have described, and also in all outlying lamps, the governor which I have had the honour of bringing under your notice is, in my humble opinion, by far the preferable appliance. Of course, there are a great many other places where these electric lighters could be used, and where they would be exceedingly useful and economical; and it is surprising that they have not ere now come into more general use, especially where occasional lamps are required. I will briefly mention a few of the more likely places where they would be of very great service. They would be particularly so at railway stations, especially in smaller towns where there is generally a considerable lapse of time between the trains; and where a light is only required for a passing train. All outside lights could be lighted instantly, by the use of these lighters, a few minutes before the arrival of the train, and put out again the moment after its departure. Facilities for fixing up the lighters at railway stations are exceptional, as the batteries are at hand, and nothing further is required but the additional lighters and wires. In hotels and large dwelling-houses also, the system would be one of the greatest public convenience. In these establishments one sleeping in the top of the house may have occasion to go to the ground floor during the night, when on coming from his room, and by pushing a button placed at a convenient point, the staircase would be immediately lighted up, and when returning to his quarters, by pushing an adjoining button, darkness would again prevail. This system of the push-button will be found to be equally serviceable in flats of spinning mills, factories, and in show and sale rooms, doctors' surgeries, &c.

The cost of the combined automatic lighting appliance as you now see it is about £4 10s., including the cost of the governor. This governor, of course, I made to suit myself; but to light up a row of ten or more lamps which would necessitate a few extra cells to be added to the battery, and an additional lighter for each lamp, the total expense would be about 45s. per lamp. Extra cells cost 2s. 6d. each; and the best special wire about 6s. per 100 yards. The lighter and battery will last for a number of years; and all that the battery requires at any time is simply to be replenished with a little plain water added after the salammoniac, zinc, and carbon blocks.

I may here further state, for the benefit of anyone who may think of using a similar apparatus in the close vicinity of the sea, that damp from the salt water or even the sea air has a very injurious effect upon all metals and especially copper, which in a very short time gets quite green in colour, followed rapidly by verdigris; and, if not protected, corrodes the wire connections in a very short time. All wire connections should, therefore, be carefully covered up by whatever means may suggest itself. The means of protection which I adopted was to completely bury the battery in a sheet of common wadding, with a close case to cover the governor, above which I also placed a sheet of wadding.

THE MANAGEMENT OF THE BRISTOL GAS-WORKS.—We are pleased to learn that the Directors of the Bristol United Gas Company have appointed Mr. William Fiddes as their Engineer, in which capacity he will have control of all the Company's works, and will carry out such new works and extensions as the Directors may decide upon. We congratulate the Directors upon having taken the wise step of securing the services of Mr. Fiddes as their Engineer-in-Chief. He has had considerable practical experience in every detail of his profession, during the many years he has been assistant to his father (Mr. Walter Fiddes, M. Inst. C.E.), as well as an intimate acquaintance with the requirements of the city and districts. Besides his qualifications as an Engineer, Mr. William Fiddes is an able Chemist, proof of which is afforded by the valuable tables published in "King's Treatise on Coal Gas," showing the ultimate analyses of coals—analyses which were made by him while still serving his articles with the Company under his father. About the same time he was elected a Fellow of the Chemical Society, having previously distinguished himself as a National Medallist in the chemical examinations held under the Science and Art Department. The many friends and well-wishers of Mr. Walter Fiddes will be pleased to learn that his eldest son has received this important appointment in the Company with which his name has been so long associated.

THE LIGHT-GIVING POWER OF DIFFERENT GAS-BURNERS.

The occasion of the exhibition of illuminating appliances held in St. Petersburg under the auspices of the Russian Technical Society afforded an opportunity for conducting a series of tests on a large scale with different gas-burners. These tests were undertaken by Professor S. Lamansky, assisted by MM. E. Komaronski and J. Schelkownikoff; and full details, with the results of the experiments, are published in the report of the exhibition. Professor Lamansky has, however, republished the most important results in the *Journal für Gasbeleuchtung*; and, inasmuch as the different gas-burners were all examined by the same method, with the same gas, and by the same observers, it is possible to compare satisfactorily not only individual types, but also burners of different manufacture. We therefore lay these results before our readers.

Slit, Argand, incandescent, and inverted regenerative burners were included in the tests, which were conducted in such a manner as to determine the light-giving power of the burners with variable consumption of gas, in order to ascertain the favourable conditions of combustion for each of them. Measurements of the quantities of gas employed were made by means of an experimental gas-meter, which indicated the actual consumption of gas in litres. With the smaller burners, the consumption was observed during 5 minutes; with the larger ones during 15 minutes. Photometric measurements were carried out with a Bunsen photometer made by Herr Elster, of Berlin; an angle photometer being employed for the inverted regenerative burners. A normal burner from the same factory served in most cases as the standard; but for the regenerative burners an Elster Argand with adjustable air supply was used.* The ordinary Argand was compared every evening with an English standard candle; the height of the flame being 45 mm. With a consumption of 150 litres (5·30 cubic feet) per hour, the intensity of the Argand burner fluctuated between 14·5 and 14·75 standard candles. The gas was also thoroughly tested with Sugg's "London" Argand burner, and with the Paris standard burner of Bengel; n-ing in each case the prescribed quantity of gas—viz., with the Sugg burner, 141·6 litres (5 cubic feet) = 16 candles in London; with the Bengel burner, 105·0 litres (3·71 cubic feet) = 1 Carcel, or 9·6 candles in Paris; and with the Elster burner, 150 litres (5·3 cubic feet) = 17 candles in Berlin. The present results may therefore be compared with others obtained with these burners with different gas. The specific gravity of the St. Petersburg gas varies from 0·37 to 0·45 at 15° C. In the original communication, the quantities of gas consumed are given both in litres and cubic feet, and consequently the results are of universal utility. To facilitate comparisons of the efficiency of individual burners from an economical point of view, the gas consumed per hour and candle, and the number of candles corresponding to the consumption of a definite volume of gas, are given in each case.

Slit Burners.

No.	Name of Burner.	Gas Consumption per Hour in Cub. Ft.	Illum. Power in Standard Candles.	Gas Consumption per Candle Power per Hour in Cub. Ft.	Candle Power per Cub. Foot.
1	Bray's standard, Patent (80-candle power)	7·81	16·0	0·49	2·04
		9·22	21·0	0·44	2·25
		12·29	27·0	0·46	2·20
		5·67	11·0	0·46	2·17
		6·89	14·5	0·48	2·10
2	Bray's standard, Patent (60-candle power)	8·03	16·5	0·49	2·05
		8·45	17·5	0·48	2·07
		9·17	19·0	0·48	2·07
		10·63	20·5	0·52	1·92
		6·99	14·25	0·49	2·04
3	English Fishtail	9·32	19·0	0·49	2·04
		10·81	20·0	0·54	1·85
4	Double Fishtail.	7·42	15·5	0·48	2·09
		8·90	18·25	0·49	2·05
5	Ordinary Hollow-top, No. 7 Cub. Ft. Burner	11·63	21·5	0·52	1·81
		6·50	11·75	0·55	1·81

All the slit burners were hollow topped. In these experiments the plane of the flame was parallel with that of the photometer screen. In some experiments with the plane of the flame at right angles to that of the screen, a lower illuminating power was obtained. For example, burner No. 1, with the gas consumption shown in the table, gave, when parallel, 16, 21, and 27 standard candles, while at right angles it indicated only 14·5, 16·5, and 23 candles. The table shows that the consumption of gas for different slit-burners averages 0·44 to 0·55 cubic foot per candle per hour, or that 1 cubic foot of gas gives the light of from 1·81 to 2·25 normal candles.

* The efficiency of a new burner or high-power lamp is now generally tested by comparing it with a standard light on a specially constructed photometer, whilst the illuminating power of the gas itself is either determined by means of a separate ordinary photometer or not determined at all. In the new gas-works at Rotterdam, the unavoidable errors attached to these modes of procedure are eliminated by the use of an ordinary flame of 16 candles as the standard of light in the special photometer, with which the gas itself may then at any time be tested.

The results with Argand burners were as follows :—

Argand Burners.

No.	Name of Burner.	Gas Consumption per Hour in Cub. Ft.	Illum. Power in Standard Candles.	Gas Consumption per Candle Power per Hour in Cub. Ft.	Candle Power per Cub. Foot.
<i>Without Discs.</i>					
6	Paris standard Argand (Bengel)	3·71	8·4	0·44	2·26
7	Berlin standard Argand (Elster)	5·30	14·6	0·36	2·75
8	London standard Argand (Sugg), with 24 holes and cone	5·00	11·5	0·43	2·31
9	Flürschheim's Argand	6·70	16·2	0·41	2·42
10	Hirzel Argand	7·13	21·1	0·34	2·96
10	Hirzel Argand	7·26	19·1	0·38	2·63
<i>With Discs.</i>					
11	Bengel Argand, china disc	8·66	22·5	0·38	2·60
12	Do., metal plate	8·05	17·8	0·45	2·21
		8·77	21·9	0·40	2·50
		7·60	9·4	0·81	1·24
		9·47	23·8	0·40	2·51
		10·06	24·1	0·42	2·40
13	Bec-Golz, metal plate disc	10·64	33·3	0·32	3·13
		9·00	17·3	0·52	1·92
		10·58	27·6	0·38	2·61
14	Expansion burner, do.	10·04	18·9	0·53	1·83
15	Royal Argand, from New York	10·61	20·3	0·52	1·91
16	Argand by Vervin, of Paris	7·37	8·5	0·86	1·15
17	"Precision" Burner, by Siemens	9·32	19·2	0·49	2·06
		10·31	28·0	0·37	2·72
		12·26	38·4	0·32	3·13
18	Argand recuperative burner by Rotsiper	5·78	14·9	0·39	2·58
		7·12	23·1	0·31	3·24
		8·34	31·4	0·26	3·75

Burners Nos. 11 to 18 had discs—No. 11 a porcelain one, the others of metal. The Siemens "Precision" burner, and Rotsiper's burner with arrangement for heating the air supply (Nos. 17 and 18) in the above table, were the most complicated; but they show a greater saving of gas than the ordinary Argand burners. From these results it may be assumed that, on the average, Argand burners consume from 0·32 to 0·53 cubic foot of gas per candle per hour; and for each cubic foot consumed give from 1·83 to 3·13 candles' light.

Only two kinds of incandescent burners were tested—the Lewis-Sellon, with platinum cone, and the Welsbach. The latter gave a whiter and more agreeable light than the former. The results show that altogether these incandescent burners do not effect any greater saving of gas than the Argand burner. They, however, do not burn as steadily.

Incandescent Burners.

No.	Name of Burner.	Gas Consumption per Hour in Cub. Ft.	Illum. Power in Standard Candles.	Gas Consumption per Candle Power per Hour in Cub. Ft.	Candle Power per Cub. Foot.
19	Lewis-Sellon	3·68	6·75	0·54	1·83
		4·24	10·60	0·40	2·50
		5·31	14·40	0·37	2·71
20	Welsbach	2·75	7·80	0·35	2·84
		3·28	9·60	0·34	2·93
		3·90	8·10	0·48	2·08

Inverted Regenerative Burners.

No.	Name of Burner.	Gas Consumption per Hour in Cub. Ft.	Illumin. Power in Standard Candles.	Gas Consumption per Candle Power per Hour in Cub. Ft.	Candle Power per Cub. Foot.
21	Siemens's horizontal flat-flame, with No. 10 slit burner	5·51	29·6	0·19	5·37
		6·47	40·1	0·16	6·20
22	Siemens's horizontal flat-flame, with No. 8 slit burner	4·05	10·8	0·37	2·67
		5·45	26·2	0·21	4·81
		5·91	27·4	0·22	4·64
23	Siemens's inverted regenerative, No. 3.	6·63	36·1	0·18	5·44
		10·41	21·8	0·48	2·09
		11·57	41·7	0·28	3·60
24	Siemens's inverted regenerative, No. 11.	11·89	57·2	0·21	4·81
		32·87	161·1	0·20	4·90
		37·12	187·9	0·20	5·06
25	Cromartie (small).	42·95	288·4	0·15	6·72
		3·06	10·05	0·30	3·25
		11·89	54·9	0·22	4·62
26	Do. (large).	14·90	88·7	0·17	5·95
		4·20	12·1	0·35	2·88
		5·15	17·7	0·29	3·44
27	Wenham, No. 1.	8·62	39·4	0·22	4·57
		11·78	55·1	0·22	4·68
		15·62	99·2	0·16	6·35
28	Do., No. 3.	15·17	48·3	0·31	3·18
		17·29	86·3	0·20	5·02

Passing on to inverted regenerative burners, they were all, with the exception of the small "Cromartie" burner, which was only tested at an angle of 45°, tried at angles of 30°, 45°, 60°, and 75°. The following results with Butzke's burners, with a consumption of gas of 15·85 cubic feet per hour, are given as an example of the variation in intensity with the angle:—

Angles	30°	45°	60°	75°
Standard candles	80·5	84·2	95·2	104·3

For the sake of brevity, only the mean of the four measurements is given in the preceding table.

A comparison of these burners as regards their consumption of gas indicates a great economy with the more powerful ones, except in the case of the horizontal flat-flame burner, which, with the small consumption of 6·47 cubic feet of gas, yields the high illuminating power of 40·1 candles, which is equal to 1 candle for a consumption of 0·16 cubic foot per hour—a performance only attained by the other burners with a much larger consumption of gas.

Comparing the smallest consumption per candle per hour for the different types of burners, it will be seen that, under the most favourable conditions of burning, slit burners consume 0·44, Argand burners 0·32, and regenerative burners 0·15 cubic foot; therefore in this particular they stand in the relation of 3:2:1. So that, as regards the consumption of gas, regenerative burners are three times as economical as slit burners, and nearly twice as economical as Argand burners. But, of course, the initial cost and the working expenses must also be taken into consideration.

THE DETECTION OF LEAKS IN WATER-MAINS.

In Vol. XC. of the "Proceedings of the Institution of Civil Engineers," the Engineers of four of the London Water Companies (Mr. J. Francis, of the New River; Mr. W. B. Bryan, of the East London; Mr. A. Fraser, of the Grand Junction; and Mr. J. W. Restler, of the Southwark and Vauxhall) contribute some interesting notes on the detection of leaks in water-mains.

Dealing first with the New River Company we find that the pipes generally lie in clay, and the water escaping from any defective place is at once directed towards the surface. Even where the stratum is gravel, it is usually of so compact and loamy a nature that the effect is practically the same. A leak, therefore, most frequently shows itself immediately over the weak place, even though there may be concrete and asphalt above, the water having a tendency to filter through the concrete, and to force up the asphalt covering in the form of a blister. Occasionally, however, it is first seen at some distance, having crept along the side of the pipe to a place where the filling-in above may happen to be loose, or of a nature more easily penetrated. Or it may travel along the under side of the paving until some point is reached where the continuity of the outer skin is broken—as at a kerb, a gully, or in front of a house. In such cases the leak is found by digging down at the various pipe-joints until the right one is discovered. Where there happens to be a sewer in close proximity, the water may find its way in, and thus attract attention. Undoubtedly, an impermeable surface to a road greatly increases both the difficulty of localizing a leak in an underground pipe, and also the extent of damage that is likely to occur before the evil can be remedied. A successful method of following a leak having an underground exit has been to remove a small portion of the surface covering in several places near the suspected spot, and to bore down to the required depth with an auger of 2 or 3 inches diameter. The escaping water has necessarily a certain amount of fall from its point of origin, and consequently stands highest in the hole nearest to that point. By boring further holes in the direction indicated, the site of the leak is at length reached. With regard to the arrangement of the pipes in streets covered with concrete, the New River Company do not spare any pains to ensure that the iron may lie on a solid bed, and the joints be soundly made; but further than this no special arrangements are provided for detecting any leakage that may occur.

With regard to the East London Water-Works Company, we are told that where asphalt or wood pavement is laid, leaks in water-mains are exceedingly difficult to localize. In some cases, the water, being unable to rise to the surface, makes its way into a basement which may be at a considerable distance from the actual leak; in other cases, the water will force up the pavement in the weakest place in the neighbourhood. The ground is then opened, and the leakage has to be traced to the fractured pipe, to the great cost of the Company and inconvenience of the public. In the Company's district there are comparatively few roadways of wood or asphalt, and these are principally situate in the City. Where ordinary pavements are upon a clay foundation, leaks show almost exactly over the fractured or faulty pipes. In the neighbourhoods of Bow and Old Ford, and many other places in the East-end, the subsoil is gravel, and leaks do not always show on the surface, as the water passes away without detection into deep sewers and elsewhere. In these cases leaks are difficult to localize. If the supply to the houses near is insufficient, the cause is sought, and sometimes a length of pipe has to be uncovered to detect the fault. The East London Company use Deacon's waste-water meters; and they also "stethoscope" the pipes at various places. These methods frequently enable the leaks to be localized. In this Company's district the pipes were mostly laid anterior to the introduction of concrete pavement—no special arrangements having been made. But great care is exercised in jointing the pipes, which are run with lead. A novel system has been introduced for detecting leaks on a particular service, which so far has proved more successful than anything else. It is simply the

employment of a small bye-pass of $\frac{1}{2}$ or $\frac{3}{4}$ inch diameter, spanning an ordinary sluice-cock. The sluice-cock on the service pipe (supplying 50 houses, more or less, and in some cases 100 houses) is shut, and the bye-pass opened. It is known how much water will go through the bye-pass, and that it is sufficient for all the needs of the consumers. If complaints of insufficient supply are made, it is evident there must be either waste or leakage; and a visitation is made to all the houses. If the fittings are good, there must be a leak somewhere; and the site can generally be ascertained by listening at various points, or boring with an auger.

In the district of the Grand Junction Water Company there are but few streets laid with asphalt; and there are no subways. Until recently the streets were paved with granite setts laid on concrete or gravel, or with broken granite (macadam), or simply with gravel. In either case, when a leak occurs it soon asserts itself on the surface; and the exact site is readily found. Moreover, the escaping water runs down the gutters and gratings into the sewers. Now, however, the practice is to take up all the macadam, and mix it with Portland cement into a concrete, which is spread evenly over the whole surface of the road about 6 inches thick. On this wood blocks are laid. The substratum of the greater part of this Company's district is clay; but it is traversed by sewers and drains. Most of the houses have basements, and also cellars under the pavements. Consequently when a pipe bursts, or a leak occurs, the water finds an impermeable ceiling above, and the pressure drives it either into the sewer or into some basement or cellar, whichever may be nearest. Great trouble and expense result, as the Company usually compensate those who receive injury. Moreover, should the street be on an incline, the water runs downhill from the actual point of leakage. This is a great annoyance. The leakages into the sewers are usually discovered by sewer-men. Some few years ago a case in point occurred in Oxford Street, on the incline near Bond Street. A cone about 3 feet in height suddenly appeared in the wood pavement at the bottom of the incline; and from it a small quantity of water issued. This was found to proceed from a $\frac{1}{2}$ -inch pipe supplying a drinking fountain at the top of the incline. The water had accumulated under the concrete till it drove up the surface. On another occasion a 30-inch main burst at Notting Hill; and the water not finding a ready outlet at the surface, on account of the concrete substratum, forced its way laterally into cellars, basements, and kitchens, and finally forced up the pavement. It cost £500 to reinstate everything and to pay proper compensation. A serious objection to wood pavement is that so much of it requires to be opened up and relaid beyond the actual size of the opening necessary to effect the repair of the pipe. This is a source of great expense. The officials of the Company are of opinion that there is more danger where the road is covered with concrete, carrying either asphalt or wooden setts, than in ordinary cases. In the interests of water companies wood pavement should be laid on gravel and sand well consolidated, and not on concrete. Wherever asphalt is employed, there should be subways for the pipes.

There are in the district of the Southwark and Vauxhall Water Company many miles of streets paved with asphalt, wood, or granite setts laid on a concrete foundation; also wood blocks laid on cross timbers. In all these cases the greatest difficulty is experienced in tracing leakages, owing to the distance often travelled by the leak before it shows on the surface, or in the basements of the houses. This difficulty is frequently increased by the water getting into disused surface drains, numbers of which exist in the older portions of the district. The pipes are laid without special reference to the distance from the houses. The usual practice is to place them in the roadway at about 3 feet from the curb; but this cannot always be done in the main roads, owing to the number of other pipes—for gas, water and telegraph purposes. The pipes used by this Company are of iron, cast vertically, and jointed with lead. The nature of the ground varies considerably in different portions of the district. In nearly all cases any considerable leakage forms a great cavity under the concrete, which rarely gives any intimation of its existence. In some cases leakages from pipes 4 inches diameter have occasioned cavities which required 18 cubic yards of material to fill them up. An important aid to the detection of underground leakages in pipes up to (say) 7 inches diameter, is afforded by Deacon's waste-water meter. These are used by the Company in all districts that are under constant supply; and whenever a leak occurs, the meter indicates its existence, and the approximate amount on the diagram. The leakage is then localized in the manner usually adopted with this system.

THE GAS AND WATER COMPANIES' DIRECTORY, ETC.—We have received a copy of the twelfth issue of the "Gas and Water Companies' Directory," edited by Mr. C. W. Hastings, and published by Messrs. Hazell, Watson, and Viney, Limited. The directory is accompanied by the "Gas and Water Works Statistics," compiled by the same gentleman; and the whole forms a very useful work of reference for all who are engaged in the supply of gas or water. The particulars given are supplied mainly by the officials of the companies or local authorities to whose undertakings they relate; and therefore they may presumably be regarded as reliable. We are assured in the preface that in no previous year has the number of returns been so large; and thus the present edition of the book must be considered as an improvement upon its predecessors. The Editor has noted most of the recent changes in the management of gas-works; though, unfortunately, the work had to go to press with a few unrecorded. The book is bound, as before.

Register of Patents

DISTILLATION OF AMMONIACAL LIQUORS.—Wyllie, R., of Warrington. No. 11,799; Aug. 3, 1887. [8d.]

This invention relates to the distillation of ammoniacal liquors—more particularly such as chloride of ammonia—for the extraction of ammonia therefrom; and it has particular reference to the ammoniacal liquors produced or used in the ammonia-soda process.

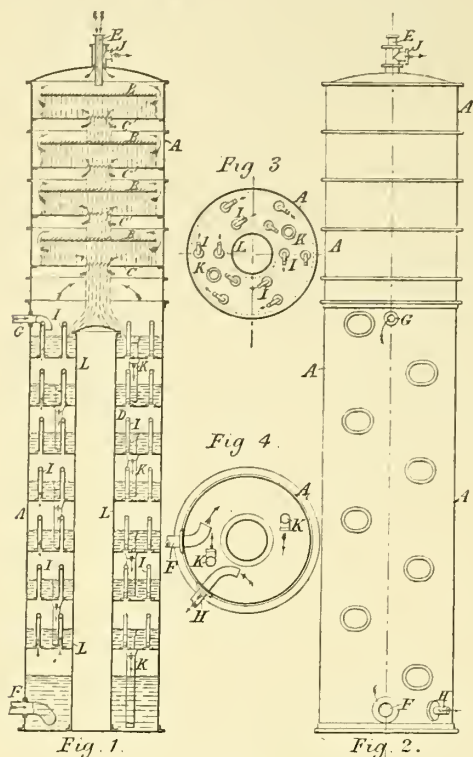


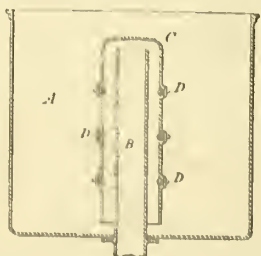
Fig. 1 is a sectional elevation of a distiller embodying these improvements; and fig. 2 is an outside view of the apparatus. Figs. 3 and 4 show cross sections of the apparatus.

A is the casing of the apparatus having a number of manholes therein; B and C are alternate trays, over which the liquor is passed a number of times in the upper portion of the apparatus; and D trays over and round which the liquor is passed in the lower portion. E is the chloride of ammonia inlet; F, the steam inlet; G, the milk-of-lime supply pipe; H, the chloride of calcium outlet; and J, the steam and ammonia outlet—all of which are provided in the ordinary way with controlling valves. L is a central hollow column, to which the inner edge of the trays D are secured, and around which the liquor circulates in the trays; and I are syphon pipes through which the steam passes from one tray to another. A number of these pipes are used in each tray; and their exit orifices are all arranged at an angle to the diameter of the plane of the circle in which they lie. K are conduits through which the liquor flows from one tray to another. The trays B are circular, and placed concentrically within the casing A, leaving thereby an annular space between their peripheries and the case. The trays C are provided with a central aperture of less diameter than B. Both trays are shallow, and are provided at the part from which the liquor overflows, with serrated edges.

The circulation and agitation carried on in each of the trays D, together with the heat of the steam will, in the presence of the milk-of-lime, free the ammonia from the liquor, which passes with the steam to the outlet J. The steam, however, before leaving the outlet has (after leaving the uppermost tray D) to pass through the ammonia chloride as it falls from the trays B and C, and C and B; and in so doing heats it thoroughly and also drives off any free ammonia in the liquor. It is preferred that the apparatus shall be so operated that when the liquor arrives at the point where the milk-of-lime is added, it shall be thoroughly heated—say to about 200° Fahr.—and that by the time the steam and ammonia leave the apparatus they are comparatively cool.

SYPHONS FOR GAS SCRUBBERS.—Cutler, S., of Millwall, E. No. 11,867; Sept. 1, 1887. [6d.]

This invention relates to the construction of an automatic syphon in such a manner as to discharge any desired quantity of liquid less than the maximum capacity of the vessel in which it is inserted. It is especially designed for supplying liquid to gas scrubbers; but it is equally applicable for use in connection with the flushing of sewers, or for any purpose where variable quantities of discharge are required.



The illustration shows a vertical section of the tank or chamber A, through the bottom of which the long leg B of the syphon is inserted; the bottom of the syphon being sealed or not with liquid in a vessel below.

Over and encircling the long leg is placed a bell or short leg C of the syphon, supported in any other suitable manner. In this short leg of the syphon, holes are made at appropriate distances; each hole being provided with a plug D, or cock for opening and closing the passage. When it is desired to discharge the maximum quantity, all the holes are closed by plugs D or cocks; and the syphon acts in the usual manner. But if a less quantity be required, then, by removing the plug or opening the cock of any hole or passage, the discharge ceases. The liquid in the tank then reaches the level of that particular hole, in consequence of the admission of air or gas to the bell or short leg of the syphon.

It should be noted (says the patentee) that, although the tank may be only partially emptied at each action of the syphon, the liquid is always drawn from the bottom, and therefore no stagnation occurs.

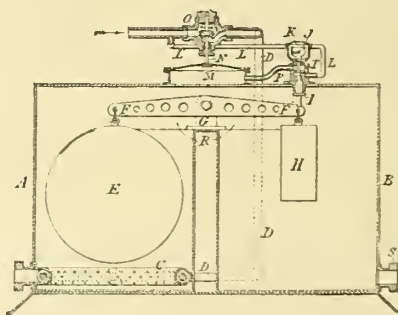
GAS-ENGINES.—Atkinson, J., of Hampstead. No. 11,911; Sept. 2, 1887. [8d.]

This invention relates to a modification in the construction of the now well-known "Atkinson" engine.

In the specification of patent No. 3522 of 1886, there was described a gas-engine in which the single-acting piston was caused to make four strokes for each revolution of the crank-shaft—one for drawing in the explosive mixture, one for compressing it, one for performing work due to its ignition and expansion, and one for the exhaust. Means were also described to allow of the expansion stroke being made longer than the drawing-in stroke, so as to obtain the benefit of carrying this expansion to any desired extent. The present invention is designed merely for the purpose of making the amount of expansion variable whilst the engine is running.

REGULATING THE QUALITY OF CARBURETTED VAPOUR OR GAS.—Frost, E. J., of Philadelphia, U.S.A. No. 6496; May 1, 1888. [6d.]

The object of this invention is to overcome the difficulty attending the use of carburetters, due to the fact that the saturation of the air-current varies greatly, so that the flame is at times smoky from excess of hydrocarbon.



In the illustration, A and B are two cylindrical closed vessels, communicating with each other at the top by a horizontal passage R. An annular perforated pipe C extends around the lower portion of the vessel A, and is provided with an external coupling, to which the exit pipe of the carburettor (not shown) is attached. Within the annular pipe C is a smaller perforated pipe communicating with an exterior air-blast pipe D. This pipe (in communication with the main air-blast supply of the carburettor) is provided with a normally closed puppet valve O, whose stem N rests upon the surface of a flexible diaphragm or aneroid M, mounted upon the top of the passage R, but isolated from the interior of it. A pipe L leads from the pipe D (at a point not under the control of the valve O) to a valve chamber T, mounted upon the top of the vessel B. From this valve chamber a pipe P leads to the interior of the space beneath the diaphragm. Upon suitable supports G, within the space R, is mounted a balance beam F F', carrying upon the arm F a float E (preferably an air-tight globe of thin copper), and upon the other arm a counterweight H, and a vertical valve stem I, which extends through the top of the vessel B, and into the chamber T. The stem is provided with two puppet valves facing in opposite directions within the chamber, and so arranged that when one is open, communication is established between the pipes L and P, and consequently the full pressure of the air-blast in the pipe D is transmitted to the underside of the diaphragm M. When, however, this valve is closed, the other valve is open, and the pipe then communicates with the enlarged upper portion K of the chamber T, which is open to the outside air. The stem I terminates in a cup J, in which shot may be placed to obtain a counter-balance of the utmost nicety. At the bottom of the vessel B is a coupling pipe S, which leads to the burners.

The operation of the device is as follows:—The normal quality of vapour having been determined, the counter-weight upon the arm F' is so adjusted that when the vapour is passing through the vessels A and B, the weight of the globe E just suffices to hold the valve up against its seat. If, however, the current becomes too highly saturated, the increase of density floats the globe E upwards, and by depressing the arm F' opens the valve. This admits the air current from the pipe D beneath the diaphragm M, and distends it; raising the stem N, and opening the valve O. The air current then passes down through the continuation of the pipe D, and enters the annular pipe issuing through the perforations and mingling with the arriving vapour current in the annular pipe C so as to dilute it. The consequent reduction of density causes the globe E to sink, and when the normal point has been reached, its descent closes one valve, opening at the same time the other one, permitting the escape of the air under pressure from beneath the diaphragm M. This diaphragm then falls and permits the valve O to close, cutting off the diluting air-current.

GAS MOTOR ENGINES.—Southall, J., of Worcester. No. 7934; May 30, 1888. [11d.]

This invention relates to gas-engines of the kind described in patents No. 12,424 of 1885 and No. 15,472 of 1886.

The proposal is to employ two equal cylinders, each closed at both ends, placed horizontally side by side, and having their piston rods passing through stuffing-boxes and linked to the same crank on a crank-

shaft. The cylinders have ports and passages governed by valves for the admission of gaseous mixture and the discharge of products of combustion, to and from each of their four spaces—i.e., the spaces on both sides of the two pistons. The valves are so operated that the four strokes constituting a complete cycle (one for drawing in the charge, one for compressing the charge, one for propelling by the firing of the charge, and one for expelling products of combustion) are performed successively in each of the four spaces; the four operations being so timed that at each stroke, a different operation goes on in each of the four spaces simultaneously—the action of the engine being thus to a large extent equalized. The two front spaces communicate with a reservoir by passages governed by valves worked by the engine, and the two hinder spaces communicate in like manner with another reservoir. The valves are so timed that during the first part of a stroke, while one piston is compressing the charge of gaseous mixture behind it, and the other is expelling the products of combustion, a portion of the charge undergoing compression is forced into one of the reservoirs, and is there retained till the pistons have reached the ends of their strokes. A valve is then opened, allowing compressed fluid from the reservoir to rush into the space whence the products of combustion have just been expelled, driving out the residue of them, and taking their place as part of the next charge. By these arrangements, each of the four spaces is in its turn cleared of the products of combustion, and is charged with combustible mixture which is not vitiated to an appreciable extent by admixture of any residue from previous combustion.

APPLICATIONS FOR LETTERS PATENT.

- 10,967.—LEA, J. W., "Improvements in gas-brackets, gaseliers, and pendants." July 30.
 10,979.—THORP, T., "A new and improved water-meter and waste-preventer." July 30.
 10,996.—MILLS, B. J. B., "Improvements in gas-burners." A communication from C. S. Upton. July 30.
 11,043.—WILSON, J. R., "The improvement of gas motor engines." July 31.
 11,064.—LAVENDER, H. P., "Improvements in gas stoves and burners." July 31.
 11,157.—MEIDINGER, H., "Improvements in gas and similar stoves." Aug. 1.
 11,159.—PORTER, G., "Improvements in regenerative gas-lamps." Aug. 1.

PATENTS WHICH HAVE BECOME VOID.

[AFTER THE FOURTH YEAR.]

- 6662.—WIEGAND, S. L. "Gas-engines."
 6678.—MUGNIER, P. "Gas motors."
 6727.—CLUTTERBUCK, G. "Water-waste preventers."
 6764.—WILSON, J. G. (Bott.), "Gas producers."

[AFTER THE SEVENTH YEAR.]

- 1818.—CLARK, F. W. "Regulating the flow of gases, &c."

THE PUBLIC LIGHTING OF MALVERN LINK.—This matter has recently been referred to in our pages. It may be remembered that the Malvern Link Local Board, after failing to come to an arrangement with the Gas Company to light the district with gas, advertised for tenders for lighting it with oil, and when in possession of them it was found there had been a misunderstanding with the Gas Company—the Board not knowing that the Company intended to include in their tender the cleaning, lighting, and extinguishing of the lamps. It has now been decided to accept their terms to do this and supply gas at 4s. 6d. per 1000 cubic feet.

THE PRICE OF GAS AT BIRKENHEAD.—At the meeting of the Birkenhead Town Council last Wednesday, a recommendation of the Gas Committee that the rebate for the reduction of price account be increased from 1d. to 3d. per 1000 cubic feet of gas to consumers by meter from and after the 25th of September next, came up for consideration. Alderman Walker moved that the recommendation be referred back. He said his experience of reductions was that the more the price of gas was lowered, the more the consumers had to pay when they received their gas bills. He had to pay more now for the gas at 2s. 9d. per 1000 cubic feet than he had when it was 4s. 9d.; but he supposed this was caused by greater pressure being put on at the works. He wished they could either give the consumers better gas or meters that were honest. He did not believe people burned the quantity of gas for which they were charged. Mr. Little said five or six years ago the same complaint was made by Alderman Walker at the time a reduction was made in the price of gas. Their Engineer (Mr. T. O. Paterson, Assoc. M. Inst. C.E.) then took the accounts of every member of the Council and compared them with the accounts of the corresponding quarter of the previous year before the reduction took place. He found that there was a reduction of more than 9 per cent. in the price paid for gas consumed. No doubt Alderman Walker's bill had been amongst the others; and what he said now was simply untrue. The amendment not being seconded, the recommendation was agreed to.

THE FENTON LOCAL BOARD GAS UNDERTAKING.—At the meeting of the Fenton Local Board last Tuesday, the annual report of the Gas Manager (Mr. F. H. Darwin), an abstract of which appeared in the JOURNAL for June 5 last, was referred to. Mr. J. Gimson remarked that the Gas Committee considered it very satisfactory. The works were in an improving condition, and there was every reason to believe they would continue to improve; and that this year would be a much more satisfactory one than some of the preceding years. Mr. Hawker alluded to some correspondence which had appeared in the newspapers relative to the report. Mr. Gimson said a satisfactory answer could be given to the letters; but for certain reasons it had not at present been made. Mr. Hawker thought that the way in which the report was worded was calculated somewhat to mislead the ratepayers, though he did not think the Gas Committee had any such intention. Mr. Gimson said a mistake had occurred in attributing £2500 as net profit, and omitting to state that out of this sum principal and interest on loans had to be paid. This expenditure reduced the net profit to something like £146. The £500 which was paid over to the rates was really a portion of the profits of the first two years' working. Then the gas was reduced in price to 3s. per 1000 cubic feet; and consequently, instead of there being a profit, there was a loss of about £186. As he had already stated, the Committee (although the price of gas had been reduced) hoped this year to show a much larger profit, though they did not expect any very great things. The gas-works had to pay the interest on the money spent in the construction of a road, which was about £133. If this sum had been reckoned last year, it would have made the profits for the year about £280.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

PUBLIC LIGHTING BY OIL AT ERITH.

SIR,—Secretaries are writing to me for information of the doings of the wonderful Defries Oil Company at Erith; and, with your usual courtesy, I feel assured that you will insert a few remarks on a personal visit I made to see these public oil-lamps last Saturday evening, and thus save me from a long correspondence on this subject with individual secretaries and managers.

Let me say, in sort, that the exhibition I witnessed on the above-named evening was a partial failure. Many of the lamps were smoking; there was no uniformity in the light that was afforded; and I looked in vain for a lamp above 10-candle gas power. The most influential newspaper in the district was perfectly silent upon the subject of this "great light," although the several members of the Local Board had during the week, driven about the district in a cab to try and find their 30-candle power lamps. There was something very ominous, to my mind, in this omission on the part of the local "Thunderer;" and long before I arrived at Erith I was fully convinced there was "something rotten in the state of Denmark."

I arrived about six o'clock, walking from Crayford; and between that village and the Public Hall, Erith—a distance of over two miles—not one lamp was alight, neither could I see any public lamps alight anywhere. This was long after sunset; and it is mentioned as an illustration of the difficulty of getting some 250 lamps lighted up quickly upon this system. (It takes 2½ minutes, on the average, to light each lamp.) On the previous Saturday, I waited at the Local Board's office until 10 p.m. to see their lamp lighted; but the lamplighter had not arrived when my train started. On the last occasion, however, as all Erith was abroad to see this "great light," my determination was to wait in Erith until the poor lamplighter could get round to light up the main street before all the shops were closed. My friend and I waited an hour; and at nine o'clock the lamplighter, with his ladder and matches and stock of extra chimney-glasses, was just arriving at the Public Hall. We followed up, before him and behind him, and saw him light up a number of lamps; and then inspected those that he had previously lighted. I was particularly struck with the great want of uniformity in the light; and was informed that after the lamps are lighted, the lamplighter has to go over his ground again and adjust all the lamps (turn them up or down as the case may be), and renew the chimneys that are "apt to fly" too often.

The lamp has a tank at the top, with tubes on either side—one for oil and the other for air; and white opal under the tank throws the light down upon the pavement. A man with a ladder and a can fills the tank through a funnel during the early part of the day; and this operation of filling and cleaning the chimney and the lantern takes about a quarter of an hour for each lamp. The contractor has painted many of the columns a pretty Post Office red or scarlet, which shows up in good contrast with the green of the hedges in the rural parts of the district, and was the only improvement I could give the Local Board credit for in this matter. The new lamps necessitated new lanterns and new spiders and ladder-stays, which are charged some 38s. 9d. each extra.

Oil-lamps are a good substitute for gas where the latter cannot be obtained or paid for; but general regret and disappointment were expressed by the ratepayers at the contrast between the 5-feet gas-flames and these puny 10-candle power oil-lamps. The announcement was made with a big flourish of trumpets that the ratepayers were to have 30-candle power oil-lamps instead of the 14-candle gas-lamps, and they cannot see it, and feel that they have been hoaxed up to this date. Should any of my brother secretaries pay a visit to Erith, to inspect for themselves, let me warn them not to make the lamp-columns a resting-post for their weary shoulders, as, in filling the lamp-tanks from the top, a quantity of oil appears to be spilt at every lamp, and the asphalt pavement was pretty freely saturated with oil.

But I would add that we must not overlook the broad fact that oil has become a powerful rival, and that a partial failure will not daunt the Oil Company from endeavouring to get 5 per cent. profit if they cannot get 40 per cent.; though doubtless they will try in every possible way to give satisfaction to the Local Board, and keep us out of the field as long as they can. The "moving spirits" in the Company belong to the most persevering and indomitable race on the face of the earth; and are no mean adversaries in business transactions, and must not be despised. They have got a three-years' contract; and if they do not succeed at first they will "try, try again." The Local Board having expected 30-candle power lamps, will endeavour to get their "pound of flesh;" and the Oil Company will try and get a dividend out of their contract; and it does not require a very far-sighted man to see that we have not yet heard the last of the action of the Erith Local Board and their oil public lamps.

R. P. KEYS,

237, Sotuhwark Bridge Road, Secretary, West Kent Gas Company.
 Aug. 1, 1888.

As confirming one statement made in the above letter—that the lighting of Erith is "a partial failure"—it may be mentioned that one of the local papers last week published the following paragraph:—"On Wednesday evening (the night of the severe storm), we have been informed that a number of the lamps were out. This has been accounted for by the fact that the rain got into the oil reservoir during the process of filling. In the Queen's Road, Avenue Road, Crayford Road, High Street, and other leading thoroughfares, several were out during the storm; and complaints have reached us of numerous lamps being also out at Belvedere the same evening."—ED. J. G. L.

THE PUBLIC LIGHTING OF YORK TOWN.—At a special meeting of the Lighting Inspectors of York Town (Surrey), held on Friday, the 27th ult., a letter from the Gas Company was read, in which the Directors reminded the Inspectors of their claim upon them for £5 11s. 11d. in respect of the last contract, and stated that when this was settled, and not before, they would reply to the Inspectors' question as to future supply. After the reading of this letter, the Inspectors decided to light the town with oil. A letter was ordered to be sent to the Gas Company, asking them to disconnect all the lamps from the mains.

Parliamentary Intelligence.

HOUSE OF LORDS.

MONDAY, JULY 30.

The Llanelly Local Board Bill was read the third time, with the amendments, passed, and sent to the Commons.

HOUSE OF COMMONS.

WEDNESDAY, AUGUST 1.

The Municipal Corporations (Local Bills), Ireland, Bill was read a second time, and committed.

THURSDAY, AUG. 2.

A petition was presented by John Williams for an inquiry in connection with the Pontypool Gas and Water Company.

SATURDAY, AUG. 4.

The Municipal Corporations (Local Bills), Ireland, Bill, as amended, was considered, read the third time, and passed.

Miscellaneous News.

THE GASLIGHT AND COKE COMPANY.

The following reports, with the accounts showing the working of this Company during the six months ending June 30 last, will be submitted to the proprietors at the half-yearly general meeting to be held on Friday next:—

Report of the Directors.

The Directors herewith submit the accounts for the half year which ended on the 30th of June last.

The business of the Company has continued to make sound progress; and an improvement has taken place in the value of residual products.

The receipts on revenue account have amounted to £1,576,301 0s. 10d.; and the expenditure has been £1,010,389 0s. 11d.

After the requisite deductions for fixed charges, there remains, with the addition of the unappropriated profit brought forward from the last account, a divisible balance of £633,021 16s. 10d.

The Directors recommend a dividend on the ordinary stock at the rate of 13 per cent. per annum, which will absorb £355,459 and leave the sum of £277,562 16s. 10d. to be carried to the credit of the current half year.

A Bill for the continuance of the Coal and Wine Dues was introduced into the House of Commons at the commencement of the present session; but has since been withdrawn. The existing power to levy these dues will expire in the middle of next year.

The Bill of the Metropolitan Board of Works, to which allusion was made in the last report, has been dropped, and the legal position of the Company in relation to damage caused by steam-rollers, which the Bill sought to alter, remains unaffected.

The adverse decision of Mr. Justice Kekewich in the case of the Company *versus* the South Metropolitan Gas Company was confirmed by the Court of Appeal, whose judgment, however, was delivered in such terms as suggested to the Directors the expediency of further prosecuting their appeal; and they were advised by Counsel that, with such a judgment, they were bound, in the interests of the Company, to obtain the decision of the highest tribunal. An appeal to the House of Lords has therefore been lodged, and is now awaiting a hearing.

WILLIAM THOMAS MAKINS, Governor.

Horseferry Road, Westminster, S.W., July 17, 1888.

Construction and Carbonizing Department.

I beg to certify that the whole of the Company's gas manufacturing and storage stations have been kept in good order and efficiency during the past six months. I have further to report that, in order to meet the anticipated maximum day's increase during the next winter, the last of the twelve retort-houses at Beckton is being fitted up, together with all the apparatus in connection therewith. This will add 5½ million cubic feet to the total daily manufacturing power of the Company. A large gasholder tank is also being constructed at the Bethnal Green station of the Company, to accommodate a gasholder to contain 4 million cubic feet.

G. C. TREWEY,

Constructing and Carbonizing Engineer-in-Chief.

Distribution Department.

I hereby certify that the whole of the distributing plant under my charge has been maintained in a thorough state of repair and efficiency during the past half year.

ROBERT HARRIS, Distributing Engineer.

Products Department.

I hereby certify that the whole of the plant, engines, boilers, stills, trucks, machinery, and tools, in connection with the Company's products works under my charge, have, during the past half year, been maintained in good working order and repair.

THOS. WILTON, Superintendent of Products Works.

Appended to the report is the statement of accounts therein referred to. These will be given next week.

PUBLIC LIGHTING AT CONSETT.—The new agreement just entered into between the Consett Local Board and the Shotley Bridge Gas Company is to the effect that the latter are to light the lamps for 1600 hours between August and April at the cost of £2 2s. each lamp.

STROUD WATER COMPANY.—The half-yearly general meeting of this Company was held at the London Offices last Tuesday—Rear-Admiral Bythesea, V.C., C.B., in the chair. The Secretary (Mr. P. H. Stephens) having read the notice convening the meeting, the Chairman moved the adoption of the Engineer's report and the balance sheet to June 30 last, copies of which had been sent to the shareholders. He said the works had not progressed as well as they should have done; but the contractors had had a good many difficulties to contend against, owing to the unfavourable reception of the project in Stroud. The applications for the supply of water were coming in very fairly; but they could hardly expect the demand to reach its full force until the works were completed. What seemed most necessary was to endeavour to create an interest in the works in Stroud itself; and to add to the Board one or two local Directors, so that a quorum could always be obtained by one Director going down from London. The report was adopted. The great need of the district being a good supply of soft water, the Chief Engineer of the Company was instructed to inquire into the various softening processes now in use. Steps are being taken to place a local Director upon the Board.

SOUTH METROPOLITAN GAS COMPANY.

DIRECTORS' HALF-YEARLY REPORT.

The following is the report of the Directors of this Company, which, with the accounts for the six months ending June 30 last (to appear next week), will be presented to the proprietors at the half-yearly general meeting on the 15th inst.:—

"The past half year has been uneventful but satisfactory, as is shown by the accompanying accounts. There has been an increase the corresponding period of last year of 4.7 per cent. in the gas sold; but, owing to the price being lower than in the March quarter of 1887, the addition to the gas-rental is proportionately smaller—amounting to \$8111. Products have been in somewhat better demand, and have yielded £22,061 more than last year. As the supply of tar still evidently exceeds the demand, 39 per cent. of the total make has been used as fuel. Exhibitions of various kinds of apparatus for the use of gas, coupled with cookery lectures, have been held in all parts of the Company's extensive district, and have resulted in a great demand for gas-stoves, and in the dissemination of much practical information amongst consumers of the best and most economical methods of using gas for lighting and for many other purposes. Some large regenerative burners shown at these exhibitions gave a magnificent light; proving that gas can hold the field against all competitors. Your Directors have taken an active part in opposing the renewal of the Coal Dues, on the ground that they are an unjust tax on the consumers of gas and coke, who thereby pay more than their share of rates for local purposes. The Bill promoted by the City Corporation and the Metropolitan Board of Works failed to secure Government support, and has again been withdrawn. Should it be revived next session, it will meet the same uncompromising opposition. This oppressive tax, unless renewed, will expire next July; in which case your Directors intend to give the entire benefit of the saving thereby effected to the consumers. The profit on the revenue account amounts to £144,763 12s. 10d. This with £5263 17s. 3d. brought forward from last half year, and the interest on the reserve fund £4606 0s. 1d. (less £933 7s. 8d., the difference of interest paid and received on loans and deposits), gives a sum of £153,700 2s. 6d. Interest on debenture stock and bonds amounts to £13,667 5s. 1d., which leaves £140,032 17s. 5d. A dividend of 13 per cent., less a fraction undivided as usual, will require £123,947 10s. Your Directors therefore recommend the said dividend; leaving a balance of £11,085 7s. 5d. to be carried forward to the current half year."

BRENTFORD GAS COMPANY.

THE DIRECTORS' HALF-YEARLY REPORT AND ACCOUNTS.

The report of the Directors of this Company for the half year ending June 30 last, with the accounts for this period, has been issued, and will be presented at the general meeting of shareholders next Friday. The accounts show a sum of £64,414 10s. 6d. available for division. The Directors recommend the declaration of the following dividends, subject to income-tax:—At the rate of 5 per cent. per annum on the 5 per cent. preference stock, 11½ per cent. per annum on the consolidated stock, and 8½ per cent. per annum on the new stock (1881). The Directors report with pleasure that the sale by tender of £15,000 of new stock (1881) in March last realized £24,497; the whole amount having been tendered for above the minimum price named in the conditions. The sulphate of ammonia plant at Southall, mentioned in the last half-year's report, is now in satisfactory operation; and the works and machinery (under the supervision of the Company's Engineer, Mr. F. Morris, M. Inst. C.E.) are in efficient order. The amount received from the sale of gas to private consumers in the first six months of the present year was £67,188 12s. 5d.; for public lighting, £7499 0s. 5d.—together, £74,687 12s. 10d. Stove and meter rentals produced £2843 13s. 3d. Residuals yielded £16,292 3s. 11d. The total receipts were £93,876 16s., against £85,378 in the corresponding six months of last year. The increased receipts for gas come to about £3000; coke returned about £1500 more, tar about £750 more, and ammoniacal liquor about £600 more. The manufacturing expenses were £46,953 9s. (coals costing £32,290 12s. 8d.); those relating to distribution came to £5424 17s. 6d.; rents, rates, and taxes to £4215 13s. 11d.; the lighting and repair of the public lamps to £1244 17s. 11d.; management expenses to £3564 11s. 2d.; miscellaneous items making up a total of £62,102 8s. 11d., against £61,322 in the corresponding six months of 1887. The balance carried to the profit and loss account is £31,774, against £27,056. The quantity of coal and cannel carbonized was 46,883 tons, against 45,111 tons. The following are the working results:—Gas, 502,631,000 cubic feet; coke, 31,338 tons; breeze, 3925 tons; tar, 469,392 gallons; ammoniacal liquor, 12,691 bbls of 108 gallons. The Company's paid-up capital on June 30 last amounted to £700,211 17s. 4d., of which £686,006 6s. 8d. had been expended.

SCARBOROUGH GAS COMPANY.

The Half-Yearly General Meeting of this Company is to be held next Saturday, when the Directors will present their report, with the accounts of the undertaking for the six months ending June 30 last. The revenue account shows a net profit of £6021. The balance of net revenue, including £465 4s. 1d. remaining from last half-year's account, after the transfer of £779 8s. 2d. to the reserve fund, and after deducting all interest charges for the half year, is £5871 9s. 7d. Out of this sum, after providing for the dividend on the 5 per cent. preference stock, the Directors recommend the payment of the maximum dividends upon all other stocks of the Company. The payment of these dividends will absorb £5036 11s. 5d.; leaving a balance of £834 18s. 2d. to be carried forward to next half-year's account. The operations of the last twelve months having resulted in a considerable increase of revenue, the Directors have announced a reduction in the price of gas of 3d. per 1000 cubic feet to all classes of consumers as from the 1st ult.; making the present net price 2s. 9d. per 1000 cubic feet—a rate which the Directors trust will encourage still further the use of gas for the many purposes for which it is available. Taking the accounts now before us with those for the preceding half year, we find that the cost of coal, including labour, for the twelve months was £10,219; being at the rate of 13s. 7.72d. per ton, and 1s. 3.34d. per 1000 cubic feet of gas sold. Deducting the amount yielded by the residuals (£4927), the net cost was £5292; being at the rate of 7s. 0.78d. per ton, and 3.799d. per 1000 feet of gas sold. The other items of expenditure make up a total (less residuals) of £13,100; being 17s. 5.87d. per ton of coal, and 1s. 7.79d. per 1000 cubic feet. The revenue from gas (including public lamps) was £24,371, the meter and stove rents were £991, and miscellaneous receipts bring up the total to £26,046; being at the rate of £1 14s. 9.26d. per ton of coal, and 3s. 3.34d. per 1000 cubic feet of gas sold. Deducting the expenditure, as above, there is shown a profit of £12,945, of which £11,359 is required for the payment of dividend and interest; leaving a surplus of £1586—equal to 2s. 1.41d. per ton of coal carbonized, and 2.39d. per 1000 cubic feet of gas sold. The quantity of coal and cannel dealt with in the works (which are under the supervision of Mr. W. J. Moon, the Secretary and Manager) was 14,981 tons, which produced 170,263,900 cubic feet of gas, of which 158,870,117 cubic feet were sold. On this sale the concession announced to the consumers by the Directors in their report will come to close upon £2000.

THE SALFORD CORPORATION AND THE GAS INSTITUTE.

At the Meeting of the Salford Town Council last Wednesday—the Mayor (Alderman A. L. Dickens) presiding—there was a remarkable scene when Mr. Mandley brought forward the resolution of which he had, as mentioned in the JOURNAL last week, given notice, in these terms:—"That, in view of the positive and apparently incontrovertible assertion made by Mr. George Bray, C.E., in his pamphlet, entitled 'Corrupt Practices in the Gas Industry,'—namely, 'that corruption in the gas industry has been largely fostered by the policy pursued by the Council of The Gas Institute'—no further subscription be paid, nor any other support whatever be afforded by or on behalf of this Corporation, to The Gas Institute; and that it be a standing instruction to the Gas Committee that they shall, whenever occasion arise, express their strong disapproval of membership of the said Institute being entered into or maintained by any of their officials."

On the motion being reached, Mr. PHILLIPS submitted, as a point of order, that it could not be entertained, because the Corporation did not pay any subscription to The Gas Institute.

Mr. MANDLEY: The very frivolous objection of Mr. Phillips you will dispose of; and I am surprised that he should display *animus* at the outset.

Mr. PHILLIPS: Are we to have our time taken up by a discussion on The Gas Institute, with which we have nothing to do?

The MAYOR: We have subscribed to the Institute?

Mr. PHILLIPS: Years ago. We are not subscribing now.

Mr. SNAPE: Is this the proper place to "wash the dirty linen" of The Gas Institute?

Mr. JACKSON: Has Mr. Mandley received a retaining fee from Mr. Bray?

Mr. MANDLEY: We all know the purity of Mr. Jackson's motives. I wish him to be quiet, and if he has any brains to show them. (Laughter.) I shall take my time. Alderman Bowes and other aldermen are trying to waste as much time as possible.

Alderman Bowes protested against this statement.

Mr. MANDLEY (after appealing to the Mayor to preserve order) proceeded to say that every member of the Council had been furnished with a copy of a pamphlet he held in his hand—a pamphlet by Mr. George Bray, of Leeds, on "Corrupt Practices in the Gas Industry" [Mr. SNAPE: I have not received one.] He hoped every member had read the pamphlet; and if not they had not done their duty. He would not commit himself to everything that the pamphlet stated; but he might give the Council the gist of it. It stated that the honest trader had no chance against bribing firms and venal gas managers. As an illustration of this, it was asserted that a certain firm of meter makers in the year 1886 paid to gas managers alone commission on not less than three-fourths of the whole of their trade. In this connection he might say that he saw, in the JOURNAL OF GAS LIGHTING, that some of the meter makers were advertising that they would not any longer pay those illegal commissions. The pamphlet further said that considerations of quality or price were ignored by the venal managers, who thought only of those secret commissions; and that this vile system did not merely prevail in coal contracts, but in relation to everything bought or sold in the manufacture of gas, and, unless commission was paid, no trade could be done. The pamphlet further set forth that certain consulting engineers and many gas managers were either directors or shareholders in companies whose articles they strongly recommended to their employers. A corporation called in a consulting engineer and—

The MAYOR (interposing) said he had been from home, and did not see this resolution until Tuesday. Had he seen it earlier, he should never have allowed it to go on the agenda paper. The Council did not subscribe to The Gas Institute; and why did they "wash the dirty linen" of an institution with which they had no cognizance? It would be quite time to engage in a discussion on this question when there was any intention on their part to subscribe.

Mr. MANDLEY said he had made notes, and would confine himself to them.

The MAYOR: Why should we rake up these matters here, when we have nothing to do with The Gas Institute?

Mr. MANDLEY: Having the highest regard for yourself, Mr. Mayor, I am sorry that you should have interposed with these remarks. I do not take this course without first obtaining competent advice. Our Standing Orders and Municipal Law are framed on the hypothesis that nothing whatever shall be excluded from the agenda paper merely as a matter of taste. I am positive that if I were to apply for a *mandamus* you would be compelled to place the motion on the paper; but I do not wish to take this course. I have consulted a Town Clerk whose opinion is held in high esteem; and I say that this motion could not—

The MAYOR: Are we to understand that any member can put a notice on the agenda paper to enable him to vilify an institution to which we do not subscribe?

Mr. MANDLEY: We have subscribed. ("No.") Somebody said "No," which is the result of ignorance; for we have not only paid subscriptions to the institution, but also the expenses of the former Gas Engineer to go away—

Mr. PHILLIPS: What is the use of discussing these matters, which do not concern the Corporation?

Mr. MANDLEY: The expenses of the late Gas Manager were paid by— Alderman WALMSLEY: Have you not ruled, Mr. Mayor, that the point raised by Mr. Phillips is fatal to the motion?

The MAYOR: It places me in a very difficult position, seeing that the motion has been allowed to appear on the agenda paper; but as the point has been raised by Mr. Phillips, I must say that I consider the motion out of order. The Council subscribed in 1882, £5; in 1883, £5; and in 1884, £15, when an exhibition was held at the Crystal Palace, London, to illustrate the comparative merits of gas and electricity. We have not subscribed since 1885. The expenses of the late Gas Manager were paid by himself.

Mr. RYCROFT contended that the latter portion of the motion was regular. It could not be out of order to give an instruction to the Committee.

Mr. SNAPE wished to know if it would be in order to move a resolution instructing the Committee not to go to St. Petersburg. If Mr. Rycroft was right, this might be done.

The MAYOR: I think it would be quite time for Mr. Mandley's motion when it was proposed to subscribe to The Gas Institute.

Mr. MANDLEY: This matter must go further. Year by year since I entered the Council I have been most abominably ill-treated; and if you rule the motion out of order, I cannot allow it to rest. I ask the Town Clerk, whose credit is at stake, for his opinion; and if I am not allowed to move my resolution, I say it is against all logic and all justice.

Alderman WALMSLEY: We cannot discuss the rule of the chair. If Mr. Mandley feels aggrieved, he has his remedy.

Mr. MANDLEY: Must gentlemen go to law to get what is right? Is this the position members of the Council are to be put in? It would be with very great reluctance indeed that I should appeal from the injustice of the Mayor to the justice of the law.

Mr. GROVES: Would not the final clause justify Mr. Mandley proceeding?

The MAYOR: I do not see any objection to it.

Mr. PHILLIPS: I offer no objection to that.

Mr. MANDLEY: But I object to being "badgered."

Mr. JACKSON thought their time ought not to be wasted in this way.

Mr. MANDLEY: The whole gist of the thing is that we should not subscribe to The Gas Institute; it is an instruction to the Committee that what has been done in the past must not be done in the future. I left off by stating that even the consulting engineers that were called in, and who were paid a considerable sum for their advice, were getting direct profit on the very articles they were recommending should be bought; that The Gas Institute—

The MAYOR: I must decide that you cannot go into these matters.

Mr. COTTRELL: Limit yourself to the latter part of the resolution.

Mr. MANDLEY: I demur to that. If I am not allowed to show why we should not subscribe to the Institute, I am most unfairly handicapped. What has Mr. Bray done that the Council of the Institute should seek to expel him?

Mr. COTTRELL: We all know that.

Mr. MANDLEY: All may not. Some members make a boast that they have not read the pamphlet.

Alderman MAKINSON: If Mr. Mandley gets from the Chairman of the Gas Committee an assurance that the Committee will not subscribe to the Institute, will he not be satisfied?

Mr. LORD (Chairman of the Gas Committee): I shall be pleased to give that assurance. We do not intend to subscribe.

Mr. MANDLEY: I have no doubt I shall be told these statements are purely *ex parte*; that Mr. Bray must produce his legal proofs, or they will not be listened to. If Mr. Bray's charges against the Institute were false, how was it—

Mr. SNAPE: I understood, Sir, you had ruled that The Gas Institute and Mr. Bray are not before the meeting.

Mr. MANDLEY [to Mr. Snape]: You take your seat.

The MAYOR: I must request you, Mr. Mandley, to bring your remarks to a close.

Mr. MANDLEY: I will bring them to a close if you will keep these "terrier dogs" off me. (Laughter.) I cannot proceed for them. If these charges that Mr. Bray has made against the Institute are false, why have they not brought Mr. Bray into Court? Mr. Bray's charges have not been controverted; yet a mean and cowardly attempt—

The MAYOR: I must rule these references out of order.

Mr. MANDLEY: An attempt was made to expel Mr. Bray—(Cries of "Order.")

The MAYOR: Considering that you have had an assurance that the Committee do not intend to subscribe to the Institute, why in the world should we be listening to extracts from the pamphlet of Mr. Bray, which I do not think we have anything to do with. I leave it to your own good sense to bring your remarks to a close.

Mr. MANDLEY: Then I will leave Mr. Bray out, and will take you to something else. On the late Gas Committee, I opposed the payments to Mr. Hunter for going away in connection with the meetings of The Gas Institute. When your late Gas Engineer attended these meetings it was then that he made contracts with these bribing firms.

Alderman HALL: If Mr. Mandley will confine himself to the resolution, it would be better; but he surrounds it with a lot of stuff that has no connection with it. We are not dealing with Mr. Bray's pamphlet at all.

Mr. MANDLEY said he had met with similar treatment to this in the Gas Committee for years. The men who were now opposing his motion formerly spoke of Hunter as a man of genius, and a most competent Engineer; but so long ago as 1875 the Rochdale Corporation—

The MAYOR said this was altogether out of order. He should be sorry to take an extreme course; but Mr. Mandley paid not the least attention to his ruling.

Mr. RYCROFT suggested that the difficulty might be overcome by the adoption of the latter half of the resolution—the instruction to the Committee—with the addition of the words "as at present constituted" immediately after the word "Institute."

Mr. MANDLEY: I will accept that.

Alderman ROBINSON said that the present Gas Manager was a member of the Institute; and therefore the Council had better understand clearly the position in which the resolution would place them. He thought it would be far better to refer the matter to the Gas Committee for consideration, and let them report.

Mr. MANDLEY: I will accept that.

A resolution referring the matter to the Gas Committee was then formally adopted; and the Council proceeded to other business.

A MISHAP TO A HOLDER AT ROCHDALE.—Some inconvenience was caused at Rochdale last Wednesday afternoon by the failure of the gas supply during a period of temporary darkness. A question on the subject was put to the Chairman of the Gas Committee at the Council Meeting on Thursday; and it was elicited that the pressure failed because one of the holders stuck. Mr. T. B. Ball, the Engineer, was on the premises, and the mishap was rectified immediately, but complaint was made that the sudden fall of the holder had the effect of forcing the water out of the meters in some cases. As a result of the extraordinary weather which is being experienced, it is stated that the daily consumption of gas at Rochdale on Wednesday was double what is usual at this time of year.

NEWPORT (MON.) WATER SUPPLY.—The Crumlin section of the water-works now being constructed by the Rural Sanitary Authority of the Newport Union has lately been inaugurated by turning the water into the new mains. The source of supply is a powerful spring situated in the Tongwyn Wood, about a quarter of a mile out of Crumlin, the property of Lady Llanover. This spring is of remarkably uniform volume and purity. It was gauged by Mr. T. Dyne Steel, M. Inst. C.E., the Engineer of the Authority, throughout the summer and autumn of last year, and the lowest yield was 28,350 gallons per day. As regards purity, the water was analyzed by Dr. C. Meymott Tidy in May, 1887, and pronounced by him to be a very good water, pure and wholesome. The water is taken from the eye of the spring direct into the mains by an ingenious arrangement, so that it never sees daylight till it is drawn from the consumers' taps. Close to the spring a brick service-tank has been constructed, holding about two days' requirements of the district in case of any accidental derangement at the spring. In order to supply the high district of Cwmdows, the Engineer has continued the Crumlin mains to the neighbourhood; and several residences situated at an elevation of more than 500 feet above the sea level, are now successfully supplied with water from the Crumlin spring. The whole of the works were designed and superintended by Mr. T. Dyne Steel. Mr. Steel is also constructing for the Authority larger works for the supply of Newbridge, Abercarn, and Cwmcarn; but as these involve a storage reservoir, now in course of construction, in the Gawn Valley, it will take about three months to complete the water supply of the whole district.

THE TRANSFER OF THE EDINBURGH AND LEITH GAS WORKS TO THE CORPORATIONS.

THE GAS COMMISSION AT WORK.

The Edinburgh and Leith Gas Commission held their second meeting on Monday last week—Baillie TURNBULL presiding. Mr. Smith Clark was present, and made the statutory declaration.

The Finance Committee met an hour before the assembly of the Commissioners; and the minute of their meeting stated that they had authorized the payment of £27,000 to the Edinburgh Gaslight Company, and of £11,000 to the Edinburgh and Leith Gaslight Company; these being the capital sums on the payment of which, as the Act provided, the gas undertakings should become vested in the two Corporations. The Committee's minutes also contained the following letter from Mr. Adam, the City Chamberlain:—"As authorized by the City Treasurer's Committee, I beg to send you detailed statements of the outlay by the Lord Provost, Magistrates, and Council of Edinburgh in connection with—(1) the opposition to the Edinburgh Gaslight Company's Bill, 1887, and negotiations in that year for the proposed acquisition of the undertakings of the Edinburgh Gaslight Company and the Edinburgh and Leith Gaslight Company by the Town Councils of Edinburgh and Leith; and (2) the promotion of the Edinburgh and Leith Corporations Gas Bill, 1888, which received the Royal Assent on the 24th inst. As instructed by the Treasurer's Committee, I have added interest on the advances by the city at the rate of 4 per cent. per annum. These advances have so reduced the cash balances on the city's proper municipal accounts as to make it desirable that the amounts be repaid by the Gas Commissioners before the close of the city's financial year on the 1st prox." Annexed to the letter were abridgments of the statements of outlay and interest; the totals being as follows:—Opposition to the Edinburgh Gas Company's Bill, 1887, £2952 17s. 1d. Promotion of the Edinburgh and Leith Corporations' Gas Bill, 1888, £3049 1s. 7d.—total advances for outlay, £6001 18s. 8d. Add interest on total outlay, £133 1s. 2d.—together, £6134 19s. 10d. The Finance Committee's minute went on to state that they had authorized the repayment of the above sum to be made to the City Chamberlain without delay. They had also, at the request of Mr. Beveridge, the Parliamentary Solicitor, authorized a further remittance to him of £1500 on account. In order to meet these various amounts, the Committee had asked from their bankers a loan of £50,000 on the short loan system, for a period of either two or three months, as might be arranged. The minute concluded by stating that a remit had been made to a Sub-Committee in regard to the increased accommodation and rearrangement and alteration of the office premises necessary for efficiently carrying on the work of the Commission.

The report was adopted.

The meeting then proceeded to elect an interim Clerk. The names of two gentlemen were submitted—Mr. W. P. Lindsay, W.S., and Mr. J. M. Jack, S.S.C. On a division, Mr. Jack was elected by 11 votes to 7; the appointment being for three months.

Mr. COLSTON moved, and it was agreed, to empower the Works Committee to make arrangements for taking stock of the stores of both Companies at a valuation, as provided by the Act of Parliament.

A vote of thanks was then accorded to the Town Clerk (Mr. Skinner) for his services; it being agreed that he should have something more substantial.

It was also agreed to keep the price of gas the same as at present for another year; and that the quality should be 28 candles.

THE TRANSFER OF THE WORKS.

In accordance with the Act of Parliament, the newly-constituted Gas Commissioners became the owners of the undertakings of the Edinburgh and Edinburgh and Leith Gas Companies at midnight on the 31st ult. The transference was a merely formal matter; the Managers of the two Companies, at their respective works, taking a measurement of the coals and other stores on hand. At the same hour a note was taken of the quantity of gas which had passed through the station meters at the respective works since the beginning of the financial year till that day, and for which each Company is entitled to payment. At noon on the 1st inst., the Clerk to the Commission (Mr. J. M. Jack) paid over £11,000 to the Edinburgh and Leith Company, and £27,000 to the Edinburgh Company, as the amount of goodwill arranged to be paid; to meet which the Commissioners borrowed the sum of £50,000 from the Commercial Bank of Scotland.

On the invitation of the Directors of the Edinburgh Company, a large number of the Commissioners met in the afternoon, at the works in New Street, for the purpose of taking part in the formal handing over of the establishment to the new body. The members assembled in the open space in front of the offices, and there they awaited the presence of the Directors, who had a meeting arranging the details of the transfer. Sir T. Boyd and other Directors shortly after one o'clock emerged from the building, and the ceremony immediately proceeded.

Sir Thomas Boyd said he regretted exceedingly that Mr. Syme, the Deputy-Governor of the Company, was not present, and that in his absence the duty devolved upon him (Sir Thomas) of formally handing over the undertaking and the works to the newly-formed Gas Commission. In doing so, he had very great pleasure, on behalf of the Directors, in wishing the new body every success in the management of the works. The negotiations, as they knew, which led up to the transference, involved very serious and difficult problems. The matters under consideration had to be investigated to the very bottom, and this led to very protracted negotiations; both parties contending—and justly contending—in the interests of their constituents, for what they thought was their due. It was, however, gratifying now to look back upon what had taken place, and say that amid all the difficulties that arose, not a single word was used which they had any reason to regret. It was most gratifying to them all, seeing that matters had come to this stage, that such should have been the case. With regard to the prospects of the newly-formed Commission, there was every reason to congratulate them on the favourable position in which they were placed. The price of coal was very low. The Company had brought the manufacture of gas to a very high state of efficiency; and he believed that the other Company had done the same. Had they continued as a Company, they intended to make some improvements in their works—improvements which would have enabled them to very materially reduce the price of gas; and there was no doubt that had they continued long in office, the price of gas would certainly have been greatly lowered. He had no doubt, further, that when the Commissioners came to consider the matter of reducing the price, they would find themselves in a position to do it. They would, he said, find the working of the concern of a very interesting character; and he thought it was due to the Engineer (Mr. R. Mitchell) to say that he had managed his department in a very efficient way. Indeed, had they continued as a Company, he believed they would have been mainly indebted to him for his advice in effecting such improvements in the works as would have enabled the Directors to reduce the price of gas in the way he had referred to. It was also right to mention

the name of Mr. Cockburn, who had taken charge of the office department, and had always given the highest satisfaction.

Mr. COLSTON, who replied on behalf of the Commissioners, thanked the Directors for affording them an opportunity of meeting them on so interesting an occasion. He had no doubt they would find the works as efficient as Sir Thomas and the Directors stated them to be. It was gratifying to know that the Commission took over this great concern at a time when circumstances were so favorable. He understood that, according to the contract just entered into by the Commission, a saving on the price of coal would be effected to the amount of £15,000. It gave those who had been fighting the battle of the public the utmost satisfaction to know that this was the case. He fully reciprocated every word that had been said by Sir Thomas Boyd with regard to the negotiations.

The whole party, led by Mr. Mitchell, then proceeded through the works, where they examined with evident interest the various stages in the process of gas manufacture. In the afternoon, the Directors and the Commissioners lunched, on the invitation of the former, in the Waterloo Hotel. The chair was occupied by Sir Thomas Boyd, and several complimentary toasts were proposed and duly responded to; "Success to the Gas Commission" being received by the Directors with enthusiasm.

The formal transfer of the works and undertaking of the Edinburgh and Leith Gas Company took place on the afternoon of Thursday last. The Edinburgh members of the Commission assembled at the City Chambers, and drove to the Company's works at Baltic Street, Leith, where the Directors had previously met. On arrival there, the whole company proceeded to the vacant ground immediately behind the offices, where the ceremony of formally handing over the works took place.

Mr. J. TAWSE, Chairman of the Company, said that, on behalf of the Directors, they had very great pleasure in handing over the undertaking; and he was sure that the Commissioners would find in going through the works that they were in good condition, and capable of providing their constituents with an efficient gas supply. The Directors had for years striven to keep up their works to a high degree of efficiency, and to introduce into them all modern improvements. For some years they had been renewing the works—supplanting old material by new. He might take the opportunity of saying that some animadversions had been made in regard to past matters that the Directors had to deal with. It was thought the Company should not have done certain things last year. Now, these were not done last year in consequence of any negotiations that were in progress or anticipated. They were part of the plan which the Directors had been carrying out for a number of successive years—renewing their works by degrees. They only did last year what they had done in former years. All the improvements had been carried out under the charge of Mr. F. T. C. Linton, their Engineer; and the Commissioners would find him a gentleman capable of adequately carrying on the management of their affairs. He further said that, on behalf of himself and the former Directors of the Company, he hoped the transfer of the gas undertakings to the Commission would be productive of much good, and that the Commission would realize their highest expectations. He trusted also that it would be found to be a great boon to the people of Edinburgh and Leith.

Mr. COLSTON, who replied, said that when they first became aware of the necessity for taking over the lighting of Edinburgh and Leith, they saw that it would be absolutely requisite for them to have both gas undertakings in their possession. Of course, it was right for the Directors to make the best bargain they could; and it was also right that, in defence of the public, the Commission should get the best terms. They had had a long and hard fight; and it was gratifying that all parties were pleased, and that now, after all the controversy, they could meet in the most friendly and cordial relation. As to the condition of the works, in the matter of retorts he had the best reason for saying that they were up to modern ideas. The report of Mr. George Livesey, which would shortly be issued, would, he thought, amply testify to this view. He could only trust, in conclusion, that the public interest would benefit by the transfer of the undertaking.

The members of the Commission, accompanied by the Directors and Mr. Linton, then proceeded through the works; all expressing the utmost satisfaction with their condition. They afterwards visited the gasholder stations. The Commissioners and Directors afterwards lunched at the Windsor Hotel, on the invitation of the directorate.

SALTCOATS GAS COMPANY.

The Directors of the Saltcoats Gas Company have lately issued some interesting notes and statistics regarding the concern under their management. The pamphlet embodies a short statement in reference to the early history of gas lighting, which concludes by stating that gas was supplied for the first time in Glasgow in September, 1818; in Paisley and Kilmarnock in 1824; in Irvine in 1829; in Leith in 1831; in Dalry in 1834; in Saltcoats in 1836; in Kilwinning and Largs in 1837; in Girvan and Ardrossan in 1841; in Stevenston in 1856; and in West Kilbride in November, 1856. It will be seen that, with the exception of Glasgow and Paisley, all these towns are in Ayrshire. The construction of the Saltcoats Gas-Works commenced in the summer of 1836; the leading contract being taken by Messrs. Reid and Hanna, Engineers, of Paisley, whose business is now continued by the firm of Hanna, Donald, and Wilson. Gas was supplied to the town for the first time about the end of the year, or early in 1837. The price to consumers by meter was at the commencement 10s. 6d. per 1000 cubic feet; and in 1841 it had been reduced to 8s. A considerable number of the consumers paid for the gas used according to the number and size of jets or lights, and the number of hours they were kept burning. Numerous grievances arose out of this mode of charging, and the surveillance which it necessarily required. Eventually, in the course of the year 1849, after the subject had been much canvassed, it was agreed to let out meters on hire—a system which ultimately became general. It put a stop to "watching," it was more profitable to the Company, and more satisfactory to the consumers on the whole. At the same time it was decided to pay the cost of gas-fittings for weavers' shops, and charge a percentage on the outlay. This proved a considerable boon to the weaving industry, which was of greater importance in Saltcoats in those days than it is now. Up till July, 1883, a charge was made for the hire of meters; but it was then abolished, the Company supplying all meters free. The first gasholder erected at the works served its purpose well for the first 13 years. It continued to be of use for many years longer; but it ultimately became unserviceable, and was sold as old metal in 1882. The second holder was erected in 1849; and in 1874 the third had become necessary. A report to this effect was obtained from Mr. G. R. Hislop, of Paisley, who also recommended other improvements; the whole estimated cost being upwards of £1500. A fourth holder is now in contemplation. The two holders at present in use have a total capacity of 33,044 cubic feet. The average daily make of gas in December, 1887, was 40,863 cubic feet, and in January of this year, 37,650 feet. As to the residual products, only £21 19s. was obtained for them in the year 1888; but in 1883-4 the revenue from this source was almost £200. Last year, however, the sum realized was only £66. The lighting of the town was for a long time a matter involving much annoyance,

owing to the difficulty of obtaining payment for the gas consumed; but in 1859 it was agreed to put 2d. per 1000 cubic feet on the price of gas, so as to ensure that the Company should be paid for the gas. This extra charge was discontinued after the annual meeting in 1864; the Company supplying the gas for the street lamps free. Last year there were about 1120 gas consumers in the town, and the number will be considerably increased this year. The first Manager was Mr. W. Shearer; and for three years his successor was his widow. Several others followed till 1876, when Mr. T. Wilson, now of Coatbridge, was appointed. He was succeeded in December, 1880, by Mr. J. Henderson, the present Manager.

MANCHESTER CORPORATION GAS SUPPLY.		
ABSTRACT OF THE ACCOUNTS OF THE GAS UNDERTAKING FOR THE YEAR ENDING MARCH 31, 1888.		
In the JOURNAL last week (p. 212), we gave the report of the Gas Committee of the Manchester Corporation for the year ending March 31, 1888. We now give a few particulars taken from the accounts for this period, as certified by the Auditors (Messrs. Lees and Graham):—		
PROFIT AND LOSS ACCOUNT.		
EXPENDITURE.		
Coal and cannel	£175,179	17 3
Retort-men's wages	32,550	13 3
Retorts, materials, and setting	11,006	17 9
Labourers' wages and repairs of works, street mains, and repair of hired meters	37,944	6 9
Purifying charges	2,422	13 7
Salaries and wages	14,198	0 10
Collectors' salaries	7,492	12 9
Chief and other rents, rates, and taxes	18,012	3 10
Amount of depreciation written off for the year	33,623	0 9
Stationery, advertising, and stamps	1,428	0 4
Law expenses	95	10 0
Miscellaneous expenses	598	1 8
Official clothing	354	3 11
Painting offices, repair of furniture, and alterations	199	3 11
Subscriptions and donations	72	10 0
Bad debts	853	19 11
Bankers' commission and charges	258	2 8
	£336,289	19 2
Balance, being the gross profit on the year's working	106,072	9 3
	£442,362	8 5
Interest on loans, consolidated stock, deposits, &c.		
Cost of street lighting	£29,832	16 11
Less value of gas (not charged)	20,942	18 10
	8,528	19 4
Transferred to sinking fund	26,454	0 0
Amount paid to the City Fund account during the year	£23,331	0 0
Balance, transferred towards the liquidation of adverse balances on the profit and loss account in past years	17,925	13 0
	41,256	13 0
	£106,072	9 3
INCOME.		
Gas-rental within the city—		
Private consumers	£269,761	11 2
Meter-rents	7,258	9 4
Stove-hire	444	7 9
Gas consumed in public lamps, not included £20,942 18s. 10d.		
	£277,464	8 3
Gas-rental beyond the city—		
Private consumers	£93,646	14 1
Meter-rents	3,147	1 4
Stove-hire	203	4 11
Public lamps	6,778	5 4
	103,775	5 8
	£381,239	13 11
Coke	24,845	17 7
Tar	18,645	4 9
Ammonia water	16,968	14 5
Rents	323	10 10
Balance of bankers' interest	106	18 8
Spent oxide, Droylsden station	32	8 3
	£442,362	8 5
GENERAL SUMMARY OF THE CAPITAL AND REVENUE ACCOUNTS.		
RECEIPTS.		
Balance brought forward*	£127,452	10 6
Loans received during the year	28,770	0 0
Transferred from profit and loss account for liquidation of mortgage debt	26,454	0 0
Amount of depreciation written off capital account	33,623	0 9
Balance of profit and loss account (as per statement)	41,256	13 0
	£257,556	4 3
EXPENDITURE.		
Loans repaid.	£55,305	16 0
Amount paid over to the City Fund account out of profits for the year ended March 31, 1888	23,331	0 0
Expenditure on capital account	30,624	0 9
Stocks on hand.	£76,462	3 3
Gas-rents, &c., due	143,067	15 0
Cash in Treasurer's hands	3,787	9 8
	£223,317	7 11
Less accounts, &c., owing by the Committee, deposits in hand, with interest due thereon, and balance owing to bankers	75,022	0 5
	148,295	7 6
	£257,556	4 3
* Improvement Committee (balance of contribution for the year ended March 31, 1887)		
Balance	£8,989	0 0
	127,452	10 6
Total (see Summary at March 31, 1887)	£136,441	10 6

STATEMENT OF ASSETS AND LIABILITIES.		
PERMANENT ASSETS.		
Gaythorn station—land, buildings, and apparatus, less depreciation	£195,457	9 9
Rochdale Road station—do.	251,783	15 0
Droylsden station—do.	8,960	8
Bradford Road station—do., and amount received for brick-making	408,796	12 11
Street-mains stores (Poland Street)—land, buildings, and apparatus, less depreciation	2,989	18 4
Street-mains—less depreciation	347,265	17 2
Service-pipes laid	48,008	16 4
Hired meters—less depreciation and amount received for damaged meters	74,216	13 8
Meter-proving apparatus—less depreciation	26	17 11
Lamp department—do.	8,260	13 6
Hired stoves—do., and amount received for stoves sold	4,601	5 1
Cottage property purchase-money	1,652	13 6
FLOATING ASSETS.		
Cannel, coal, retorts, and other material in stock	76,462	3 3
Gas-rents and sundry accounts due to the Committee—revenue account	143,067	15 0
Cash in Treasurer's hands	3,787	9 8
Total property and assets	£1,575,338	9 6
Profit and loss account—		
Deficiency on revenue account, March 31, 1887	£45,857	7 3
Less profit this year	17,925	13 0
	27,931	14 3
	£1,603,270	3 9
LIABILITIES.		
Mortgage debt	£759,356	13 4
Sums advanced (not secured by mortgage)	2,430	0 0
Sundry accounts owing by the Committee	25,195	8 2
Deposits in hand	30,055	16 10
Interest due on same	3,380	1 2
Cash deposits for due performance of contracts	5,050	0 0
Amount payable on account of cottage property	1,600	0 0
Balance owing to banks on revenue and extension accounts	9,740	14 3
Total liabilities	£836,808	13 9
Sinking fund, as per last report	£740,007	10 0
Transferred from profit and loss account for the year ended March 31, 1888	26,454	0 0
	766,461	10 0
(Signed) CHARLES NICKSON, Superintendent.	£1,603,270	3 9

APPENDIX A.		
Statement of the Lamp and Private Rental (including Meter and Stove Rents) for the Year ended March 31, 1888.		
Within the city—		
Private rental	£277,464	8 3
Public lamps	20,942	18 10
	£298,407	7 1
Beyond the city—		
Private rental	£96,997	0 4
Public lamps	6,778	5 4
	103,775	5 8
	£402,182	12 9
Deduct gas supplied to city lamps and not charged	20,942	18 10
Total gross rental	£381,239	13 11

APPENDIX B.				
Comparative Statement of the Gas transmitted from the Works in the Daytime and during the Twenty-four Hours.				
	DAYTIME.		TWENTY-FOUR HOURS.	
	Year ended March 31, 1888.	Increase or Decrease per Cent.	Year ended March 31, 1888.	Increase or Decrease per Cent.
April	Cubic Feet. 49,152,000	inc. 14·93	Cubic Feet. 202,288,000	inc. 7·00
May	45,502,000	" 11·69	166,338,000	" 6·16
June	33,301,000	dec. 9·28	117,572,000	dec. 5·70
July	32,435,000	" 9·65	116,918,000	" 6·66
August	33,984,000	" 4·73	142,294,000	" 5·98
September	48,352,000	inc. 20·73	197,017,000	inc. 1·84
October	58,992,000	" 4·69	282,514,000	dec. 0·02
November	73,677,000	" 1·06	365,682,000	inc. 2·62
December	92,889,000	dec. 10·71	431,981,000	dec. 1·90
January	99,983,000	inc. 11·52	416,739,000	inc. 3·26
February	70,570,000	" 23·22	328,523,000	" 7·83
March	65,185,000	dec. 7·66	277,855,000	dec. 4·92
Total	704,082,000	inc. 3·13	3,045,727,000	inc. 0·85
Daytime. Twenty-four Hours.				
Year ended March 31, 1887	Cubic Feet. 682,695,000		Cubic Feet. 3,020,171,000	
Do.	704,082,000		3,045,727,000	
Increase	21,387,000		25,556,000	
Total quantity of gas transmitted from works	Cubic Feet. 3,045,727,000			
Do.	measured and accounted for 2,897,933,000			
Loss (by condensation and leakage)	147,794,000, or 4·85 per cent.			
[For Appendix C, see next page.]				

APPENDIX D.

This appendix consists of a table showing the number of each size of meter, and also the number of stoves, in use on March 31, 1887 and 1888, respectively. Of the first-named appliances there were fixed at the former date 77,655; at the latter, 78,084—an increase of 429. Of stoves, there were 1750 in use at the end of last March, as compared with 1609 at the corresponding date in 1887; being an increase of 141. Accompanying the table is a statement showing the number of meters on hire at the two dates above named. On March 31, 1887, it was 63,261; on March 31, 1888, it was 64,707—an increase of 1446. Of course, these figures are included in the totals already given.

APPENDIX C.

Statement showing the Results of Working, &c., at the Gas-Works from June 24, 1880, to March 31, 1888.*

Year ended June 24.	Coal and Cannel Carbonized.	Gas.						COKE MADE.		TAR MADE.		AMMONIA WATER.			
		Make.	Yield per Ton Carbonized.	Illuminating Power.	Make reduced to 20-candle Power.	20-candle Gas made per Ton.		Tons.	Cwt. per Ton Carbonized.	Tons.	Gallons per Ton Carbonized.	Make.		Make at 10-oz. Strength.	
												Gallons.	Gallons per Ton Carbonized.	Gallons.	Gallons per Ton Carbonized.
1881	Tons.	Cubic Feet.	Cub. Ft.	Candles.	Cubic Feet.	Cub. Ft.		159,815	12.70	17,193	13.32	6,577,535	26.13	6,485,104	25.76
1882	251,737	2,425,713,000	9,636	19.46	2,360,215,000	9,376		162,759	12.77	16,376	12.53	6,591,005	25.07	6,728,967	26.40
1883	254,894	2,471,177,000	9,695	19.77	2,442,758,000	9,583		164,830	12.73	17,612	12.26	6,557,539	25.71	7,009,034	27.07
1884	258,896	2,574,325,000	9,943	19.81	2,549,868,000	9,849		145,750	12.75	14,596	12.71	5,640,796	24.68	5,841,111	25.55
1885	228,582	2,271,841,000	9,940	19.53	2,218,452,000	9,705		175,388	12.56	18,203	12.70	6,769,570	24.10	6,937,110	24.72
1886	280,594	2,743,675,000	9,778	20.25	2,777,970,000	9,900		179,833	12.61	18,373	12.60	7,293,766	25.60	7,888,376	27.60
1887	285,141	2,899,306,000	10,133	19.41	2,804,071,000	9,534		185,645	12.56	18,446	12.30	7,364,150	25.20	7,608,208	26.00
1888	292,335	3,021,682,000	10,336	19.44	2,937,074,000	10,047		181,970	12.61	19,573	13.00	7,072,169	24.10	7,379,181	25.20
1888	293,318	3,045,907,000	10,383	19.96	3,039,815,000	10,363									

* These particulars appear in the accounts for the first time.—ED. J. G. L.

† This is a period of nine months ended March 31, 1884.

‡ From this year the figures are made up to March 31.

APPENDIX E.

Gas-Mains Laid and Taken Up during the Year.

Laid within the city	34,012 yards	
„ beyond the city	14,036 „	48,048 yards
Taken up within the city	30,838 yards	
„ beyond the city	5,805 „	36,643 „
Net increase	(or $6\frac{1}{2}$ miles 405 yards).	11,405 yards
Pipes laid prior to March 31, 1887—		
Within the city	711,657 yards	
Beyond the city	444,946 „	1,156,603 „
Total length of mains laid	(or 663 miles 248 yards).	1,168,008 yards

APPENDIX F.

This consists of a statement showing the amount of gross profit made from the gas undertaking, and the mode of its appropriation, from 1862 to March last. It is, however, sufficient here to give the figures for the past financial year, and the totals for the 26 years during which the gas supply has been in the hands of the Corporation:—

	Year ended March 31, 1888.	Total from 1862 to March 31, 1888.
Profit.	£106,072 9 3	£2,170,410 3 8
Appropriation of profit—		
Interest.	£29,832 16 11	£534,811 10 5
Liquidation of mortgage debt	26,454 0 0	660,041 10 10
Surplus.	41,256 13 0	908,711 5 1
Street lighting (gas not included)	8,528 19 4	66,845 17 4
Transferred from reserve fund	—	£29,943 17 9
Carried to reserve fund for contingencies	—	29,943 17 9
Paid over to Improvement Committee	£23,331 0 0	936,642 19 4
Borrowed money owing	761,786 13 4	—
Amount charged to revenue for depreciation	33,623 0 9	622,641 6 6
Excess of assets	738,529 15 9	—

THE PUBLIC LIGHTING OF EXMOUTH.—The Exmouth Local Board, at their meeting last Wednesday, considered a long report from a Committee appointed to deal with the subject of the defective gas supply. The Committee reported that the consumption of the gas-burners at which there were meters fluctuated greatly—from 5 to 7 feet per hour; and they recommended that a uniform rate of 5½ cubic feet per hour should be adopted forthwith, as fair to both the Company and the town. A long discussion followed between the Chairman and a Director of the Company; and the latter elicited that the irregular burning arose from lack of attention by the officers of the Board, and that it was now remedied. On the part of the Company he agreed to the recommendation.

LIVERPOOL WATER SUPPLY.—Our readers are aware that for a considerable period great inconvenience has been experienced in Liverpool, particularly in factories and other large establishments, owing to the short supply of water. The Corporation officials were compelled to resort to the expedient of restricting the hours of supply so as to prevent a water famine in the city. Their anxiety has been relieved to a great extent by the heavy rainfall of the past few weeks, which has caused a large increase in the quantity of water in stock; but the stock is now much less than it was at this time last year. At the meeting of the Water Committee of the Corporation on Monday last week, it was reported that the stock of water at Rivington had been increased to 1,280 million gallons. This was considered very satisfactory; and the Committee decided to increase the hours of supply in the city and Bootle to 12 hours per day, and in the suburban districts other than Bootle to 18 hours per day; the alteration to take effect on the following Wednesday.

THE HUDDERSFIELD CORPORATION WATER-WORKS ARBITRATION.—In the arbitration which took place some months ago between Sir J. P. P. Radcliffe, Bart., and the Huddersfield Corporation, to settle the amount payable by the Corporation for lands at Marsden, belonging to him, and taken permanently, or temporarily used, for the purpose of the Corporation water-works, the Arbitrator (Mr. J. Smith, C.E., of Bradford) has awarded to the claimant £1602. The agreement for arbitration, made before the lands were entered upon, provided that the Corporation should also pay 5 per cent. interest upon the amounts found to be due from the dates at which the various portions of land were taken and occupied. As most of the lands have been in the hands of the Corporation from 10 to 15 years, the interest will amount to upwards of £3000 more. The agreement for arbitration also provided that the Corporation should pay the whole of the costs of both parties. The valuers for the claimant estimated the sum which ought to be paid to him, exclusive of interest, as follows:—Mr. T. Fenwick, C.E., £13,845 10s. 6d.; Mr. J. Farrar, C.E., £14,980 1s. 6d.; Mr. B. S. Brindell, C.E., £14,988; and Mr. J. D. Butler, £35,750. On the other hand, the Corporation valuers made the following estimates of the amount which should be paid:—Mr. G. H. Crowther, C.E., £1649; Mr. T. Hawksley, C.E., £2873; and Mr. P. Fowler, C.E., and Mr. C. H. Marriott, C.E., agreed with the estimate of Mr. Crowther. The Counsel for the claimant in the arbitration (which occupied eight days) were Mr. E. Tindal Atkinson, Q.C., and Mr. R. W. Harper; and Mr. L. A. Kershaw and Mr. F. Mellor were Counsel for the Corporation.

YORK UNITED GAS COMPANY.

The Half-Yearly General Meeting of the Company was held last Thursday—Mr. J. F. TAYLOR in the chair.

The SECRETARY and MANAGER (Mr. C. Sellers) read the Directors' report, in which they stated that there was a balance of £9128 to the credit of the profit and loss account. This amount, after being charged with £365, the half-year's interest on the borrowed money, leaves £8762, out of which the Directors recommend the payment of the usual half-year's dividend, amounting to £6600; being at the rate of 5s. per share upon the old shares, and 4s. per share, or 5 per cent. per annum, upon the new shares. The Directors observe that the balance of revenue account for the half year is somewhat exceptional, and higher than they anticipated. This arises, they say, largely from the better prices obtained for the principal residuals, and from the fact that the Company's stocks of residuals were practically all sold, and credited in the half-year's accounts; also from the fact that the legal form of the accounts excludes the monetary values of the stocks on hand from appearing as items of debit and credit in the revenue account. They point out that the profits during the years 1886 and 1887 were below the amounts necessary to meet the dividends; and, in consequence they had to be supplemented by withdrawing nearly £3000 from the reserve fund. They have therefore transferred £1000 out of the surplus profits of the past half year back to this fund, towards meeting the withdrawals referred to. The general business of the Company maintains a steady growth; but the Directors remind the shareholders that the current half year will have to bear the reduction in the price of gas to the large consumers announced in February last. As anticipated in their last report, the Company are now carrying out some improvements to their carbonizing, condensing, and purifying plant, which will further add to the efficiency of the works.

The CHAIRMAN, in moving the adoption of the report, said he did so with very sincere pleasure and gratification. As this was the end of the financial year, the meeting was the annual as well as the half-yearly one; and they consequently had a review of the year's proceedings before them. Although the increase had only been somewhat moderate during the year—viz., 4 per cent.—yet this was so far satisfactory. He thought they would find from the balance sheet, as a whole, that the prospects and position of the Company were as good as ever, or he might say better. Mention was made in the report that the price obtained for the principal residuals had increased; but, although they had met with an advancing market, they had not had any great advance at one time, but the articles had steadily grown in value. Unfortunately, this value had previously sunk very low; but, as anticipated, a revival had taken place. Another reason he might name was the fact that the legal form of the accounts excluded the monetary values of the stocks on hand from appearing as items of debit and credit in the revenue account; and as the stocks of coke and tar, &c., were nearly all sold, and credited during the past half year, they tended naturally to increase the amount of ordinary profit during this period, leaving, of course, scarcely any stock of residuals with which to commence the current half year. He was glad to say the use of coke was gradually increasing—people were finding out that it was more economical to burn it in their stoves as the Company supplied it, than to use coal; and he was glad to find that what he predicted of coke some time ago was now being realized, and its use was becoming almost universal. It would be seen from the balance sheet that £1000 had been paid back to the reserve fund. The Company had now commenced to grant the large consumers that reduction which was announced at the last meeting; and they were supplying large consumers with gas at 2s. per 1000 feet, and the next largest at 2s. 1d. per 1000 feet. He was quite satisfied that this concession would prove of great advantage to the Company, and that it was one of the wisest steps the Directors had ever taken. He expressed a hope that the next reduction made would be to the general consumer, and that this would not be long delayed. The aim of the Directors was to make as good an article as they could, and supply it as cheaply as possible. The Directors were always on the look-out to adopt anything that would improve the quality of the gas, as well as improve the facilities for its manufacture; their anxiety being to maintain the present excellent position of the Company.

Mr. W. W. WILBERFORCE seconded the motion, which was carried unanimously.

The CHAIRMAN then proposed the payment of the dividends mentioned in the report.

Mr. WILBERFORCE seconded the motion, and it was also carried unanimously.

The whole of the Directors were re-elected, and a vote of thanks accorded to them for their services.

The CHAIRMAN acknowledged the vote, and the proceedings closed.

OPENING OF A STORAGE RESERVOIR AT PORTISHEAD.—Some months since the Directors of the Portishead Water Company thought it necessary, in consequence of the unprecedented drought, to supplement their supply by constructing a reservoir capable of holding 1½ million gallons of water, according to plans prepared by Mr. W. Minns, of Portishead. The contract of Messrs. G. Biss and Son, of Portishead, was accepted; and this firm has carried out the whole of the works—having excavated 5000 cubic yards, and built a new retaining wall across the valley—in 34 working days. The Engineer and Directors being thoroughly satisfied with the work, Mr. W. Hall, the Senior Director, opened the inlet-valve on Saturday, the 28th ult.; and the reservoir is now rapidly filling with water.

THE PUBLIC LIGHTING OF REIGATE.

PROPOSED ADOPTION OF OIL.

At the Meeting of the Reigate Town Council on Monday, the 23rd ult.—the MAYOR (Alderman Summers) in the chair—a long discussion took place on the subject of adopting oil for the public lighting of the district. The matter came up on a report presented by the Highways and Works Committee, in which it was stated that the Town Clerk had been directed to write to the Gas Companies requesting them to modify the terms contained in their previous offers of contracting for the public lighting; and that the Surveyor should apply to the Street Lighting Company and to the Defries Safety Lamp and Oil Company for their respective terms for adapting the public lamps for lighting by oil, and lay the information before the Committee.

Alderman PYM, in moving the adoption of the report, recounted the steps that had been taken at the request of the Committee to obtain further information on the subject. He stated that Messrs. Defries and Co. (whose written offers were read by the Town Clerk) were prepared to enter into a contract for lighting the public lamps with oil for a period of three years, from sunset to sunrise, for £2 8s. per lamp; and at the expiration of that time they would be willing to contract for the work for a further period of three years at the same figure, provided oil was not higher in price; but even if it increased their maximum charge would not exceed £2 10s. per lamp. It was their opinion, however, that the price would be lower and not higher. Each lamp would hold sufficient oil to burn the full power, if necessary, for 30 hours. He pointed out that at Erith, where they had adopted oil lighting, it had resulted in a saving of 5d. on the rates.* The communication addressed to the two Gas Companies had resulted in their sending in an amended proposal. But he must remind the Council that the previous offer of the Companies was to light the public lamps for the same number of hours from sunset or one hour afterwards until midnight for £3 7s. per lamp for one year and £3 6s. for three years, and the alternative proposal the Companies now made was that they should consume gas by meter, and would require one meter to be affixed to every ten lamps. Assuming that the lamps consumed the stipulated 5 cubic feet of gas per hour, each lamp would burn in the course of the year 11,000 feet of gas; and the result would be that for gas alone the cost would be £1 18s. 6d. Then the cost of lighting, extinguishing, repairing, and painting each lamp, which had hitherto been estimated at 15s. per lamp, would bring the cost to £2 13s. 6d. per lamp. The Companies always contended that, as a matter of fact, the lamps consumed on an average more than 5 feet of gas per hour—he was told that they consumed 6 cubic feet; and if that was so, it would still further increase the charge for gas from £1 18s. 6d. to something like 45s. to 46s. per lamp. Then as the Companies required them to provide meters, they would either have to pay the rent of them or provide them at their own cost; and with regard to this question he directed the Surveyor to obtain what information he could. It would be necessary for them to obtain something like 50 columns with meters attached. It appeared from the correspondence with various firms who supplied meters, &c. (which was read by the Town Clerk at the request of the Chairman), that the cost of supplying lamps with meters attached would be altogether £4 12s. per lamp, supposing the Corporation accepted the amended offer of the Companies. Messrs. Defries offered to light the lamps for the same number of hours that they had hitherto been lighted for £2 8s. per lamp. This added to the cost of £1 15s. for providing and adapting the lamps would make a very serious item; but if they accepted the contract for the three years, the cost would be about £3 per lamp. Then if they accepted their offer for another three years at the expiration of that time, the cost would only be £2 8s. per lamp, while the lamps would be lit from sunset to sunrise, which would be double the number of hours they were lit now. His own private experience convinced him that oil lighting was cheaper than gas in the ratio of 2 to 1; in other words, it was not more than half the cost of gas. He had no motion to propose on this matter, but would leave the Council to arrive at any decision they thought proper after they had heard the correspondence.

Mr. ONLEY seconded the motion, and requested that the joint letter of the two Gas Companies should be read.

The letter, signed by the Secretary of the Reigate Gas Company (Mr. E. S. Pike) and the Secretary of the Redhill Gas Company (Mr. C. Reid) contained a copy of a resolution agreed to by both Companies, offering to supply the public lamps by meter at 3s. 6d. per 1000 cubic feet; the Corporation to find their own labour, and to be at any expense necessary for lighting, extinguishing, cleaning, and repairing the lamps.

Mr. BROWN said that on the previous occasion he proposed that the Companies should be offered £2 17s. per lamp, which he considered a very fair offer. He did not think it was necessary to go into the figures again to show how he arrived at this sum; but if they took the offer of the Companies to supply by meter at 3s. 6d. per 1000 feet, they would find that 11,000 cubic feet of gas per lamp would amount to £1 18s. 6d., and repairs, &c., were estimated at 15s. per lamp—making a total of £2 13s. 6d. He contended that the Companies' offer to supply by meter had really strengthened his case. He maintained that the offer of £2 17s. per lamp was ample, and would cover any cost incurred in lighting, extinguishing, &c. He would propose—"That the Council are unable to accept the offer of the Reigate and Redhill Gas Companies to supply the street lamps by meter, or their tenders for lighting at £3 6s. per lamp; and unless they amend the same, reducing the price to £2 17s. per lamp, on the same conditions as under the present contracts, the Surveyor arrange with Messrs. Defries and Co. to light six lamps, three in the principal streets of Reigate and Redhill, with their 30-candle power lamps for 14 nights, from sunset to sunrise, to commence on Monday, the 30th of July, to the end that the Highways and Works Committee may be in a position to make a recommendation to the next Council concerning the offer of Messrs. Defries and Co., to light the public lamps at £2 8s. the lamp by the year; that the Town Clerk write to the Gas Companies, stating that unless a reply in the affirmative is received from the Gas Companies by noon on Friday, July 27, the Council will consider that the offer has been declined."

Mr. STEER seconded the motion.

Mr. FULLER said that by adopting oil-lamps the Corporation would in the first instance have to incur an expenditure not far short of £1000 in providing new lamps; and he hardly thought Mr. Brown could be in earnest in urging that they should go to this expense. The trimming and lighting of oil-lamps in the streets would become an intolerable nuisance to pedestrians, by causing an unpleasant smell. He therefore thought it was advisable to dispose of that part of the resolution at once. He moved, as an amendment—"That the question of oil lighting for the public streets be not entertained."

Mr. BURTENSHAW seconded the amendment.

Mr. SEEX proposed as a further amendment—"That the Council offer the Gas Companies £3 3s. per lamp for three years; the conditions of lighting to be the same as under the present contracts."

Mr. BROOKS: Make it £3, and I will second it.

Mr. Fuller's amendment was then put and negatived; only the proposer and seconder voting for it. Mr. Seex's amendment was also put and lost. Subsequently, Mr. Brown's amendment was carried by 6 votes to 3.

It having been suggested that the Council might refuse to adopt the report.

Alderman BUDGEN said if anyone would move a resolution doing this, and negating the last part of Mr. Brown's motion, he would second it. It was a most unfair thing to introduce the matter of oil lighting into the motion; and a considerable want of consideration had been shown to those members of the Council who were disqualified from voting.

Eventually, the motion for the adoption of the report was put and carried.

THE WATER SUPPLY OF CROYDON.

NEW WORKS AT ADDINGTON.

In the last number of the JOURNAL, we intimated that the new works which have been constructed by the Croydon Town Council for the purpose of augmenting the supply, and also for furnishing a supply (when opportunity affords) to the higher portions of the borough which are at present served by the Lambeth Water Company, would be inaugurated on Thursday last. This was done with much *éclat*. It may be of interest, before noticing Thursday's proceedings, to give a few particulars regarding the various steps which led up to the erection of these additional works. The idea originated with the late Local Board of Health, whose powers were transferred to the Town Council by the incorporation of Croydon as a municipal borough in 1883. Croydon stands prominent among the provincial towns which first availed themselves of the sanitary powers of local government created by the Local Boards of Health Acts; and one of its primary undertakings was the remodelling of the water supply. The present engine-house, and other necessary buildings were erected, and the reservoir and water-tower constructed; but the area of supply had to be restricted—the whole of Upper Norwood and the greater part of South Norwood having to be supplied by the Lambeth Water-Works Company, at the rates charged in the other districts served by that Company. Discontent followed; and this has never passed away. From that time the local authorities have given earnest attention to the question of developing the supply; and the outcome is the great enlargement which was dedicated to the public on Thursday. Of course, a mutual agreement of transfer will have to be made between the Corporation and the Lambeth Company before the residents in the high districts (who at present pay double the rate charged in Croydon for their water) will derive any tangible benefit from the new works. Soon after the *régime* of the Corporation commenced, a Water Sub-Committee was appointed to consider the subject of the water supply. They advised that additional provision should be made; and, upon the recommendation of the experts engaged, they were requested to investigate the probabilities of procuring a permanent accession to the existing supply on the Addington Hills. Negotiations were commenced for acquiring about 4 acres of land from the Ecclesiastical Commissioners; and these were confirmed by the Town Council in February, 1884. It was found that not only was there water, but that there would be no difficulty in forming a reservoir capable of containing 5 million gallons at an elevation 91 feet higher than Upper Norwood. Professor Boyd Dawkins's reports on the scheme were very satisfactory; showing that there was here an available supply of more than a million gallons a day, without any fear of diminution. The works have been proceeding with much vigour and success since 1886; and there can be no doubt that the future will show the wisdom of this undertaking.

The following particulars of the new works, which were distributed to the visitors on Thursday, will be of interest:—The well is situated three-quarters of a mile south of Addington village, near Hares Bank. The level of the surface of it is 311 feet above sea-level. It is sunk to a depth of 200 feet, and is 10 feet in diameter, all in chalk. The lowest bed of flints or bottom of the upper chalk was passed at 152 feet from the surface. Water was first found at 87 feet from the surface; the largest yield during the sinking being about 180,000 gallons a day. Headings have been driven in several directions from the well, chiefly at a depth of 142 feet from the surface; but those on the east side have yielded the most water by crossing several important water-bearing fissures. The first of those cut through increased the pumping 600,000 gallons a day. In continuing the headings on this side, several more important fissures were cut through, yielding large supplies of water; and when the yield of the well was 2,491,000 gallons in the 24 hours, the work in the well had to cease through the inability of the pumps to keep the water down. This was in February, 1887. The total length of the headings is 813 yards, which are generally 6 feet high and 4½ feet wide. The storage capacity of these and the lower part of the well is about 502,090 gallons. The pumping machinery has been erected by Messrs. Easton and Anderson, and comprises a compound beam-engine of the Woolf type, three steel boilers, and double-acting well and lift pumps of the bucket-and-plunger pattern. The engine has a high-pressure cylinder, 20 inches diameter, and 4 feet stroke; low-pressure cylinder 34 inches diameter and 6 feet stroke. The well pump is worked from the end of the beam; and the reservoir or lift pump by a continuation of the low-pressure piston-rod under its cylinder. Both pumps are 19 inches diameter and 6 feet stroke, and deliver 72 gallons each stroke. The engine will make 18 strokes per minute; and will therefore deliver 77,760 gallons per hour. The boilers are 26 feet long and 5 feet in diameter. The working pressure of the steam is 100 lbs. per square inch. The pumps are so arranged that a duplicate set can be put in the well. Suitable buildings, consisting of engine and boiler houses, have been erected large enough to contain duplicate engine and boilers; and also two cottages for the engine driver and stoker. The reservoir is built upon the Addington Hills, which are composed of the pebbles of the Woolwich and Reading Beds. It is built entirely of concrete, without puddle backing; but it is rendered inside with neat Portland cement. The contour of the ground caused the reservoir to be narrow, the size being 420 feet by 124 feet by 16½ feet deep; and the capacity 5 million gallons. The seven covering arches, run lengthways, have a span of 16 feet with a rise of 4 feet, and rest upon walls consisting of piers and arches 2 feet thick. The outside walls are 6 feet thick at the base, and batter to 4½ feet thick at the top. The floor is 1½ feet thick. The covering arches are 1½ feet thick at the crown, and 3 feet at the springing. There is 1½ feet of earth covering over the crown of the arches. The overflow-level is the same level as the springing of the covering arches, and is 465 feet above sea level. The reservoir has a division wall 12 feet high, with arrangements for using one-half when the other one is emptied for cleaning or repairs. The overflow level is 100 feet above that of the high-level tank on Park Hill, and 86 feet above the highest road in the borough—viz., Church Road, Upper Norwood. Instruments will be used which will transmit automatically and register upon a diagram paper, and also upon a dial plate in the engine-house, the varying levels of the water in the new and old reservoirs. This is for the purpose of regulating the pumping according to the demands of the day, and will, it is said, be of great service in the management of the water-works. In regard to the mains, the pumping-main from the well to the reservoir is 21 inches in diameter and the delivery-main from the reservoir is an 18-inch

* In connection with this statement, it will be well to call our readers' attention to the letter of Mr. R. P. Keys which appears elsewhere to-day.—Ed. J. G. L.

one to Coombe Lane, down which there is a 12-inch main to the old reservoir, and along Oaks Road a 15-inch one to Upper Addiscombe Road; a 12-inch one forward to High Street, South Norwood; and a 9-inch one to All Saints' Church, Upper Norwood, with smaller mains forward to Norwood new town, in Central Hill, and other branch mains, the smallest of which are 3-inch ones. The total length laid is about 13½ miles, and 2454 tons in weight. The greatest pressure is 345 feet in Portland Road. The district for domestic supply is the area of the borough within a 2-mile radius from the Town Hall, with about 75,000 people; but the Council have power to supply the whole of the borough with water for road watering and flushing sewers. The consumption last year averaged 2,255,327 gallons per day. The supply is constant. All the works were carried out by Messrs. Kirk, Knight, and Co., of Sleaford, from the plans and under the superintendence of Mr. Thomas Walker, C.E., Borough Engineer.

The inauguration proceedings commenced on Thursday shortly after noon, when the Archbishop of Canterbury was met at the well by the Mayor (Mr. J. W. Hobbs, J.P.), the members of the Water Committee, the Town Clerk (Mr. C. M. Elborough), and the Borough Engineer. His Grace at once set in motion the engine which pumps the water from the well into the reservoir; and an enthusiastic cheer was promptly given by the visitors. The company then proceeded to the reservoir, where a large marquee had been erected. Here, by invitation of the Mayor, some 250 guests sat down to luncheon. A number of toasts were proposed and duly honoured. The Primate afterwards offered up a special supplication, alluding to the work which had been so successfully accomplished. Prayers over, His Grace opened the valves of the reservoir; and almost instantly a fountain, some 500 yards off, leaped into the air. A trumpeter signalled with a flourish the event, and the band of the First Volunteer Battalion, "The Queen's" Royal West Surrey Regiment, struck up the "National Anthem;" and shortly afterwards the large concourse of people which had assembled dispersed.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Aug. 3.

Sulphate of Ammonia.—The market partakes somewhat of a holiday appearance; and there is very little inclination all round to do business. The quantity offering remains small; and, with a probability of an increasing demand during August, there is no occasion for manufacturers to lose heart—the weaker tendency of the Leith and London markets notwithstanding. Speculators, encouraged by the continued slackness of the market, are freely offering for near and future delivery at lower prices, though the undiminished firmness of the nitrate market seems hardly to invite ventures of this kind. The position differs strangely from that of the same time last year, when sulphate was about £1 per ton dearer, and nitrate was lower; and what is more peculiar still is that no sufficient reason can be furnished for these altered conditions. The increase in the production this year appears to be less than usual; and it can hardly be said that the consumption is declining. Hull quotations are £11 12s. 6d. to £11 13s. 9d.; Leith, £11 8s. 9d. to £11 10s.

LONDON, Aug. 4.

Tar Products.—Benzole and anthracene find ready buyers, and, indeed, most of the products are in fairly good request; but there is very little business transpiring owing to the small quantities being produced. Prices have ruled generally about the same as the previous week: Tar, 15s. to 20s. per ton. Benzol, 90 per cent., 2s. 10d. per gallon; 50 per cent., 2s. 4½d. per gallon. Toluol, 1s. 8d. per gallon. Solvent naphtha, 1s. 2d. per gallon. Crude naphtha, 30 per cent., 1s. per gallon. Light oil, 3½d. per gallon. Creosote, 1½d. per gallon. Pitch, 12s. to 13s. 6d. per ton. Carbolic acid (crude), 3s. 5d. per gallon. Cresylic acid, 10d. per gallon. Tar salts, 15s. per ton. Anthracene, 30 per cent., "A" quality, 1s. 4d. per unit; "B" quality, 1s. 2d.

Ammonia Products.—Considerable shipments have been made during the week; and the effort to depress the advanced prices has as not so far been successful. The market is firm, and stocks are low. The following prices have been obtained during the week:—Sulphate of ammonia, £11 12s. to £11 16s. 3d. per ton, less discount. Gas liquor (5° Twaddle), 8s. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 2d. per lb. Carbonate of ammonia, 3½d. per lb. Muriate of ammonia, brown, £18 per ton; white, £28. Sal ammoniac, £30 per ton.

[From the *Chemical Trade Journal*, Aug. 4.]

Sulphate of Ammonia.—Advices from all parts of the country say that business in this article is not so brisk as it was a week ago, in spite of the reports of those speculators who have bought for a rise, and who seem a little bit disappointed. Prices nevertheless have not given way much, though buyers offer about 2s. 6d. per ton below what sellers are anxious to realize. The market closes with Hull at £11 13s. 9d. and £11 10s. at Leith; while Beckton is quoted at £11 15s., and London (outside makes) at £11 13s. 9d.

Tar Products.—Tar products remain in much the same condition as last week. In benzols, 90 per cent. is quoted at 2s. 10½d., and 50 90's at from 2s. 4d. to 2s. 5d.; while solvent naphtha is in great request at about 1s. 2d. Creosote is very firm, though the fancy prices at one time realized by a few dealers have been cut down by the action of one or two large makers, who are now willing to sell one or two barrels at a distance at wholesale rates. Carbolic acid (crude) is dull for the present; but better prices are looked forward to in the future. Anthracene is firm at 1s. 1½d. for "B" quality, and 1s. 4½d. for "A." Our London correspondent informs us that sales have been made of "A" quality at this price extending over the whole of next year. Pitch remains at 13s. f.o.b.; and in some instances 13s. 6d. has been realized.

MALTON GAS COMPANY.—The report of the Directors of this Company to be presented to the shareholders at their half-yearly meeting to-day shows that, in all branches, the operations of the concern in the six months ending June 30 last have been successful. The amount available for division among the shareholders, after providing for the interest on loan capital and on the reserve fund, is £1183 0s. 10d., out of which the Directors recommend the payment of a dividend at the rate of 10 per cent. per annum, free of income-tax. After payment thereof, there will remain £141 4s. 10d. to go to the next half-year's account, being £109 1s. 7d. in excess of the balance brought from the previous half year. The long-continued cold weather of the past winter and spring induced a more than usual increase in the sale of gas; the quantity sent out from the works being 1,445,000 cubic feet in excess of the corresponding six months, or an increase of over 9 per cent. The Directors have concluded an agreement with the Malton Local Board for the public lighting for a term of three years, upon a basis fair and equitable to both parties. The Manager (Mr. H. Tobey) reports the works and mains to be in thoroughly good condition.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

The Corporations of Edinburgh and Leith are now in possession of the gas-supply undertakings. As stated in another column, the Commissioners became proprietors of both the local gas-works at midnight on the 31st ult.; their ownership beginning on the following day, in terms of the Act recently passed. The stocks and stores then on hand were measured by Mr. R. Mitchell in the Edinburgh Gas-Works, and by Mr. F. T. C. Linton in the Leith Works; and the gas sold since the opening of the financial year being also the property of the Companies, by arrangement, the station meters were read. It is intended that the Commissioners will draw the revenue for the period since the last collection of accounts; and, subject to the usual deduction for leakage, pay over to the Companies an amount proportionate to the quantity of gas passed out of the works within the period, calculated at the current price, which is 3s. 6d. per 1000 cubic feet. It was a condition of the transfer that the cash payments for goodwill should be made on the 1st inst.; and, after arrangement with the bank (the Commissioners not having then drawn any revenue), these liabilities were promptly met. Following this there was a more formal ceremony of handing over the works in both cases—a proceeding which was not statutory, but which was got up, no doubt, out of respect for the well-known propensity of public bodies to indulge in display. The ceremonies at the works were brief; but after them there followed a luncheon which occupied more time. It was quite apparent that there was a much stronger *rapprochement* between the Commissioners and the Edinburgh Company than between them and the Leith Company. Sir Thomas Boyd, on behalf of the Edinburgh Company, was all compliment; and Mr. Colston, on behalf of the Commissioners, echoed every sentiment. On behalf of the Leith Company, Mr. Tawse took advantage of his last opportunity to refer, in tones of evident disappointment, to the animadversions which were cast upon his Company during the negotiations; and, as if it were necessary to point it out, he called the attention of the Commissioners to the efficient condition of the works. Mr. Colston, in his acceptance of the works, spoke stiffly, and proceeded to utter a few sentences which, in the recollection of what actually took place, might have been better left unsaid. They saw from the first, he said, that it would be absolutely requisite to have both undertakings in their hands. I cannot pin the Committee to any official utterance to this effect; but in the course of last winter it was portentously given out by the organ of the Committee—evidently to frighten the Leith Company—that the Corporations were to go on with their Bill, and to enter into opposition with the Leith Company. Of course, such a thing was out of the question; Mr. Colston himself now says it. What is important in the statement of Thursday, is that the Committee are admitted to have acted with more knowledge than judgment; having been quite aware during the winter that they were occupying an untenable position.

The Commissioners have got through a great deal of work—much of it of a routine nature. They have been fortunate in securing contracts for coal at an average rate of 11s. 0½d. per ton, as compared with 14s. 7d. which was paid by the Companies last year. With this saving there ought to be a very large surplus at the end of the first twelvemonth of the Commissioners' ownership. In the meantime, they have resolved to keep the price of gas at 3s. 6d. per 1000 cubic feet, and to maintain a quality of 28 candles. But for the negotiations, I have reason to believe the price of gas would have been reduced before now. As it is, the Commissioners may be expected to be popular at the end of the year, when they announce the concessions they will be able to make. It will be some time before the work of transfer will be so far advanced as to allow of the dissolution of the two Gas Companies. There is, of course, no need to hurry this matter, except in the interests of the shareholders, some of whom may be anxious to have their share in the distribution of what is realized. Until the Companies are dissolved, their interests will require to be attended to; and I understand that it has been arranged that they will not be under the necessity of incurring charges for maintaining a staff of officials to look after their work—the Commissioners having agreed that this shall be done by the present staff.

There was a discussion in the Edinburgh Town Council last Tuesday—probably the last on the subject of the gas transfer. The subject was a small one, relating merely to the mode of electing the Commissioners—a question with which the Council had nothing to do after the election was over. The time for regulating the election was when it took place; and having once been accomplished, it could not be set aside except by judicial intercession upon proof of irregularity. The Lord Provost was slow in arriving at the above conclusion, and allowed a discussion which, had he been better advised, need not have occurred. The irregularity was started by Bailie McDonald, who only received two votes in the election. It is just probable that his complaint was more founded upon that score than upon the exclusion of the Convener of the Lighting Committee from the Gas Commission, which he put forward as the ostensible reason for his raising the question.

The Aberdeen Gas Committee have obtained a very exhaustive report from Dr. Wallace, upon the quality and capacity of the coals they have been employing in the Corporation Gas-Works; but whether they will be able to do anything with it remains to be seen. I fancy it is rather technical for most of the Commissioners. What they will be able better to explain to their constituents will be the report by the Gas Treasurer, giving the result of the investigation into the amounts realized for gas in certain thoroughfares since 1886. Taking everything into account, the explanation of the recent agitation over increased charges seems to be that the distributing plant is not in the best order, taken, probably, in connection with this—that the consumption is not conducted on the soundest principles. There may also be some necessity for altering the pressure at the works; though there is no suggestion of such being required in the report which has been submitted.

There is a probability that the domestic water-rate in Edinburgh will this year be reduced by 1d. in the £1, out of the surplus of £7000 which the Trustees have in hand from the past year. Some of the Trustees are understood to be opposed to the proposal, at a time when they are looking out for an additional supply; but it is believed by others that there are considerations which render a reduction advisable, as the wisest course to follow in the circumstances.

Reports have been received by the Perth Water Commission regarding the analysis of the water which it is proposed to utilize as an auxiliary supply. Samples were taken on the 17th of July from a pit which has been sunk in a gravel-bank to the north of Perth Bridge. Dr. Stevenson Macadam, of Edinburgh, says that the water contains a very small amount of saline matter in solution, and is decidedly soft in nature. It is free from noxious organic matters or other deleterious ingredients. In these respects, the water is of excellent quality for domestic supply. The traces of flocculent suspended matter are of vegetable origin, and would be readily removed by mechanical filtration. He had, he said, concluded that the water could be conveyed through iron mains, coated hard with pitch, and

through lead service-pipes, as well as be stored in cisterns lined with lead, without being deleteriously affected. He was therefore of opinion that the water was suitable in all its characters and properties for every human purpose—including drinking, cooking, and washing—and was well adapted for raising steam and for other manufacturing operations. Dr. Wallace, of Glasgow, reports that the filtration does not appear to be perfect; but that the water is quite satisfactory, and can easily be made all that is desired. The Commission last Thursday instructed Mr. Peattie, their Engineer, to prepare a report and plans showing how the proposed additional supply could be obtained from the place where the samples were taken.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

Many of the members of The Gas Institute who, on the occasion of the meeting in this city last summer, joined the excursion to Loch Fyne and Inverary in the famous steamer *Lord of the Isles*, will doubtless have very agreeable recollections of that pleasant outing. They may therefore feel somewhat interested in learning that the Local Committee who organized the excursion, have just presented an illuminated address to Mr. D. Newlands, the Chief Steward of the steamer, who, on that occasion most successfully catered for the physical wants of about 600 persons while the vessel was on her way to and from Inverary, their desire being to recognize in a marked manner their extreme satisfaction with the handsome way in which he discharged his onerous duties. The presentation was made to Mr. Newlands on the ordinary trip of the steamer this day week; there being present a number of gentlemen who had been attending the annual meeting of the North British Association of Gas Managers, and especially including Messrs. David Terrace, James M'Gilchrist, and R. S. Carlow.

The prospective reduction in the price of gas in Glasgow to the extent of 2d. per 1000 cubic feet, as indicated in last week's "Notes," does not seem to affect the value of the shares of the Partick, Hillhead, and Maryhill Gas Company, which is a strong rival of the Glasgow Corporation Gas Commissioners, over a large area throughout the west and north-west suburbs of the city. The ordinary shares of the Company have lately been quoted at as high as 90s.; but they subsequently declined a little, and have been sold at 85s. It is stated that preference stock cannot be obtained, even at £6 10s. per share. The Company seem to have had a good year; but it will be a little time yet before the complete details are available. An immense advantage has been gained by having a branch line from the North British Railway system through the works; and not only will the Company be able to pay up the two years' arrears of dividend to the preference shareholders of 5½ per cent. per annum, making 16½ per cent. for three years, at their next meeting, but they can also pay 2½ per cent. to the ordinary shareholders, or write off this amount for depreciation, as may be deemed most advisable. Within the past two years the works have been much improved, with a view to economy of manufacture. One of Young's patent washer-scrubbers has been put up, capable of dealing with 3 or 4 million cubic feet of gas per day; and quite lately the top framing and columns of a gasholder 100 feet in diameter by 50 feet in height have been completed by the Airdrie Iron Company. On the occasion of the recent excursion of the members of the North British Association of Gas Managers they had the opportunity of seeing the gas-works under Mr. Levi Monk's charge displaying a lot of bunting to celebrate the two events. I understand that the debenture stock of the Company has been reduced by about £10,000 during the past two years; and as the works have now been improved in value to the extent of about £12,000, the shareholders ought to be satisfied. If they do not get dividends, they have the gratification, at all events, of knowing that their stock has been improved in its market value from 37s. 6d. to 85s. per share; and as the arrears of preference dividend and balance of the old debt will now be paid off, while the works are in better order, Mr. Monk considers that he begins the new financial year about £4000 better than the past year was commenced.

There is still a hitch in connection with the payment for the gas burnt at many of the stalls in the International Exhibition. Some time ago there was a conference between certain members of the Corporation Gas Committee and representatives of the Lighting Committee of the Exhibition with reference to the accounts that were then said to be due for gas consumed at the exhibition; and an understanding was come to that all gas that had been used for motive power and for lighting should be charged to the Exhibition Committee, and that accounts for gas employed for all other purposes should be charged to the exhibitors themselves. Still, as I have said, a hitch continues, as a number of the exhibitors consider that they have a grievance. They allege that in the original exhibition prospectus it was stated that steam, gas, and water would be supplied free to the exhibitors; and they complain at the Gas Trust officials serving them with notifications that their supply of gas will be cut off if that which has already been consumed be not paid for within two days. One of them, who has a stall in the Machinery Court, has closed it; and the reason he gives for doing so is that his supply of gas has been stopped. Of course, what are regarded as being strictly within the class of "gas exhibits" are supplied with free gas by the Exhibition Committee, who will pay for it on the footing that in similar cases they provide water or steam, or both.

On Thursday night the annual general meeting of the Carlisle Gas Company was held—Dr. Selkirk, Chairman of the Company, presiding. The report and balance-sheet for the past year were read and approved, and the dividend was fixed (as usual) at 7½ per cent., or 6s. per share. It was agreed to reduce the price of gas from 4s. 2d. to 3s. 9d. per 1000 cubic feet. The Company supply (without any additional charge to the inhabitants) the gas for the street lamps, and bear the cost of lighting them and all other incidental expenses connected therewith, as well as the gas for the town clock.

At the Hamilton Town Council meeting on Thursday evening, on the recommendation of the Gas Committee, it was agreed to accept of the offer of Messrs. W. G. Walker and Son, of Ayr, for the secondary products. In moving the adoption of the report, the Convener (Baillie Archibald) mentioned that the offer for the tar and liquor exceeded that of last year; and that the revenue from this source in the coming year was expected to be in excess of that of the past year to the extent of £100.

The Glasgow pig iron warrant market has been very active this week; a rather large business having been done. For the time being storing has stopped—indeed, 75 tons have actually been taken out of the public warrant stores. A fairly large legitimate business is passing. On Monday the price of Scotch pig iron went up to 39s. 10d. per ton, cash; but on the execution of a large selling order, the price receded to 39s. 4d., and the close was 39s. 6d. per ton. The market on the following day was rather weak; the closing price being 39s. 4½d. per ton. Some fluctuation took place both on Wednesday and Thursday; and the price declined on Friday to 38s. 11d. cash. During the week the price of Cleveland and hematite iron has in each case declined 6d. per ton.

No very material change has taken place in the condition of the coal trade; but prices are certainly hardening in almost all departments.

A BANKRUPT MINING ENGINEER AND MR. S. HUNTER'S COMMISSION.—At the Nottingham Bankruptcy Court last Friday, the case of Mr. William Smethurst, mining engineer, formerly of Wigan, but recently residing in Nottingham, came before his Honour Judge Bristowe, Q.C. Mr. Hincks, who appeared for the debtor, made a statement as to Smethurst's negotiations with Mr. S. Hunter for the supply of coal to the Salford Corporation. The debtor explained that, as Manager of the Garswood Colliery, he sold coal to Hunter at 8s. a ton; but the coal was invoiced to the Corporation at 9s. 6d., and the difference of 1s. 6d. per ton was received by Hunter. He denied that any part of the 1s. 6d. went to pay off any of his liabilities. The contract which he had made with Hunter was continued by the new Company, which took over the colliery. The debtor was allowed to pass his examination.

THE NEW WATER-WORKS OF THE ST. HELEN'S CORPORATION.—The new water-works which the St. Helen's Corporation have been carrying out for the past few years, under the powers of an Act obtained by them in 1882, entered upon their final stage last Tuesday, when the Mayor (Alderman M'Kechnie) laid the foundation-stone of the new pumping station at Kirkby, in the presence of a large number of the members of the Council and the borough officials. The St. Helen's water district extends over 12,000 acres. The population within this area is estimated at about 68,000; and the daily consumption of water averaged in 1877 2½ million gallons. When this is compared with the quantity of water that it is estimated will be yielded when the scheme is completed—6 million gallons per day of 24 hours—it will be at once evident that the supply will be one of the best and most satisfactory that any borough could possess.

THE NORTHERN COAL TRADE.—The demand for coal shows a slight increase, though deliveries of gas coal have been lessened by the delay which the storms in the South brought about. Steam coal is in favour request at from 7s. 6d. to 7s. 9d. per ton; and there is every probability of a continuance of a large demand for this and the next month. There are increased applications for gas coal both for local and more distant requirements; and now that August is well entered into, we must expect a growth of the demand regularly. Generally, the gas companies are using more coal year by year; and they are inclining to take more coal in the early autumn, as all the signs of the freight market are in favour of higher rates for sea carriage of coal in a short time. Household coal is dull. There is a good inquiry for manufacturing fuel; and when contracts expire the tendency is to ask higher prices for renewal. The briskness in the iron trade takes up more coal of this class, and may drive up prices in the winter.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For STOCK MARKET INTELLIGENCE, see ante, p. 240.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.					£ s. d.
GAS COMPANIES.								
590,000	10	12 Apr.	10½	Alliance & Dublin 10 p. c.	10	18½-19½	..	5 7 8
100,000	10	"	7½	Do. 7 p. c.	10	19½-21	..	5 7 2
300,000	100	2 July	5	Australian (Sydney) 5½ p. c. Deb.	100	110-112½	+1	4 9 3
100,000	20	30 May	10	Bahia, Limited	20	23-25	..	8 0 0
200,000	5	11 May	7½	Bombay, Limited	5	7-7½	..	5 0 0
40,000	5	"	7	Do. New	4	5-5½	..	5 9 1
380,000	Stock.	15 Feb.	11½	Brentford Consolidated	100	225-230	..	5 2 2
110,000	"	"	8½	Do. New	100	165-170	..	5 2 11
220,000	20	14 Mar.	10	Brighton & Hove, Original	20	43-45	..	4 13 4
320,000	10	12 Apr.	11	British	20	45-47	..	4 15 9
50,000	10	14 Mar.	11	Bromley, Ordinary 10 p. c.	10	20-22½	..	5 0 0
328,750	10	30 May	8	Do. 7 p. c.	10	13½-14½	..	5 10 4
200,000	100	2 July	6	Buenos Ayres (New) Limited	100	18½-19½	..	5 10 4
150,000	20	29 Feb.	8	Do. 6 p. c. Deb.	100	106-109	..	5 10 1
550,000	Stock.	12 Apr.	13½	Cagliari, Limited	20	25-27	..	5 3 8
130,000	"	"	10½	Commercial, Old Stock	100	266-271	-2	4 19 8
121,284	"	28 June	4½	Do. New do.	100	205-210	..	5 0 0
557,320	20	14 June	12	Do. 4½ p. c. Deb. do.	100	120-125	..	8 12 0
242,680	20	"	12	Continental Union, Limited	20	44½-45½	..	5 5 6
200,000	20	"	9	Do. New 69 & 72	14	29½-30½	..	5 10 0
75,000	Stock.	28 Mar.	10	Do. 7 p. c. Pref.	20	35-37	..	4 17 3
284,060	10	27 July	13	Crystal Palace District	100	205-215	..	4 13 0
120,000	10	"	13	European, Limited	10	25-26½	+½	5 0 0
354,060	10	"	13	Do. New.	7½	17½-19½	..	5 5 3
5,468,350	Stock.	15 Feb.	13½	Do. do.	5	12-13½	..	5 0 0
100,000	"	"	4	Gaslight & Coke, A, Ordinary	100	252-257	-3½	5 1 2
65,000	"	"	10	Do. B, 4 p. c. max.	100	100-105	+2	3 16 3
30,000	"	"	10	Do. C, D, & E, 10 p. c. Pf.	100	265-268	..	3 14 7
60,000	"	"	7½	Do. F, 5 p. c. Pf.	100	127-132	..	3 15 9
1,300,000	"	"	7	Do. G, 7½ p. c. do.	100	185-190	..	3 18 11
463,000	"	"	10	Do. H, 7 p. c. max.	100	170-175	..	4 0 0
1,061,150	"	14 June	4	Do. J, 10 p. c. Pf.	100	261-266	..	3 15 2
294,850	"	"	4½	Do. 4 p. c. Deb. Stk.	100	119-122	..	3 5 7
650,000	"	"	6	Do. 4½ p. c. do.	100	125-130	..	3 9 3
3,600,000	Stock.	11 May.	10	Do. 6 p. c. do.	100	175-178	..	3 7 5
75,000	"	3 Apr.	6	Imperial Continental	100	205-208	..	4 16 1
560,000	100	14 June	5	Malta & Mediterranean, Ltd	5	4½-5½	..	5 14 3
541,920	20	14 June	6	Met. of Melbourne, 5 p. c. Deb.	100	114-116	..	4 6 2
150,000	5	30 May	10	Monte Video, Limited	20	20-21	..	5 14 3
60,000	5	28 Mar.	7	Oriental, Limited	5	9½-9½	..	5 2 7
				Ottoman, Limited	5	6-7	..	5 0 0
				People's Gas of Chicago—				
420,000	100	2 May	6	1st Mtg. Bds.	100	104-109	..	5 10 1
500,000	100	1 June	6	2nd Do.	100	95-100	..	6 0 0
100,000	10	26 Apr.	10	San Paulo, Limited	10	16-17	..	5 17 8
500,000	Stock.	29 Feb.	15½	South Metropolitan, A Stock	100	315-320	-4	4 16 10
1,350,000	"	"	12	Do. B do.	100	244-249	-1	4 16 4
141,500	"	"	13	Do. C do.	100	250-260	-5	5 0 0
550,000	"	28 June	5	Do. 5 p. c. Deb. Stk.	100	135-140	..	3 11 5
60,000	5	29 Feb.	11	Tottenham & Edm'ton, Orig.	5	11-13	..	4 4 0
WATER COMPANIES.								
717,467	Stock.	28 June	9	Chelsea, Ordinary	100	251-256	+1	3 10 3
1,720,560	Stock.	12 Apr.	7	East London, Ordinary	100	195-200	+1	3 10 0
700,000	50	14 June	9	Grand Junction	50	123-128	+1	3 10 4
708,000	Stock.	29 Feb.	10½	Kent	100	270-275	+1	3 16 3
1,043,800	100	28 June	9	Lambeth, 10 p. c. max.	100	257-262	+4	3 8 8
406,200	100	"	7½	Do. 7½ p. c. max.	100	200-205	..	3 13 2
200,000	Stock.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	117-120	..	3 6 8
500,000	100	27 July	12½	New River, New Shares	100	343-348	..	3 9 8
1,000,000	Stock.	"	4	Do. 4 p. c. Deb. Stk.	100	123-127	+13	3 8 0
902,300	Stock.	14 June	6	S'thwick & V'xhall, 10 p. c. max.	100	161-166	..	3 12 3
126,500	100	"	6	Do. 7½ p. c. do.	100	151-156	..	3 16 11
1,550,066	Stock.	14 June	10	West Middlesex	100	264-269	..	3 14 4

* Ex div

† Next dividend will be at this rate.

THE EXTENSION OF THE WILTON GAS-WORKS.—The Town Council of Wilton have accepted the tender of Messrs. Edward Cockey and Sons Limited, of Frome, for the alterations and extensions at their gas-works, on which, it may be remembered, they have been advised by Mr. N. H. Humphrys, Assoc. M. Inst. C.E., of Salisbury.

THE PUBLIC LIGHTING OF UXBRIDGE.—At the meeting of the Uxbridge Local Board last Tuesday, some discussion took place on the subject of adopting oil for the public lamps. Reference was made to the proceedings of the Erith Local Board in regard to the lighting of their district; and it was decided to make a trial of an oil-lamp to be supplied by the firm who have taken up the Erith lighting.

SALES OF SHARES.—On Friday, the 27th ult., Mr. W. F. Fox submitted to a numerous company, at Ossett, several lots of gas stock, which all commanded high prices. Sixty £5 "A" shares in the *Ossett Gas Company*, offered in lots of 20, were knocked down at £13 7s. 6d. each; and fifty £5 "B" shares in the same Company, in one lot, at £10 12s. 6d. per share.—Fifty-five fully-paid £20 shares in the *Gravesend and Milton Gas Company* have just changed hands at £44 per share. For some years past those shares have realized a dividend of 10 per cent. per annum.—Last Thursday, Messrs. Blake, Haddock, and Carpenter sold at Croydon 171 fully-paid up shares in the *Croydon Commercial Gas Company*, in 25 lots. The first three lots each consisted of five £5 shares of first capital, on which dividends have been paid at the rate of 13 per cent.; and these were sold at £13 17s. 6d., £13 15s., and £13 12s. 6d. per share respectively. Lots 4 to 7 each comprised five shares of £5 each second capital, bearing the same dividend as the former, and were sold at £13 10s. per share. Lots 8 to 13 were each comprised of five shares, "A" 1871 capital, £5 each, earning the same dividend, and were sold at £13 10s. per share. Lots 14 to 21, each consisting of 10 shares, third capital, £5 each, on which dividends have been paid at 10 per cent., were all sold at £10 10s. per share. Lot 22, comprised five shares, "B" 1876 capital, £5 each, and lot 23, eight shares, all bearing 10 per cent. dividend; and these were sold at £10 10s. Lots 24 and 25, each consisting of six shares of £10 each, fourth capital, realized £20 10s.

SKIPTON WATER SUPPLY.—At a meeting of the Skipton Local Board held last Friday, a letter was read from Mr. Hill, the Board's Engineer, stating that he would propose a scheme for bringing the water in pipes from Cawder Gill into the present reservoir, in accordance with the resolution of the Board; but the proposal must not be assumed as having his approval, or as being based upon any of his recommendations. The Board decided to wait until Mr. Hill had sent in the scheme required before discussing the matter.

REDUCTIONS IN PRICE.—The *Northfleet and Greenhithe Gas Company* have reduced the price of gas in their district from 4s. to 3s. 9d. per 1000 cubic feet.—The Directors of the *Kingston Gas Company* have resolved to reduce the price of gas to 3s. per 1000 cubic feet, to take effect on the Michaelmas accounts.—The *Leyland and Farington Gas Company* have reduced the price of gas from 4s. 6d. to 4s. per 1000 cubic feet, less 2d. per 1000 feet for prompt payment. They have also reduced the meter-rent from 2s. 10d. to 2s. 4d. per annum.

THE MANAGEMENT OF THE WARRINGTON GAS-WORKS.—The minutes which the Gas Committee will present at the meeting of the Warrington Town Council this week include the following resolution:—"The Gas Committee, having received the amendment passed by the Town Council relative to the report presented by them, and considering that it is a direct vote of want of confidence in them, the following members of the Committee hereby tender their resignations:—Aldermen Holmes, Webster, Pickmere, and Chandley; Councillors Barker, Greening, Roberts, and Wright." Two members—Aldermen Harrison and Davies—do not resign. Mr. J. Paterson, F.G.S., retired from the management of the works on the 6th ult., and was succeeded on that date by Mr. Spence Haddock. The following letter from the late Engineer, dated the 6th of July, and addressed to the members of the Gas Committee, appears on the minutes:—"Gentlemen,—I feel that I cannot leave without conveying to you my very cordial thanks for many past favours, and my best wishes for your future prosperity. I regret I cannot accede to the conditions imposed by the Town Council, and venture to hope my refusal will not inconvenience you.—Faithfully yours, James Paterson."

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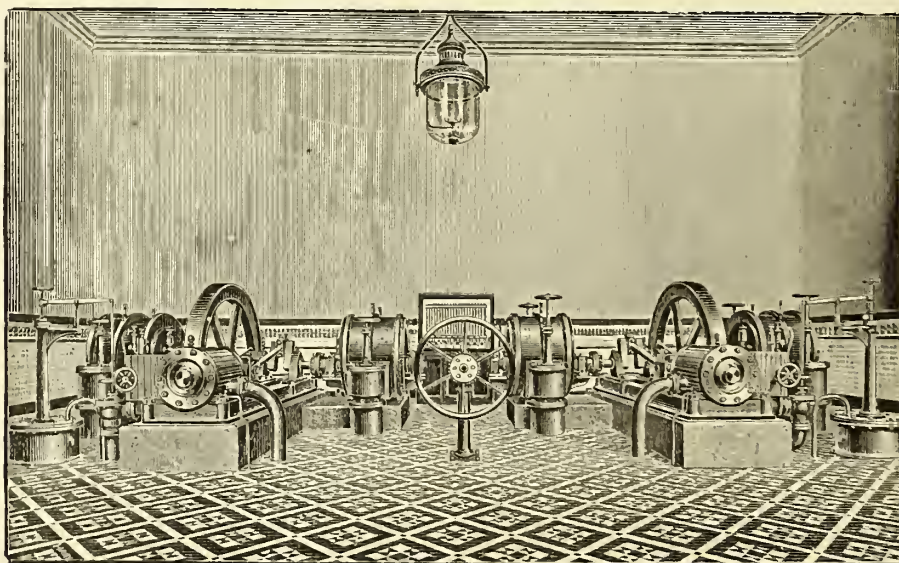
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* * See Advertisement on Page III. of the Wrapper of last week's issue.

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TO ADVERTISERS.

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Telegraphic Address: "GASKING LONDON."

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, AUGUST 14, 1888.

THE IDEAL OF GAS SUPPLY.

THE members of the North British Association of Gas Managers were edified and amused at their last meeting by an interesting paper contributed by Mr. J. M'Gilchrist, which will be found in another column. The paper is not at all technical; and the author's enemies, if he has any, might say that it is not very profound, and contains nothing new. On the other hand, it expresses a number of homely truths concerning the business of gas supply, which, although they may be as familiar as the Ten Commandments, will, like them, need to be repeated a good many times yet before they are generally carried into practice. Mr. M'Gilchrist began his observations with an acknowledgment of the fact that gas has competitors in electric lights at one end of the scale, and cheap mineral oils at the other;

and the motive of his discourse was to describe the means whereby the sellers of gas may most effectually maintain their position in face of their rivals. It is here that the reproach of want of novelty first applies to the paper. The subject of the rivalry of electric lighting and oil with gas is a very much hackneyed one. It lends itself to the not very incisive style of oratory commonly affected by Chairmen of Gas Companies when addressing shareholders assembled in general meeting; and hence the mere announcement that this is the matter of Mr. M'Gilchrist's composition will be almost sufficient to cause many of our readers to turn away from it. For all that, and notwithstanding the lack of novelty not only in the subject, but also in the author's treatment of it, we make bold to say that Mr. M'Gilchrist's paper is worth reading—why and how, it shall be our business to point out in the course of this article. It was undoubtedly wise in the author to refrain from attempting to make his paper a kind of prose epic of coal gas, extolling its peculiar advantages, and decrying its rivals. He could not help doing a little in this line; and his remarks upon this head are sensible enough on the whole. There is, however, a smack of Scotch "wut" about some of these observations, which it is rather difficult for all readers to properly relish. What, for example, is meant by the assertion that some people cannot properly enjoy themselves "in company" until the gas is lighted? The author "in all seriousness," as he says, appears to imply the existence in gas—especially, it may be presumed, Scotch gas—of a peculiar exhilarating quality, which makes it, in this respect, something like Scotch whiskey. Now, we never should have suspected that any Scotsman, especially among Mr. M'Gilchrist's acquaintances, would betray this sensitiveness regarding the means whereby their evening amusements might be illuminated. Given the right ingredients and accompaniments, we should have thought that all means of lighting, from Luna's lamp to the humble tallow dip, were indifferent to the countrymen of Burns. Surely, when "Wullie brew'd a peck o' maut," no consideration of this kind was permitted to interfere with the joviality that ensued; and it would be a melancholy effect of increasing culture if the conditions of conviviality beyond the Tweed had so gravely altered as Mr. M'Gilchrist would have us believe.

Mr. M'Gilchrist's principal task, however, was to set forth the conditions under which an ideal Gas Company might best cope with the requirements of the age. He began this portion of his work with a little special pleading which must not be allowed to pass unquestioned. He laid down the proposition that the satisfaction of consumers is always assured by the supply of gas of the highest possible illuminating power. Now, this is a transparent fallacy. The author's reputation for consistency was served by his upholding it on the present occasion, seeing that he has maintained the same view at other times; but the argument, as such, will not hold water. We do not intend to take up the gauntlet thus thrown down by Mr. M'Gilchrist, and to fight once more the cause of those who maintain that the extraordinarily high nominal illuminating power claimed to be supplied by gas makers in some Scotch towns is a delusion. Let it suffice to say that the argument is bad in connection with the present question. It is bad because, in the first place, it would limit the possibility of retaining gas in public favour to a very small area of the earth's surface—to wit, that portion of North Britain where the richest varieties of cannel coal can be used commercially by gas makers, to the exclusion of other material, and where the loss of hydrocarbons by condensation in street syphons may be regarded with equanimity by the Gas Companies. Secondly, the argument is bad in fact, because the history of gas agitations shows that people are not to be deterred from complaining of bad gas by any consideration of the nominal illuminating power ascribed to it by the makers. It would not be difficult to cite many examples of bitter complaining on the part of consumers and ratepayers in places where, according to Mr. M'Gilchrist, everybody ought to be perfectly happy on this score. We make these remarks, the truth of which cannot be gainsaid, in order to show that cannel gas is not the *summum bonum*, as Mr. M'Gilchrist would have the world to believe. The doctrine is all very well for the neighbourhood of Dumbarton, but it will not bear exportation; and in all probability its expounder in the present instance would drop it, should circumstances remove him into a different locality.

For the rest Mr. M'Gilchrist advocates, and very sensibly, a general *rapprochement* of the methods of selling gas to those

followed in connection with other commodities not protected by complete or *quasi* monopoly. In this view he will find more to agree with than to find fault with him. His remarks upon canvassing for custom, and similar matters, are to the point; and it is to be hoped that, when next he speaks upon this subject, he may be able to cite more examples than that of Nairn, which he selects for honourable mention. Dumbarton, for instance, cannot be so dissimilar from other towns as to prevent the gas manager from practising in it what he preaches. Meter-rents, unquestionably, are a relic of another and a different age, and should be dropped. We do not clearly understand the application of Mr. M'Gilchrist's theory respecting deposits, in connection with any practicable "co-operative" system, and think he will do well to write another paper elaborating his suggestion. There have been many proposals for placing the business of gas supply upon a co-operative footing; but, apart from the sliding scale, we do not recall any that are really worth talking about. The sliding scale is truly a co-operative system, because it gives the consumers, as a rule, two-thirds of all extra profits, and only then enables the suppliers to take the remaining third if they choose. This is co-operation of a very high order; and if Mr. M'Gilchrist has anything better to suggest, we shall be glad to hear from him.

The question of internal fittings is the key of the problem of rendering gas lighting popular among the poor, and it is one to which Mr. M'Gilchrist and other gas managers who may be desirous of extending the consumption of gas among the people who now burn oil may devote their best attention. It is easy to propound generalities upon this vital subject; but hard to get a firm grip of the matter, and harder to carry good measures into practice. One is tired of listening to protestations of good-will from gas officials with relation to this vexed question, while so little is being done to deal with it even tentatively. When a congress of gas managers who have had experience of retailing gas in small quantities in different parts of the kingdom meets for the comparison of notes and the interchange of counsel, it may be possible to say something fresh upon the subject by way of comment; but until that day, which seems to be far distant, there is nothing to be remarked upon it except to lament that what everybody admits to be desirable in the abstract is realized even in part by so few.

In conclusion, we may be permitted to observe that, again like the Decalogue, Mr. M'Gilchrist's ideal is already fairly realized in different examples. With but little exception, all his programme may be found in force in various localities. There are some towns wherein the highest quality of gas that can be made from cannel coal is to be had; some where the gas is cheap; some where it is as pure as chemical science can make it; others where canvassers are employed; others, again, where fittings are supplied on hire, rentals collected at short intervals, meter-rents not charged, and the other points of Mr. M'Gilchrist's charter in full force. There are, as he admits, towns where the Corporation do not take money out of the pockets of gas consumers to pay rates; but these are not so many as might be desired. As to rating gas undertakings fairly, that is one of the great exceptions which prove the rest of the statement. The problem appears to be to combine all these good points in one example, and afterwards in all. It is like the problem of humanity. There is enough good scattered among men to make an ideal man, if we could get it all together. To this end evolution tends, with slow advance and many backslidings; but until it is reached, the efforts of those who desire it must be regular, persistent, and practical.

THE MEETING OF THE GASLIGHT AND COKE COMPANY.

The half-yearly general meeting of The Gaslight and Coke Company was held last Friday; and the proceedings will be found reported in full, as usual, in another column. They are not of a very interesting character. The Governor (Colonel Makins, M.P.) made the conventional speech—going through all the entries in the accounts one by one, and comparing them with the amounts for the corresponding period of last year. This is always a tedious process, and strikes us as particularly superfluous in the case of the Chartered accounts, since all the entries are comparable at a glance with the previous year's returns printed in the margin. It is customary, however, for Chairmen of Gas Companies to treat meetings of proprietors as though none of the company could be trusted to do a mental subtraction sum; and Colonel Makins is far too good a Conservative to break in upon such time-honoured usage. For all his show of careful

explanation of the accounts, however, Colonel Makins left his hearers wholly in the dark with regard to that important question which everybody who is at all interested in the Company has been asking ever since the Directors' preliminary notification of the rate of dividend and amount of the balance to be carried forward was sent to the newspapers. He said something in the course of his address about the Board not being in the habit of reducing the price of gas by "leaps and bounds." But that is precisely what they have done; and it is the very reason why criticism has grown helpless in face of the Company's accounts. Nobody outside Horseferry Road—and not very many inside that establishment—can feel much confidence in predicting anything respecting the immediate future of the Company, as a matter of accounts. There is, of course, a general idea that the Company is "all right;" but nobody can go beyond this and declare, with any approach to certainty, whether by this time next year the undivided balance will be increased to a million, or be eaten into to make up dividend, or at what price the Board may think fit to sell gas. It is significant that not one proprietor echoed the Governor's expressions of congratulation upon the excellence of the statement submitted by the Board; probably for the reason that nobody pretends to have any understanding in the matter. The proprietors take what the Board are pleased to give them, and none of them care about the accounts. The proceedings were enlivened by the inevitable bit of word-fencing between the Governor and Mr. George Livesey. As Mr. Livesey says, Colonel Makins cannot leave him alone. The Governor peers over the table to see if Mr. Livesey is present among the shareholders; and then he deliberately stirs him up by some *ex parte* statement relating to "our neighbours 'across the river,'" which he knows will bring the Chairman of the South Metropolitan Company on his legs. This time Colonel Makins touched up his brother Chairman upon the subject of the dealings of the Metropolitan Board of Works with the two Companies, and also with reference to the litigation mentioned in the report. As usual, Mr. Livesey proved well able to take care of himself and his Company. We have had on previous occasions to remark the unfortunate propensity sometimes displayed by Colonel Makins for saying ungracious and irritating things. He has managed to avoid this failing for the last meeting or two; his last error in this line being the declaration, when the movement for the abolition of the London Coal Dues was only beginning, that the question was insignificant to the Company. We do not believe that Colonel Makins wishes to stand in a bad light in the public eye; but why *will* he say such things as he did on Friday, when sneering at the project to give the public the benefit of the remission of the dues as being "philanthropy, 'which is not business?'" It is so easy not to pose as a grasping monopolist, that any Chairman of a Gas Company who goes out of his way to incur this reproach displays lamentable want of tact, to say the least. Again, to respond to Mr. Livesey's observations upon the lawsuit between the two Companies by saying in effect that the South Metropolitan Company must own to being in the wrong, apologize, and pay all costs before the Chartered Board will meet them in a friendly spirit, is not the best way of dealing with such a question. Colonel Makins claims that his side have gone to law because they think they are right; but he never seems to realize that the other party may be defending themselves for precisely the same reason, and with quite as much justification. This, however, is a comparatively small matter; for, as between two Gas Companies in litigation, an ungracious remark or two from either side is not likely to offend the public very seriously. It is to be feared that such cynical observations as those which Colonel Makins unfortunately permitted himself to make with regard to the effect of the abolition of the coal dues will rankle in the minds of those with whom the Company which he represents have every interest in keeping on the most amicable terms; and we therefore think that his conduct in this respect on Friday deserves, as the candid statesman confessed, to be characterized as "worse than a crime—it was a blunder."

HOLIDAYS FOR THE BIRMINGHAM GAS STOKERS.

The Birmingham Town Council had a field-day last week, when sundry matters connected with the administration of the Gas Department occupied the attention of the local Parliament for five hours; and an amount of talking was done in the Council Chamber which drew down upon the perpetrators the censure of the overtaxed local press. We have already had occasion to point out that the situation of the Birmingham Gas Department cannot be rightly under-

stood without an acquaintance with local politics, to which an outsider cannot pretend, or, if he did, could not profitably meddle with. Hence we cannot say for certain why the Gas Committee wished to refer to the General Purposes Committee the question of granting holidays to the workmen employed in carbonizing, instead of dealing with it themselves. As a matter of fact, it seems to have been the general idea of the members of the Town Council that the Gas Committee should attend to this among their other business; and so, after a great deal of discussion, the matter was referred back to them, with the consent of the leading members of the Committee. It was stated that the Committee desired that something like a general principle with regard to the holidays of Corporation workmen should be stated by the General Purposes Committee—a principle to which all the departments could conform. There is, of course, much to be said in favour of this view of the subject, for it can be easily understood that harmony among the various departments of the same Corporation must be a desideratum, and also that nothing is more likely to destroy this general agreement than conflicting practices in the treatment of workmen by the different Committees. At the same time, it appears to us, rightly or wrongly, that this idea of the unity of Corporation administration may be pushed to such an extreme that practical injustice may follow. Thus, while there is truth in the proposition that the workmen of the Birmingham Gas Department are paid by the ratepayers, like those of the Water or the Health Department, yet every department is not less truly to be regarded as a concern by itself, to be administered according to its own laws and necessities. It can scarcely be disputed that the custom of giving a week's holiday in the year to stokers and other gas workmen is a good and desirable one; and we cannot see that its quality suffers from the non-existence of any similar custom in other undertakings, even though belonging to the same ownership. Rather, we should say, let the Gas Department show the example, if a precedent is needed; and the others would "follow suit" as rapidly as their circumstances permitted. We make these observations in the interest of the gas workmen and of those of their superiors who desire to take the proper course in this matter, and are more particularly concerned to state the question fairly, upon the highest grounds, because, in the course of the debate in the Council upon the subject, Mr. Bishop, the Chairman of the Gas Committee, seems, according to the newspaper reports, to have fallen back, by way of opposition, upon the plea that to give the stokers their holiday would cost £1000 a year, which he appeared to adduce as a very serious consideration. We should be sorry to think that the Birmingham ratepayers are so grasping as to adopt this idea. We do not desire to attribute to Mr. Bishop any sympathy with the objection which he stated. He may have mentioned it simply in order that the Council and the ratepayers should know what are the circumstances of the case, and to prevent anybody from saying afterwards that he did not understand the conditions. The question having been left to be settled by the Gas Committee, they dealt with it in a perfectly satisfactory manner. The debate concluded with one of the attacks upon the Gas Committee and their chief officials to which the local public are growing accustomed, and which, knowing the quarter whence they proceed, they are probably able to appreciate at their true value.

At the ordinary general meeting of the Wandsworth and Putney Gas Company held last Tuesday, Mr. A. G. Hounsham was unanimously elected Auditor in the place of Mr. Johnstone, deceased, who had filled the office for the long period of 43 years.

The summer meeting of the Institution of Mechanical Engineers was opened in Trinity College, Dublin, last Tuesday week, under the presidency of Mr. E. H. Carbutt. After the preliminary proceedings, the President delivered an address, dealing mainly with the growth of Ireland. At its close, several papers were read, and discussions followed; after which the visitors were entertained at luncheon. In the afternoon there was an excursion down Dublin Bay; and the day concluded with a dinner at the Royal University Buildings. On the following day the reading of papers was resumed; and this occupied the morning. After luncheon various excursions were made; one being to the Valley of Glensmoel, where the supply of water for the city is derived from the Rathmines and Rathgar Water-Works. In the evening a *conversazione* was held by the Local Committee in the Royal Irish Academy. By the courtesy of the Lord Mayor, the Mansion House was also opened to the visitors; and dancing was kept up till a late hour. On the following Thursday the members paid a visit to Belfast, where they spent the rest of the week; an inspection on Friday of the New Island lighthouse, where Mr. Wigham's system of gas lighting is in use, being an interesting feature of the proceedings.

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(FOR STOCK AND SHARE LIST, see p. 306.)

BUSINESS on the Stock Exchange during the past week has naturally been restricted, owing to the interference of the Bank Holiday on Monday. But there was no tendency in prices to droop; the balance of influences being, on the whole, decidedly favourable, aided by fine weather and political calms. The Gas Department has been decidedly quiet; and very little business has been done in any but the two large issues, Gaslight "A" and Imperial Continental. The recovery in the former from its sudden depression, signs of which we noted last week, made further progress; and the quotation shows a rise of $1\frac{1}{2}$. The stock closed firm; the last transaction being at the best price marked in the week—256 $\frac{1}{2}$. The Company's meeting on Friday was quiet and satisfactory, and what then transpired should be reassuring. The accounts of the South Metropolitan Company are out, and are a gratifying financial history of the past half year. The Company's stocks, however, have not moved, nor has a single transaction in them been marked throughout the week. The interest evoked by the fortunes of gas undertakings in the Metropolis will be complete when the Commercial Company's accounts are published. We shall be prepared to find that, owing to the nascent revival of trade in the east of London, and to other causes, the Company will be able to issue a statement of figures thoroughly satisfactory to the proprietors, and to all who take an interest in the well-being of the Metropolitan Gas business, in respect of a fair increase in the consumption of gas as well as in sales of residuals. There is no move in the position of the Company's stocks. Imperial Continental is very steady—pretty well the same prices being marked every day. Some of the other Foreign undertakings have made slight advances; Continental Union old and European new being $\frac{1}{2}$ better, and Cagliari is quoted *ex div.* at the previous price. The Water Department continues very inactive; but the upward move is still in action, and has made larger strides—Southwark $7\frac{1}{2}$ per cents. having risen 6, and New River 4. The Bank rate, after standing at $2\frac{1}{2}$ per cent. for nine weeks, was raised on Thursday to 3 per cent.

The daily market movements were: On Tuesday, Gaslight "A" and Imperial Continental were active; but hardly anything else was noticed. Water was quite stagnant. Gas was quieter but firm on Wednesday; Gaslight "A" advancing $1\frac{1}{2}$. Water was as before. On Thursday, business in Gas was very restricted; but Water was a shade better. Chelsea rose 1; New River, 4; and Southwark $7\frac{1}{2}$ per cents., 6. There was a shade more animation in Gas on Friday; and Continental Union advanced $\frac{1}{2}$. In Water, Kent was 2 higher; and East London, 1. Saturday's business was extremely restricted in all departments. Gas was quiet, but very firm. European new rose $\frac{1}{2}$. Water was quite featureless; and quotations were unchanged.

ELECTRIC LIGHTING MEMORANDA.

THE MAXIM-WESTON COMPANY UNDER NEW MANAGEMENT—AN IDLE COMPLAINT —THE EFFECT OF ARTIFICIAL LIGHTING UPON WATER COLOURS—THE NEW GULCHER COMPANY.

THE changes in connection with the management of the Maxim-Weston Electric Company, which have on several occasions recently furnished matter for comment in this column, have at last culminated in the retirement of Mr. Hugh Watt, M.P., the late Chairman and Managing Director, and the termination by the new Board of the engagement of the Secretary. A new Secretary, a member of a firm of chartered accountants, has been appointed; and the true financial position of the Company will therefore in all probability be discovered and announced on an early date. All this is important matter in respect of the position of electric lighting in this country, for the Maxim-Weston Company have been one of the few surviving rivals of the great Brush Company; and either their removal or rehabilitation in a business way would affect the prospects of this concern. At present it is impossible to say what the condition of the Maxim-Weston Company really is. The two inventors whose names supply the Company's title are deservedly respected as being those of two of the cleverest electricians of the age; and it is generally understood that the Company have at their command as good a system, or systems, of lighting, both with arc and incandescent lamps, as there are at present in the market. Their troubles, however, illustrate the truth that something more than technical excellence is wanted to make electric lighting commercially profitable; and while nobody likes to see good work go without proper remuneration, the history of the Maxim-Weston speculation is full of teaching to those who hold that the day of commercial success has not yet dawned for electric lighting in England. It remains to be seen whether the removal of the old administration will save the Company; but our own idea upon the subject is that the reform of the management will not have all the effect in this direction that some of the more sanguine among the shareholders seem to believe.

Matters must be very stagnant in the electric lighting business; for our contemporary the *Electrical Review* is driven to give the place of honour in its last issue to an elaborate criticism of a specification for wiring an electric light installation in London, the greater part of which is very "small beer" indeed. The various safeguards insisted upon by the electrical engineer who drew up the specification in question are ridiculed in language which is no

always dignified, and the whole tirade runs into nearly five columns of letterpress. One would think that a better punishment of any engineer who should make himself so utterly absurd as the victim of this long complaint appears to have done would be for every respectable firm of contractors to refuse to tender for the work. Our contemporary thinks differently, however, and drives home its reproaches with a reference to the happier circumstances of the gas-fitting trade. One of the obligations complained of in the offending specification is that it shall conform to the requirements of the electrician of the Phoenix and other fire offices, who, as is well known, has drawn up rules for this class of work. We are gravely told, on the authority of "one of the largest gas-fitters in the Metropolis," that gas-fitting is never subjected to fire insurance inspection; and the same authority is "firmly of the opinion that had gas been vigorously confined to the petty restriction that now seems likely to be bound round the electric lighting industry more tightly than ever, it would not at the present moment be holding such a prominent place amongst the essential necessities of the world." This is the veriest trifling. If electric light wires had never set anything on fire, there would not have been any occasion for the fire offices to take cognizance of the way in which they are fitted. As they have done this again and again, and will probably do so a good many times in the future, it is idle to complain of the fire offices for declining to take risks unless their regulations are complied with, or of consulting engineers for insisting on their clients' interest being properly safeguarded in this respect. The reference to the case of gas-fittings is childish. When gas was first introduced, it was popularly thought that the pipes which conveyed it into houses must be hot; and the gas-fitting of the Old Houses of Parliament was originally arranged in accordance with this view. The fathers of the gas-fitting art did not waste their breath in objections to what they knew were stupid regulations, but obeyed them, charged accordingly, and left the truth to be revealed by experience. So the electricians should do; and if they are maligned by over-nervous engineers, time will show who is in the right.

A report by Dr. Russell, F.R.S., and Captain Abney, R.E., F.R.S., on the effect of artificial and natural light upon the tints of the water-colour paintings in the National Collection at South Kensington has been issued as a blue-book, and contains much interesting matter for artists, owners of pictures, and lighting engineers. The South Kensington picture galleries are well lighted at night, by both kinds of electric lamps, and also by gas; and the report of the experts, based upon experiments, is very reassuring with respect to all the systems of artificial lighting in use. Taking the amount of fading of test colours exposed to direct sunshine from May to August as the standard, it is shown that, under the usual conditions of lighting by day in these galleries, at least 100 years would be required to produce a similar effect. With gas or incandescent lamps at least 2000 years of continuous illumination would be necessary for the same result; and with arc lamps it might be produced in 200 years. It should be concluded from this statement, which is made on the highest obtainable authority, that the public art treasures in water colour are perfectly safe as exhibited under the ordinary conditions of illumination.

By dint of great exertions, the sum of £12,000 in preference shares has been raised for enabling the reconstituted Gulcher Electric Light and Power Company to commence business afresh. As £20,000 was needed by the Board, the remaining £8000 is to be obtained by the issue of debenture stock. The first ordinary meeting of the new Company was held last week, when the Articles of Association were altered to meet the circumstances. The Gulcher lamp is a very good one, as arc lamps go; being one of the steadiest and most reliable. As with the Maxim-Weston systems, however, the Company owning this clever invention failed to make both ends meet; and technical excellence, without other indispensable elements of commercial success, was found to be of little avail. If managers and proprietors of electric lighting systems are able to learn by experience, and are not in this respect like the deservedly unfortunate Bourbons, a Company that has been blessed with a second chance of active existence ought to do fairly well by eschewing the bad old ways of its early prime, and going on in the road of unsensational, plodding endeavour. It is a common remark, with reference to mankind, that no man can expect to enjoy two forenoons in the same day. So with trading companies, one failure generally destroys their prospects of utility by sapping the confidence of their supporters, which is their life. The Gulcher Company are more fortunate than the generality of their companions born at the same period, and for the most part interred beyond the possibility of resuscitation. It is to be hoped they will do better in their second life than in their first stage of existence.

DR. NEUDORFER, of Vienna, has found in a substance called "creoline" a valuable antiseptic. It is a sort of tar obtained from bituminous coal by dry distillation. It is closely related to creosote, carbolic acid, resorcin, and hydrochinon. This substance has been found highly advantageous in preventing the spread of erysipelas, the pains of which it also reduces, and effects an early cure. By its use, the subcutaneous injections of carbolic acid are not required. He has also used creoline for the treatment of ordinary flesh wounds, and for the removal of tumours. A gauze is prepared which is dipped in a solution of creoline. The Doctor considers it to be the most trustworthy, convenient, and harmless, as well as the cheapest of the antiseptic preparations.

THE NEW READING GAS-WORKS.

REFERENCE has already been made in the JOURNAL to the opening of the new manufacturing station which Mr. Edward Baker, Assoc. M. Inst. C.E., has just constructed for the Reading Gas Company. We hope, by Mr. Baker's kindness, to be able soon to give our readers full particulars, with drawings, of these interesting works. Therefore the present notice of their completion—to the extent, at least, of being brought into use in preparation for the coming winter—must be taken as only an introductory description of the general arrangement. The fame of Mr. Baker's work has already travelled far; and many are the visitors he has had on this account, since the day last year when the members of the Southern District Association of Gas Managers went to Reading and saw the new buildings in course of erection. One could tell then what was going to be the general character of the work; and the Engineer received many well-deserved compliments upon it. Now, however, promise has been realized in achievement; and we are not exaggerating the merits of the new station in declaring it to be one of the most interesting gas-works in the United Kingdom, on account of the evidences of thoughtful design with which it abounds in every part, and of the patent thoroughness with which these designs have been carried out. Mr. Baker is a very retiring man among his fellows, and is not often heard of when controversy rages round disputed points of engineering or carbonizing practice. Those of his colleagues who do not know him, however, or know him but slightly in connection with the gas supply of the quiet town on the Thames which is mostly celebrated for biscuits and seeds, will be astonished to learn that the high-water mark of gas engineering may be seen in his works as plainly as in others of much greater pretensions in point of size. After a visit to Reading and one or two other places that might be named, one begins to perceive, if it has not been understood before, that the popular notion that interest and instruction culminate in huge works is a mistake. A great gas-works in particular may be, and often is, only a multiplication of features anything but admirable in themselves. Enormous size, of course, has its own imposing attributes; and the special interest of great works is that in them the insignificant details of small establishments are strikingly magnified—entailing developments which cannot be found elsewhere. In all essentials, however, size is often only a "blind;" and a gas-works which can only be properly traversed on a steam tramway may contain less that is worthy of study than a little place which can be walked through in a few minutes. So it is that there is scarcely a gas-works in the kingdom better worthy of a visit at this time than that of Reading; and we hope to be forgiven by Mr. Baker for saying so, and thus bringing on him more of the plague of deputations and inquiry-circulars than he already suffers from. Truth must be told, however; and having discovered what Reading has to show to interest a gas engineer, we must tell it at all hazards.

The new Reading works make a fine show from any of the railway lines approaching the town from the eastward, as they are contiguous to the South-Eastern Company's line, and are bounded by the River Kennet just before it debouches into the Thames. To find the site from the town is not, however, so easy; for it disappears as soon as one quits the vantage-ground of the railway, and is finally re-discovered at the bottom of a narrow entry round the corner of the great biscuit factory. The entrance to the works is, however, the last object of Mr. Baker's solicitude. He has nearly finished what he has to do for the present in the yard; and then at a blow a block of old buildings will be cleared away, a small linking-piece of roadway made good, and the way to the new station will be worthy of the rest of the extensions. The new works occupy a site almost adjacent to that of the old ones, but separated from it by a branch of the Kennet, over which Mr. Baker has thrown a peculiarly light and neat iron bridge for road traffic, and for carrying the new trunk mains. It is a low-lying quarter of rivers and navigation cuts; and when the Gas Company bought their new site, it lay in winter under 3 feet of water. The gasholder was the first structure put up here; and the story goes that when the Engineer took the Contractor for the tank to show him the scene of his prospective operations, they went over the whole site in a boat. It was known, however, that there was a good bottom of gravel to the half-drowned soil; and persevering dredging in the neighbouring river, and tipping the spoil on the site, have now raised it well above all risk of flooding. Heavy work with the pumps was required in order to get in the tank; and for all the other buildings the work that shows above ground is comparatively nothing to what has gone down out of sight in foundations. With a view to the future, thousands of tons of concrete have been buried by Mr. Baker on this remarkable spot; and although the present extent of the buildings does not show much for the money spent and the trouble taken, yet the foundations have been made good so far in advance of present requirements that the productive power of the station can be doubled for a comparatively trifling additional outlay. Fortunately, there is an unlimited supply of gravel in the locality, or the cost of these foundations would have been almost prohibitory.

Interest at present centres in the carbonizing portion of the works and plant; the rest being incomplete. The new retort-house, however, is in full work, supplying all the gas required for the town. It is in respect of this house and its arrangement and fittings, that the Engineer's care and thoughtfulness are most conspicuous. He had several problems to solve, as must every designer of new works; and while it is far from our desire to claim

for Mr. Baker a perfection of skill and foresight which he would be the last to appropriate for himself, it is at least possible to declare that he has brought to bear upon the problems presented to him a wealth of experience and study, and a power of originality, which command respect. Half-a-dozen engineers equally careful and skilled might have presented to the world as many different solutions of the same problems. We admit that we have not made any independent study of the case with a view to discovering wherein Mr. Baker might with advantage have done differently. All that we are concerned for is to tell as clearly as possible what Mr. Baker has actually done—leaving the credit or discredit a matter for himself and any who choose to criticize him from the standpoint of a better knowledge of the conditions and circumstances than we can pretend to; and we have been led to this from the conviction that, whether always right or wrong in the solution he has preferred, Mr. Baker has done nothing heedlessly. He has not used capital lavishly to compensate for lack of intelligence in design; but while spending money freely in order to carry out his plans in the best possible style, he has in all respects sought first that the plans should be worthy of their setting. He is fully entitled to the credit of doing his very best, like a good workman, according to his lights; and that is praise enough for any man.

The retort-house is a stage-house, to begin with. It is worthy of remark how this type of construction, which not many years ago was regarded as only permissible for the largest retort-houses in densely populated districts, where land is very precious, has of late been adopted in comparatively small works. The reason for this change is partly to be found in the success of Mr. West's stoking machinery, which has brought home to gas engineers the utility of mechanical hoisting, and the desirability of taking advantage of gravity. The wheelbarrow has been dispensed with to a very noteworthy extent since this idea has come into prominence. Mr. West's elevator has been the parent of many devices to the same end. Four settings of eight supply all the gas required in Reading—or did so at the time of our visit. These settings are heated by what we suppose we must call Klönne furnaces, but which are, in point of fact, the fruit of the experience of many men, and are as unlike the original Klönne system introduced into this country five or six years ago as can well be conceived. Whatever they may be, however, they work well and have never given any trouble. The retorts are in good heat, and ordinarily work off about 8500 cubic feet per mouthpiece per day, or perhaps a little more. A higher duty might be obtained, so far as the generators are concerned; but a glance upwards at a row of syphoned water-pipes, intended to cool the ascension-pipes by the well-known expedient, shows why Mr. Baker is not anxious to force his retorts too far. The generators stand on the coke-floor, partly projecting from the line of settings, and are quite cool, so that it is possible to touch the brickwork with the hand. They generate their own steam. There is no clinker worth mentioning, although there is good deal of breeze burnt every day. The secondary air is heated by simple regenerative channels. Altogether the firing arrangements look very satisfactory. The coke as drawn falls directly down to the coke-floor; a travelling shoot being arranged to conduct it into the trunnion waiting for it, in which it is removed to the yard. The buckstaves of the retort settings are exceptionally massive, since their duty is not merely to keep the bench together, but also to support the hydraulic mains (which are independent and separate for every setting) and the pipe connections. It is a principle with Mr. Baker that no weight whatever shall come upon the brickwork of the settings. To such a point is this idea carried, that the arches of the benches are built of specially moulded blocks, and there is a clearance left, so that even if the arches should settle, the settings would not necessarily be affected. The strong buckstaves already mentioned are connected at the top, across the top of the settings, by girders which carry the hydraulic mains and pipes. The tar and liquor are taken off separately; and every section of hydraulic main is washed out with clean water every morning. The foul main is of light steel riveted pipe, which effectually gets rid of all condensable matters before the gas arrives at the condenser proper, which will scarcely be needed before a great deal more gas than is now made is passed through the pipes.

The coal is brought to the retort-house over a viaduct from the South-Eastern Railway main line; and the trucks are run in on metals which stand over the coal-stores, on each side of the house, at a level of a few feet above that of the charging-floor. In the middle of the store is the tip, where a steam-hoist lifts one end of the truck bodily, and shoots its load down upon West's elevator working below. In this way two men—the hoisting-engine driver and his mate—can unload a 10-ton truck of coal in two minutes. In case anything should happen to the hoisting machinery, the trucks can be discharged by hand sideways upon the charging-floor, with very little more trouble. The coal storeage, which runs parallel with the charging-floor, is always kept full; and the fresh supply constantly tipped over the elevator. Fresh coal is therefore always used, except once a year, when the stock is cleared out and replenished. The drawing and charging are effected by West's hand machine; but power will probably be used when the house is in full work. It will be seen from this description that everything has been done to spare hand labour. The coal is never touched by a shovel in the ordinary way, from the time it enters the works until it is loaded up into carts as coke. The arrangements to this end will repay careful study. It is impossible to describe in general terms how it is done; we can only chronicle the fact.

The engine-house is in communication with the retort-house by means of a system of gongs, whereby signals are transmitted. All the steam required for the various engines is supplied by a pair of Galloway steel boilers, situated in a cool, lofty, and airy boiler-house. The engine and exhauster house is of plain and handsome design, and when complete will contain three of Gwynne's combined engines and exhausters of different sizes, for summer, autumn or spring, and winter use respectively. At present the two smaller sizes of machines only are fixed. There is a water tower in the same block of buildings. The purifying shed is situated directly across the yard. The condensing, washing, and scrubbing apparatus is the best of its kind, and conveniently placed. It is Mr. Baker's boast that there is not a T-piece in his works; all changes of direction of the gas being by easy bends. The same principle is carried throughout the distributing plant in the district. The pressures are remarkably uniform and steady. The other buildings completed, and wholly or partly occupied, comprise meter-house, laboratory, photometer-room, workshops, and stores. A handsome block of offices near the gate, not yet finished, completes the list of works in hand. All the buildings are faced with fine red brick, with blue brick string-courses, and are of handsome proportions and the highest style of finish. They are decidedly a credit to the Gas Company and to the town.

Notes.

THE AERATION OF WATER SUPPLIES.

Mr. Stephen E. Babcock recently read a paper before the New England Water-Works Association upon the aeration of drinking water. After quoting authorities and referring to common experience to establish the desirability of aerating drinking water to its utmost capacity, Mr. Babcock described the measures taken by himself to aerate a water supply after it had been carried for 8½ miles through a closed conduit. This conduit terminates at a point about 2500 feet from the distribution reservoir. The whole of this distance is constructed as an open paved channel, interrupted by a series of sixteen low weirs, 10 ft. long and 2 ft. high, placed along the open channel at intervals of 50 ft. and 100 ft., according to the contour of the ground. The channel is half-sunk in the ground; but measures are taken to keep out surface water. After running down this channel the water is conveyed into the distributing reservoir through a pipe, the end of which is turned up and serves as a low fountain, to give the supply a final aeration before it mingles with the waters of the reservoir. The open channel and its shallow dams can be cleaned out by draining off the whole of the water into a by-wash canal. The great point in Mr. Babcock's plan is that the water is kept in a state of constant agitation with air, from the time it strikes the first dam to the end of the aerating canal. It being as yet doubtful to what extent simple aeration may be relied upon as a means of purifying drinking water, Mr. Babcock supplemented his weirs and open channel with a coke filter, and expresses the opinion that coke makes the best filtering material generally available.

THE EFFECT OF ADDING SUGAR TO CEMENT.

Experiments upon the effect of the addition of sugar to cement mortar have been recently conducted by Captain A. von Grünzweig, of Vienna, the results of which have just been published. Mixtures were prepared of 1 cement to 3 sand with 10 per cent. of water, and also of pure cement with as much water as was required to give the mass the necessary plasticity. From 1 to 5 per cent. of dry powdered sugar was well mixed with the dry cement before gauging. The cement used was of inferior quality and only common, not selected, or "normal" sand was employed. The briquettes were otherwise prepared in accordance with the rules for testing Portland cement laid down by the Austrian Society of Engineers and Architects; but were laid aside to harden in a dry place, and not under water. For these reasons the strength procured was far below that prescribed and generally obtained. All the samples were prepared by the same person, under the same conditions, and with the same care. For every series of samples of mortar to which sugar was added, a comparative series without sugar was made. The tensile strength of the briquettes was ascertained by Kraft's cement-testing machine. It should be mentioned that the samples containing sugar (especially those without sand) showed a strong tendency to adhere to the surface of the smooth china plate on which they were placed, and also to swell. The experimenter gives full particulars of the tests, which are summarized in the *Builder*. As a general result, it is stated that with mixtures of cement and sand, hardened in a dry place, the binding effect may be increased by the addition of sugar, the addition reaching its maximum with from 3 to 4 per cent. of added sugar. With pure cement the addition of sugar had no additional binding effect.

DRY ROT IN TIMBER.

A report on dry rot in timber has been presented to the Standing Committee on Science of the Royal Institution of British Architects, by Mr. W. H. Bidlake. In this report it is stated that no wood which is liable to damp, or has at any time absorbed moisture, and is in contact with stagnant air, so that the moisture cannot evaporate, is to be considered safe from the attacks of dry rot. Woodwork painted or tarred before being thoroughly dried and seasoned, is liable to decay through imprisonment of the moisture.

Large beams should always be sawn through and reversed, so as to permit of completely drying. The ends of all timbers used in construction should be left free whenever possible, as it is mostly through the ends that moisture escapes. Stagnation of air under floors is a fruitful source of dry rot in the joists, especially if darkness and warmth are also present. The fungus of dry rot has the power of creeping over brickwork, plaster, and even glass and iron to reach woodwork at a distance. Larch appears to be better able to withstand the effects of damp than fir and pine. Wood bedded in mortar is specially liable to decay, for the water of the mortar is absorbed by the wood, and, in the process of setting, the mortar may decompose some of the organic substances of the woody fibre, especially if the lime has not been thoroughly slaked. Under favourable conditions of temperature and dryness, ill-seasoned wood may stand as well as wood that has been well seasoned; but it is far more liable to decay in a warm damp atmosphere, as it contains more fermentable substance, and affords nourishment for a far more luxuriant growth of fungus. If wood is to be creosoted, however, the sap-wood is better than the heart-wood, as it is more porous and absorbs the oil better. The report from which these observations are taken was made with special reference to 17 cases of rot in timber which were submitted to Mr. Bidlake, as a mycologist, for his opinion as to the causes and possible means of preventing this kind of decay in building timber.

Communicated Article.

MANAGEMENT OF GAS-WORKS EMPLOYEES.

SECOND ARTICLE.

In reviewing the different classes of labour that the gas-works manager is called upon to superintend, it will simplify matters to speak of each department as separate and distinct, notwithstanding the fact that in small works they are somewhat intermixed, two or more classes devolving upon one man. In works not making more than 5 million cubic feet per annum, one man alone will be able to carry on the whole during the summer months. He will do all the retort-house work, attend to the emptying and filling of the purifiers, adjust the supply pressure when necessary, and yet have time to do a little gasfitting and service laying. Passing on to works of double that capacity, we still find one man able to assist in more than one department; but as the works increase in magnitude, so does the division of labour. In very large works one man may be engaged as valvesman to see to the valves entirely, a matter that does not occupy more than a few minutes per day in small works.

In the retort-house there will be two gangs of men, each consisting of any number from one upwards, according to the number of retorts in operation. Some are regular hands, kept on from one year's end to another, whilst others are only had in for a longer or shorter period during the winter season. Every possible assistance should be offered in the way of inducing men belonging to the latter class to find summer employment in the neighbourhood—as bricklayers' labourers, harvest workers, &c.; and any of the winter hands that may happen to be out of work should, of course, have the preference in any odd jobs connected with extensions or repairs carried on during the summer. The object is to keep the odd hands together as much as possible; for several jobs may be found for them, such as painting holders and other apparatus, cleaning out scrubbers, boilers, &c. Very often there are plenty of men in the neighbourhood having summer occupations, who are only too glad to hear of regular indoor work for the winter; and it rarely happens that any difficulty arises in meeting with winter hands, but it is better to have the same ones back year after year, if possible, rather than to have a fresh lot in every autumn. In the case of the regular hands who work, "week in week out," all through the year, a week's holiday to each man in the course of the summer will usually be appreciated, and will not fail to yield good results. Some reference to Sunday labour may be expected here; but this subject can be dismissed in a very few words. It has over and over again been proved that the discontinuance of gas making on Sunday is possible, without any increase in working expenses; but that, if anything, the difference, taken all round, is rather the other way. Therefore there can be no excuse for not discontinuing the retort-house operations for at least twelve hours each Sabbath day—say from 6 a.m. to 6 p.m. Of course, in case of an emergency, an exception can be made.

The condensers, scrubbers, washers, boilers, exhausters, engines, pumps, and other machinery, will call for the services of a competent engine-fitter and assistants, who will attend to the proper working of these appliances and maintain the whole in working order. Workshops, with necessary tools, &c., must be provided; and if the works are above 80 million cubic feet per annum capacity or so, there will be a separate blacksmith's forge, carpenter's shop, paint shop, &c. Then we come to the purifying-house, where a considerable amount of manual labour, also subject to variation according to the season of the year, is carried on. The remarks about "winter hands" apply to this department also, as well as to the general yard work, such as loading coke and breeze, pumping tar, &c. There are also the subsidiary processes, such as the manufacture of sulphate or distillation of tar. If ample storage-room is available these can be discontinued during the busiest season, and thus made to assist in "levelling up" the labour sheet from week to week. A gang of men must also be kept on for the

lighting, extinguishing, and cleaning of the public lamps; also gas-fitters for fixing or removing meters, stoves, services, &c. These various matters represent the operations that are carried on as entirely separate departments in large works, but lumped together to a greater or less extent in small works.

Some of the operations above indicated offer a prospect of being replaced, partially or entirely, by mechanical power. A great deal of ingenuity has been expended upon such matters as drawing and charging retorts by machinery, automatic lamp-lighting devices, &c. The former has been developed in practice to some extent; but the latter must be regarded as still in the inventor's hands. In our present state of engineering knowledge, it may be pointed out that pumping liquids from one vessel to another, or elevating large quantities of coal, oxide, or lime, by manual labour, is a needless extravagance, at any rate where a supply of steam is available. Several simple and cheap little machines for raising liquids are now in the market; and as to the solid materials, either a hoist, or an elevator of the Jacob's ladder kind, actuated by steam or by gas power, can be used. Hydraulic power may also be successfully applied for such purposes.

In addition to the regular hands in the various departments, it occasionally happens that extra help must be called in, on account of emergency arising from one cause or another. The quality of the coal may be below par, necessitating the maintenance of an unusually large number of retorts in work. The purifiers may require changing more frequently than usual, by reason of the material used being defective or getting old, or because there is an uncommonly large quantity of impurity to be removed from the gas. A very large order for broken or screened coke may come in. A prolonged and severe frost will call for continual care in thawing the lutes on the gasholders and purifiers. Fortunately these contingencies usually arise in the winter when there are plenty of labourers to be had. Some regulations based upon local circumstances must be made with regard to the employment of these short-term labourers; they require strict supervision, and their time must be carefully checked.

The rates of wages payable are to some extent already defined by local circumstances. The price current for day labourers in any particular place will depend on the cost of provisions, house rent, &c.; and, as a rule, they are higher in populous than in comparatively thinly-peopled places. In large villages or small towns, a labourer can usually be obtained for 14s. or 15s. per week; and in towns of a population of 20,000 or so the figure of 20s. per week will not be exceeded. But in large towns 25s. or more must be paid. The greater part of the work on a gas-works can be done by ordinary labourers, who soon acquire a knowledge of the duties required; and therefore the wages offered need not greatly exceed the ordinary day rate of the district. In large works it is usual to employ men rather stronger than the average in the retort-house, in which case correspondingly higher wages must be paid.

The almost universal custom in the retort-house is to work 12-hour shifts, though in some few cases 8-hour shifts have been tried; and the men are paid so much per shift, or so much per week. The former plan is general on the large scale and the latter on the small. The purifier and yard men are usually paid at per week of six days; the hours of labour per day being those usual in the locality. In large works a great deal is done on the contract system. A captain or ganger will undertake to empty or fill the purifiers at an agreed price per purifier, or to load coke at so much per truck, finding and superintending his own labourers. The lamp lighters, having irregular hours, are sometimes men having other employment, who take their work at an agreed price. In other cases they agree to devote their whole time to the service of the gas-works, undertaking certain duties in the purifier-house or yard, or perhaps to attend at the works from four to six hours per day, and do whatever may be required, for fixed weekly wages.

Some gas engineers keep rigidly to the current rates of labour in the district and will not pay more. Others hold that it is not wise to beat down the rate of wages paid, and offer something higher, in the hope of inducing a superior class of men to offer themselves; but sometimes the same end is attained by means of bonuses dependent on results, or other additions to the wages. While it is possible, on the one hand, by paying low wages, to have the work done in a slovenly or careless manner that ensures a considerable loss to the company; on the other, it is very easy to dispose of money through the medium of the wages sheet, without getting a proper return for it. The "bonus" system, or "payment by results" has the advantage of encouraging the men to exert themselves to the utmost in order to secure the desired result; but it also carries several disadvantages, inasmuch as it opens a door for deceitful and underhanded practices. For example, suppose a bonus is offered to the retort-house men, on each 100 cubic feet per ton of coal carbonized beyond 10,000 feet. By careful attention to the heats, by getting the charges in promptly and evenly, &c., it is quite possible to secure that increased economy of coal and working which is the object desired in offering the bonus; but an apparent right to the bonus can also be made out by less honourable means, such as using heavier charges of coal than those booked, increasing the draught of the exhauster, or tampering with the water-line of the station meter. The bonus principle is not applicable to every employee on the works; and therefore, whilst it may serve as an incentive to those eligible to receive it, those who are not eligible will certainly not be stimulated, but rather the reverse. It also has the objection of cutting only one way. The men look eagerly for every penny to which they can establish a claim under the agreement; but if

on account of any neglect a result lower than the initial rate is obtained, they expect to receive the full regular rate of wages just the same. The bonus system has not answered well in the writer's experience; but this does not affect the fact that it has given satisfaction in some places, and therefore it may be introduced with advantage under some circumstances.

There can be no doubt that, especially in the retort-house, it is in the power of every man to make himself worth more to his employers than the current wages rate. Take the working of a furnace for example. The immense economy that can be obtained, in the quantity of coal necessary to secure a certain duty in the steam-engine, merely by the exercise of skill on the part of the fireman, is well known; and the same is applicable to every purpose for which fuel is used. If competition trials were instituted with retort-house furnaces, on lines resembling those which have been conducted in the case of steam-engines, some remarkable fuel results would be forthcoming. Inventors of new processes have frequently been misled by this very thing. They have put up, let us say, a new furnace; and this, worked with every possible care and attention in the way of nursing under their own personal supervision, gives much better results than those obtained in the ordinary rough-and-ready way of working. The proper way of arriving at a fair comparison, however, would be to select one of the ordinary furnaces, and repeat the experiments upon it, with all the care that has been bestowed upon the new pattern. If a gas engineer finds that he can rely upon care and skill in the retort-house, he will do well to offer increased pay for the same; but the mere raising of the wages will not necessarily secure that end. The men if left to themselves will do better so long as the novelty lasts, but will sooner or later return to their old ways.

Where men are employed in gangs or sets, it is necessary that all should receive the same rate of wages, and therefore impossible to treat every individual according to his deserts. The best way of working with the utmost economy under such circumstances is to rigidly define the work to be done by each man, and to take care, by means of strict supervision that he does it. The difficulty is increased when the work is done by two separate shifts or gangs, one taking on duty when the other leaves off. Suppose a furnace does not act properly, and there is reason to suspect neglect. In the absence of proper supervision, inquiry of the day man will probably elicit the remark that he does his best, but it is no use for him to try if others will not do the same; while the night man is positive that he leaves the furnace better than he finds it. Each man should be directly responsible to the manager or foreman for the due fulfilment of his duties; and when the responsibility is divided as in the above illustration it is better that each gang should have a foreman or head, who is intrusted with the duty of seeing that the particular work done by his gang is executed in the best possible manner.

Leaving the ordinary labourer, there will also be a need for men of a higher class, having a special technical training, such as engine men, main and service layers, &c.; or else men elected from the labourers by reason of more than average intelligence or diligence, to occupy the post of foreman stoker, foreman in the purifier-house, valve and governor house man, &c. Men of this class, having an increased share of responsibility, or being possessed of a special kind of skill, will require higher wages. When once suitable men in these capacities have been secured, it will be worth while to offer them every possible encouragement.

DEATH OF MR. J. F. BONTEMS.—We regret to record the death last Tuesday, at his residence in Canonbury, of Mr. J. F. Bontems, for many years a member of the Corporation of London, and until quite recently, Chairman of the Barnet District Gas and Water Company. Mr. Bontems had, in consequence of continued ill-health, been compelled to resign the chairmanship of the Company to Mr. J. Glaisher, F.R.S.; he taking the less exacting duties of Deputy-Chairman. This fact is announced in the report which the Directors will present to the shareholders at their half-yearly meeting next Thursday. In this position he might have been spared to the Company for some few years, had not an unfortunate accident caused his sudden removal. On Saturday, the 4th inst., the deceased gentleman attempted to enter a tram-car in the Essex Road; but before he could do so it moved on. In returning to the pavement, he was knocked down by a passing milk-van, and was rendered quite unconscious—death resulting from his injuries. At the Coroner's investigation last Thursday, a verdict of "Accidental death" was returned. Mr. Bontems was in his 75th year.

PRESENTATION TO MR. J. H. WOOD, OF SHIELDS.—On Thursday, the 2nd inst., the officials and workmen of the South Shields Gas Company met at the works to offer Mr. J. H. Wood, Superintendent, their united congratulations on the occasion of his marriage, and accompanied the expression of goodwill with a substantial present in the shape of a beautiful marble clock with bronze ornaments to correspond. Mr. J. H. Penney, the Secretary of the Company, presided. Mr. W. J. Warner, the Engineer, in making the presentation, said it was a confirmation of the opinion which they had all held, that Mr. Wood had not only won their confidence, but the goodwill of all engaged in the undertaking. Apart from his connection with the Company, he had been zealous and energetic as a member of the ambulance corps—teaching their own men while training himself. He ventured to forecast for Mr. Wood a career of usefulness, honour, and distinction. Mr. Wood, in acknowledging the gift, thanked Mr. Warner for his encouraging remarks, and the officials and workmen for their kindness in remembering him at such a period.

Technical Record.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

THE ANNUAL MEETING IN GLASGOW.

We conclude to-day the publication of the papers read at the above meeting. Next week we shall commence the general report of the proceedings, with the discussions on the papers, as passed by the Revision Committee of the Association.

SELLING GAS.

By JAS. M'GILCHRIST, of Dumbarton.

Time was, and many present (neither grey-haired or bald-headed) remember it, when coal gas, practically speaking, had a monopoly of artificial lighting. 'Tis not so now. Oil and electricity, within a dozen short years, have made wonderful advances in public favour. The former has, in some districts taken up a considerable percentage of the business that "King Gas" so long, and if I may be permitted to add, so honourably discharged. Although I admit the fact of the steady, if slow, progress of our rivals, I do not in any way wish to assume the position of alarmist. I merely wish to point out, without prejudice (as our legal friends would say), how we have lost business, through giving too little attention to the question of selling gas. Now, had we given this question a tithe of the attention that we have bestowed on its manufacture, I am convinced that our rivals would not have enjoyed one-half of their present popularity. In the past, gas companies have not considered it part of their duty to push the sale of gas—at least, in any organized or determined manner. They were monopolists, in the strictest sense of the term; and many of them, secured by Act of Parliament, assumed that nothing could interfere with the successful business they conducted, of supplying artificial light. They, therefore, did not show that vigour in pushing business usually engendered by active competition.

No doubt they were, and still are, protected against competition on the part of rival gas companies; but there are now other "Richmonds in the field." The extensive development of oil-wells in America and Russia, and the improved means of transporting oil in bulk, have led to the markets of the world being flooded with a cheap light-giving material. The effect of bringing these cheap oils into the European market has been to reduce the value of the shale oils produced in such large quantities in Scotland. In these oils we have a formidable rival, especially among the poorer classes of the community; and whilst they are gnawing our business at the one end, the electric light is canvassing for customers at the other. The latter appeals to the owners of large business establishments as well as to the wealthier classes. At the top and bottom of the ladder, therefore, influences are at work which, if not met and checked, may seriously affect the business and revenue of gas undertakings.

But there is yet another factor that we must take into account. Within recent years coal gas has been applied with great success to drive engines for manufacturing purposes. The manufacturer is now beginning to use water gas as fuel, finding it cheaper than coal gas; and several firms have erected apparatus to make water gas. In the town of Leeds, where coal gas is sold at a very low price, I see from the newspapers that one firm, formerly paying nearly £3000 a year to the Corporation for gas, has laid down plant to produce water gas; so that another class of consumers is being lost. Again, the gas cooker is challenged by the paraffin stove. Well, if the ordinary housewife is slow to adapt gas for cooking purposes—owing to the smell—she will not, I think, reconcile herself in the near future to paraffin. With all these influences at work, the life of the gas manager, like that of the policeman of the lyric stage, "is not a happy one." Although it may be sad to have to admit that we cannot look upon our rivals—oil and electricity—with a distant stare of contempt, I am not going to admit that our occupation, like Othello's, is gone. It is comforting to know that the great masses of the people prefer coal gas (amid all their growling and grumbling about it) to any other form of artificial lighting. With all its faults, the people love it still; and why not? Has it not proved itself a blessing to mankind? I say it in all seriousness, as indicating a peculiar power of coal gas, that I have known of people in company who could neither speak, sing, nor enjoy themselves until the gas was lighted. With these extraordinary qualities, I say (and I say it advisedly) we are unworthy of the positions we occupy if we cannot at least hold our own against—shall I say?—nasty cheap oil or fitful expensive electricity. I could tell a long tale about the dangers of oil and the uncertainties of electricity; but I prefer at all times to push business on the merits of our own manufacture, rather than dwell on the demerits of its rivals. We all know that coal gas, when properly applied, can "give points" to all other forms of artificial lighting, and is safer and cheaper; hence my reason for not detailing its many virtues.

In the hope of exciting an interesting discussion, I now proceed to describe my ideal gas company, hereafter known, in parliamentary phraseology, as "the company." It will, in many respects, resemble the commercial house of the present day. It will canvass for business. I may say it takes more money to sell than to manufacture a sewing-machine, that sewing-machine companies generally make large profits, and that they do nine-tenths of their business through canvassers. I think, therefore, the company will find that canvassing is worth many times the small amount that it would cost. To make the canvass successful, the company

first of all—and I would like to emphasize this point with all the strength of language I possess—must supply a gas of high illuminating power, and free from all impurities, so that a pleasant, cheerful light may be obtained. The company will find the consumers contented and happy (if that state can be acquired here) supplying a high quality of gas. Even although the charge per thousand cubic feet should be a few pence higher than is charged at present, it does not, of course, follow that the light is more expensive. In towns where the illuminating power of the gas is reduced, I believe our rivals do exceedingly well. The public want light in as concentrated a form as possible; and when a few pence per thousand cubic feet can make the illuminating power all that the consumers desire, I think it is an unwise policy to cheapen the price per thousand cubic feet at the expense of the illuminating power. The public grumble more about the quality of the light than they do about the price per thousand cubic feet. It is light, not gas, the people want; and a company should be pleased to supply the quality of light that the consumers find most beneficial. The company will also look after the internal pipes and fittings of consumers, and have them arranged according to a standard of sizes for the number of lights, &c. The company will find this a great improvement on the usual system of allowing Tom, Dick, and Harry to fix the pipes and fittings according to individual fancy. Indeed, they will find this to be absolutely necessary in the interests of consumers and shareholders alike. The company will not vex its consumers by charging that irritating and obnoxious tax, meter rents. It will, like many companies of the present day, find it much better to charge the meter rent in the selling price of gas. It is an objectionable charge in the eyes of all consumers, and ought to be abolished. This tax hinders the selling of gas. The company will possess a show-room in a convenient thoroughfare, where consumers may inspect appliances for developing the largest amount of light from the quality of gas supplied, see the latest contrivances for cooking, heating, &c., by gas, and receive instruction concerning their use. It will also hire out, on reasonable terms, every form of gas apparatus that consumers may require. This will greatly assist in selling gas. The company will also develop a field, which, as at present worked, does not add materially to the gas revenue—I refer to the sale of gas to the lower or labouring classes. It will supply gas to these classes either through the medium of the automatic meter, which is, I think, a step in the right direction, or by a system of weekly or bi-weekly collections.

With the former, when light is wanted, the lowly candle, or the bottle of paraffin, is purchased from the neighbouring shop, and often burned in a dangerously constructed lamp. The newspapers every other morning tell pitiful tales of lives sacrificed to the "Moloch of paraffin." With this meter such danger and trouble will be avoided. A penny dropped into the box will purchase a certain quantity of gas, and the best system of doing business—namely, "ready cash"—is introduced. When the great advantages of using gas become known to these classes, automatic meters will provide an easy way of selling gas in small quantities, and a means whereby a large amount of new business may be secured. Of the other system—"weekly payments"—I am glad to be able to state that it has been tried, and been found successful. Mr. Keillor, of Nairn, adopted it about a year ago; and he informs me that out of 530 consumers, 113 are paying weekly, at rates from 3d. to 1s., according to the number of lights, &c. The system resembles, and was suggested by, the Prudential Assurance Company's method of doing business—viz., by weekly payments. Mr. Keillor argued that, if weekly payments wrought well with insurance companies, they should be equally successful with gas companies; and I am glad that Mr. Keillor, after a fair trial, can recommend the system. Not only has it procured a considerable percentage of new consumers, but many who paid quarterly avail themselves of the system, which is simply on the lines of the old Scotch saying, "Short accounts mak' lang freens." This system may be compared to the "quality of mercy," because it "blessoth him that gives and him that takes." It is very easily wrought. The collector gets 5 per cent. of the money he collects; and for this remuneration he acts as canvasser, which he does alike in his own and the company's interest. I have ascertained from the manager of one of the largest insurance companies in the kingdom that it takes 16 per cent. to collect its money in small sums; but in his opinion 5 per cent. would pay very well for the collections under this system. In this and other cities I am confident that there are hundreds, if not thousands, of decent working people who cannot afford to pay quarterly accounts for gas, but who could easily manage to pay the amount of the quarter's gas if divided into weeks, and who would willingly avail themselves of this system, and be grateful to those who introduced it. Many families use oil, not because they consider it either cheaper or better than gas, but simply because they have so many uses for their limited incomes, that they cannot lay sufficient past to pay a three months' bill. Mr. Keillor may tell us to-day more of his system, which is calculated to assist materially in selling gas.

Messrs. W. and B. Cowan, of Edinburgh, have produced a gas-meter (a sample of which is on exhibition here to-day) to still further carry out the ready-cash, or rather "pay-before-delivery" system. It is a most ingenious arrangement. By it consumers can purchase from 100 to 5000 cubic feet of gas, just as they could buy as many pounds of cheese in a ready-money grocer's shop. Time will test whether the public will think fit to pay for gas before they get it; but the meter, I have no doubt, will do its duty faithfully and well. The intention is that a gas company

may be able to sell a quantity of gas to a consumer, and when such quantity has been used, the meter will stop and shut off the supply. The long moveable and stationary pointers are set by a key at the quantity sold—say, 2000 cubic feet. The moveable pointer then begins to travel back to zero, at which point it stops. By means of the stationary pointer, any dispute regarding the starting point is prevented; and, further, consumers may see at any time how much gas has been used, and the quantity still to be consumed. The meter moves the ordinary index, into which is geared the wheel of the moveable pointer; and while the latter is being actuated by a key, it un gears with the index train. The result is that the ordinary index always keeps a record, and thus checks the quantities indicated from time to time by the moveable pointer.*

The gas companies of the near future will also protest against the iniquitous system of valuation adopted by assessors when valuing gas-works. They will fight until the coal-gas industry is valued upon the same basis as other industries, and get rid of the greater part of this unjust tax that militates against selling gas. The company will also adopt the co-operative system, that has been so successful throughout the country—viz., that of making all the consumers shareholders (who are not included in the automatic or weekly-payment system), by charging deposits at, say, the following rates:—5s. for a house of one apartment, 7s. 6d. for a house of two apartments, 10s. for a house of three apartments, 15s. for a house of four apartments; larger houses at corresponding rates. The amount for shops and other places of business to cover four months' consumption in winter. From experience, I can assure you that you save much time and trouble in collecting accounts. No bad debts are made. Indeed, it is rather odd, a profit is sometimes made out of bad debts, through consumers running off and leaving deposits amounting to more than their accounts. This enables the manufacturer to sell gas at the lowest price, and when consumers get 5 per cent. on the amount of their deposits, they have "nothing in the world to grumble at." Gas companies who charge deposits as they think necessary, generally create a bad feeling among the consumers. Ratepayers, as regards deposits, should all be put on the same level. The man in good position at least should not object to pay a deposit, because by this system he does not require to pay his portion of the debts of runaway consumers in towns where deposits are not demanded.

In conclusion, the gas corporation of the future will not take gas profits to pay rates that, in justice, ought to be paid by the ratepayers generally. Public opinion is ripening on this vexed question; and the day is not far distant when this iniquitous tax will also be abolished, and gas sold at as near cost-price as possible. Mr. Chairman and gentlemen, I have done. My ideal gas company—or gas corporation if you will—is not to be found in this enterprising country. Can you give me any reason why gas undertakings should not push for business like other commercial firms?

REGENERATIVE FURNACES FOR SMALL GAS-WORKS.

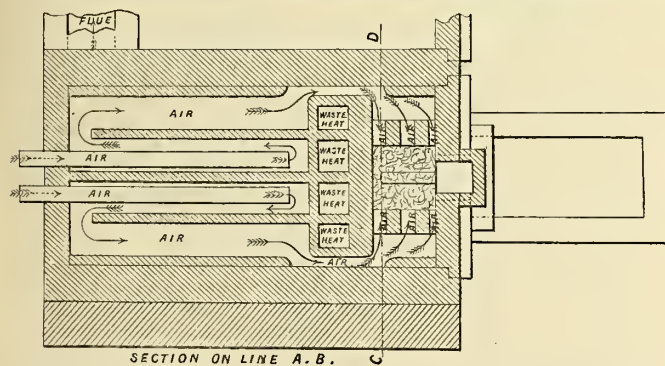
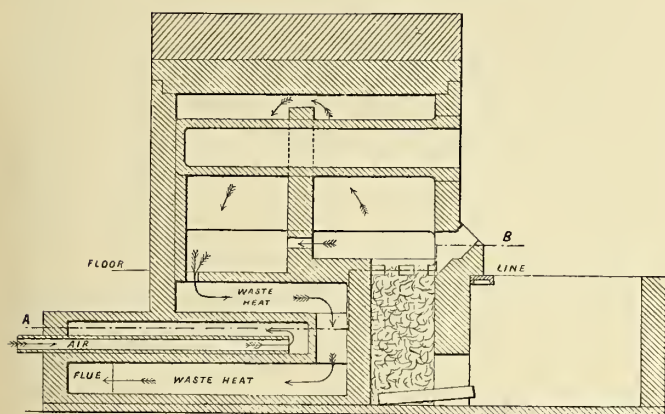
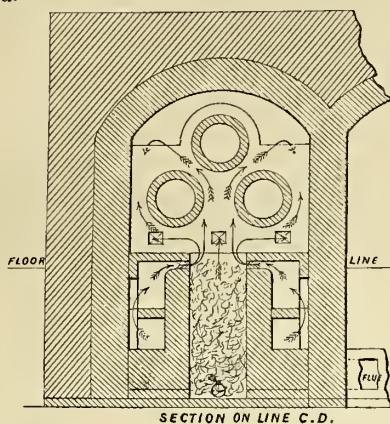
By JOHN SMITH, of Rosewell.

As most of the gentlemen here are now pretty well acquainted with the principles of the regenerative furnace, I do not intend in the following paper to say anything of a general nature with regard to it, but to confine myself principally to what I have done, how I have done it, and the results thereof.

In the month of July last, I constructed a regenerative furnace at the Rosewell Gas-Works, which is still at work, and is giving full satisfaction. The furnace in question is adapted to a setting of three retorts; and as is generally the case, the first operation was to excavate under the oven and in the floor to the depth of 3½ feet, and to underbuild the side walls of the oven. The bottom of this excavation having been laid with 3-inch pavement brick bedded in lime, the foundation of the flues and producer was commenced. The latter is placed inside the oven under the front of the retorts, and is 2 feet square inside, and 3½ feet deep. The flues—four in number, and 9 in. by 9 in. square—occupy the rest of the space, and extend 3 feet outside the back of the oven, where they are carried to the chimney by a cross flue. These flues were covered with 3-inch checked covers; and another set of flues commenced on the top of them, and covered up in the same manner. A third set of flues was built, and covered up the same way; this last covering forming the bed of the oven. The top and bottom sets of flues are for the waste heat passing from the oven to the chimney; and the middle set is for the heated air. The producer being built with these is now 3½ feet deep; a hole 15 in. by 15 in. being left at the bottom for cleaning it out. The air for the hot-air flues is admitted at the back of the regenerator, and is carried forward by two 4-inch fire-clay pipes to nearly the front end of the two centre air-flues. It goes back outside these pipes, but still in the two centre flues, and returns to the front in the two outside air-flues, entering the top of the producer by three ports at each side. The two fire-clay pipes are used for the purpose of carrying the air to the starting point; there being no other means of admitting the air to the front end of the two centre flues. The gases rising from the producer go into combustion with the heated air, and pass up the front portion of the retorts, over a middle wall, down the back portion, then enter the upper set of flues, travel forward, descend to the lower set of flues, and flow outward (as before stated) to the cross flue that leads to the chimney. The upper door of the producer

* Several references to the meter here alluded to appeared in the last volume of the JOURNAL.

consists of an iron frame 11 inches square inside, and bolted to two brick cheeks; the whole fitting into the angle formed where the front wall and floor meet. A brick to fit this door, bolted to a piece of sheet iron, serves as a cover, and can be lifted off and on when required.



The producer is filled by applying a scoop to the mouth of the retort when drawing, and is cleaned out from below every 24 hours; an excavation having been made in the floor for that purpose, which is covered over with a piece of sheet iron 6 feet long 3 feet wide, $\frac{1}{2}$ inch thick, and on the inside of which three pieces of angle iron are rivetted across to give it strength. The primary air is admitted at the door at which the producer is cleaned out. There being no fire-bars and no side holes for the admission of air, a piece of 4-inch cast-iron pipe, about 2 feet long, is laid down with one end sticking out at the door, the other reaching nearly to the back of the producer, and carrying a portion of the air to that point. This pipe also serves another useful purpose. Having no steam to keep the bottom of the producer cool, I use water for that purpose; and by allowing it to enter the pipe at something between a drop and a run, it is by the heat immediately converted into steam, and answers the purpose admirably. The distance the heated air has to travel is about 21 feet; but, the flues being large for the small quantity of air required, it travels very slowly, and before reaching the producer is nearly as hot as the inside of the oven. The size of the flues for the waste heat—four in number and each 9 in. by 9 in. square—may seem to be large for the size of the oven; and I have no doubt they would do if they were smaller. This, however, was the size which was most convenient for me, and I thought it best to err on the safe side; for if at any point the flues are contracted, intense heat, choking up, and destruction to the brickwork is generally the result. In the construction of this furnace, I have taken a slight departure from any I have seen or heard of—that is, in making the horizontal part of the building the conducting partition, or the partition between the waste heat and the heated air. My reasons for doing so are these: The vertical portion of the building has to be of some strength, because it is upon this that the whole structure rests; and, there being no stress upon the horizontal part, it can be made an inch or two thinner, and therefore there is much less of that good non-conductor—brick—between the two. The horizontal part, which consists of covers, also makes the isolation between the flues more

complete. Another departure from the usual method is in filling the whole space under the oven with flues, and not leaving a vacant space as is usually done. When the producer is placed inside a small oven, it and the side walls occupy nearly 4 feet. The space, therefore, left for the flues is very limited. In this furnace I have dispensed with flues at the side of the producer, but have used up all the rest of the space for that purpose.

This furnace was lighted up in August last; and is still in operation, giving general satisfaction. Some things about it seem to me rather strange. For instance, I have read about it being possible to regulate the secondary air supply by looking into the oven and judging by the appearance of the flame. I had pictured to myself the gas rising black from the fuel, and going into flame—Bunsen burner like—when it met the hot air. In this I was disappointed. It is true that when the charge is newly drawn, there is some flame, and you can see the combustion taking place at the air ports; but, generally speaking, there is no flame at all to be seen. Still the heat kept increasing, until it had to be checked by the damper. What then could be keeping up the heat? It could not be the hot air passing through the fuel, as in the old fireplace; for the air is admitted on the top of the fuel. I have no doubt most of the gentlemen here know what was puzzling me; and what I afterwards found out for myself—viz., that the blue flame of a Bunsen burner, when placed inside a fire or red-hot oven, entirely disappears; and although still there, does its work invisibly. As far, then, as my experience goes, you cannot well regulate the quantity of air by sight, but must judge by results; and in my case the best results were obtained by an opening of 2 square inches in each of the pipes at the back of the regenerator.

At first I cleaned out all the ashes in the producer every morning. By doing this, a good deal of heat was lost, as it took the fire about two hours before it was at its full strength again. Latterly, I found it better to clean out only what was lying black at the bottom; there being generally a quantity of red clinkers sticking upon the sides, and often bridges right across near the top. A few strokes from the steel bar from above sent the whole to the bottom, and formed a much better foundation for the fresh fuel than the clean bottom of the producer. If fire-bars are used, this might be different. The clinkers are sometimes rather hard to remove if the water is neglected, when the heat is very high. A small quantity of spent shale, however, drawn from the retorts along with the coke, was found to be an excellent thing for preventing clinkers being formed. The fire is damped down at night for about seven hours, during which time there is some loss of heat, but nothing like what would be with the old fires. At the point where the waste heat first enters the flues, there is an accumulation of dust 3 inches deep; otherwise the flues are as clean as at the commencement. I attribute this deposit to the fact that I use dross to some extent for firing. The brickwork does not appear to be affected in the slightest; although the heat was sometimes so intense that I was afraid to look into it, and as far as I can judge from it at present would last for a number of years.

And now, as to the important question of economy. Would the saving effected compensate for the first outlay? In my case the saving is very great; but there are special circumstances to take into account. In the first place, the gas-works under my charge are close to the Whitehall Fire-Clay Works, where the best of material can be had at a moderate rate—the cost of carriage being almost *nil*. The whole cost of this furnace amounted to only £8. In the next place, I use shale to a large extent for making gas, from which there is no coke; and I have therefore to use a large quantity of dross. Formerly I required to have two ovens going for five months of the year; whereas, with the improved heat working off the charge in three hours when it used to take four hours, I can now do with one oven going. The result of the whole is that, whereas formerly I used 18 tons of dross per month, I now only use 3 tons; the coke from one of the retorts, which is charged with splint, being nearly sufficient to keep up the heat. But, as I said before, this is partly due to special circumstances; and the saving is not so much in the summer time. There is also some saving of labour, as the fire requires less attention.

In this furnace, although I had what appeared to me to be feasible reasons for departing from the usual mode of construction, I do not claim to have constructed a better furnace than anyone else. It does its work well, and gives no trouble whatever; but that may only go to show how the same end may be accomplished in many different ways. Had I been less favourably situated, I might not have been justified in going the length I have done. More especially was I convinced of this when seeing Mr. Turnbull's furnace at Lauder in April last. It does its work beautifully; is simplicity in itself; and would not cost half of what mine would.

The question therefore seems to be, What length should we go to whether should we attempt to recover the whole of the waste heat, or be contented with taking the best of it? I think I have gone quite far enough; and in another furnace which I am at present constructing I have not gone so far; but having a large choice of materials ready at hand, and full liberty from my employer to use my own discretion in the matter, I was placed in a more favourable position for trying the experiment than most of those in charge of small gas-works.

In the furnace which I am at present building, the producer is exactly the same as in the first one, but the flues are different. The waste-heat flues are three in number. The two outside ones are 18 inches deep and 9 inches wide, and the middle one is 18 inches deep and 12 inches wide. The heat after passing over the retorts descends at the back of the oven into the two outside flues, comes forward to

the back of the producer, and returns to the chimney in the centre flue. Each of the two partitions between the centre and outside flues consists of two 3-inch brick walls 6 inches apart, and tied together with baffle bricks forming something like a hollow brick wall. These hollows are used as hot-air flues. The air is admitted at the front, and passes along the side of the producer and along the bottom of the two outside flues in a 5-inch fire-clay pipe. When at the back end of these flues, it is turned into the hollow walls, travels forward, and ascends into the bed of the oven, where it is conducted into each side of the producer by a channel 6 inches broad and 3 inches deep. The result of my year's experience has led me to modify the system thus far. I do not expect any better results from this than from my first one, but it is much less complicated, and will cost only about one-half. Such a furnace as this would be of considerable advantage in any small gas-works, more even than in a medium-sized works where a regular night shift is kept on.

THE SCRUBBING, CONDENSING, AND WASHING OF COAL GAS.

By WILLIAM KEY, of Tradeston, Glasgow.

In considering these subjects, I shall do so in the order given in the title to this paper, though not for any fanciful or accidental reason; for as I proceed it will become apparent to you why they are so placed. I shall also deal with the arrangement from a consideration of the mechanical effects produced on the gas, and will not enter into any question in the meantime of any improved results or otherwise in the secondary products either by tar or ammoniacal liquor, from the fact that there has been no opportunity of forming an opinion thereon.

Scrubbing.—The scrubbing and washing of coal gas have of late years become almost synonymous terms; for in both vessels water is the chief agent employed, and motive power is also brought into requisition for both sets of apparatus, not only to rotate the apparatus, but also to supply means to distribute the water, and work up the resultant ammoniacal liquor, by repumping, &c., to the desired strength of the contained ammonia. I shall, however, make a thorough distinction between these apparatus by designating the scrubber an apparatus for the extraction of the heavy condensable vapours; and no water will be used in connection with the arrangement I am about to describe for the purpose. Fig. 1 is designed for the extraction of the tarry and watery vapours from the gas, while it is still hot. The gas flows direct to the scrubber on its leaving the hydraulic main. The passing of crude gas in pipes, along with the tar that may be condensed from it in its travel, for considerable distances is most objectionable, and should be carefully avoided. The temperature of the gas must not be allowed to fall under 120° Fahr., and is preferably conducted to the scrubber as hot as possible.

This scrubber is designed of a capacity to thoroughly deal with 60,000 cubic feet of gas per hour; and is 5 ft. 3 in. inside diameter, by about 21 feet in height over all. The gas travels upwards for 15 feet of this height, which is the distance between the inlet and the outlet pipes. Similar vessels may be placed in a horizontal position, and the one over the other, to effect the same purpose. The outer case of the scrubber is of wrought iron, and is lined the entire length with corrugated sheet iron. A shaft passes through stuffing-boxes in the bottom and crown, to which is attached a grooved pulley, to be driven by a rope from another of a larger diameter fixed on a main shaft, and driven by an engine; so that by frictional, or other gearing, one or more of the scrubbers may be set in motion as the increased manufacture of gas may demand. Keyed on to the scrubber shaft are several cast-iron arms, to which are attached fans, butterfly-wings, or "wipers," made of corrugated or ribbed sheet iron as shown; or several layers of wire cloth of various meshes may be used. These are caused to rotate at a speed of about 300 revolutions per minute; whereby the gas is repeatedly forced to pass through the narrowed and irregular passage between the corrugated iron lining of the outer case and the ribbed wipers. Thereby the gas is impinged upon by the revolving surfaces; and otherwise is made to impinge upon the corrugations of the scrubber case. Thus the whole of the tarry and watery vapours are extracted. In a vessel of this size, the flow of gas, at the rate of 60,000 cubic feet per hour, is sufficient to refill it three times in a minute; so that the wipers, revolving at 300 revolutions per minute, enables the gas in its passage through the vessel to receive 100 wipers or switches from the wipers before it passes off at the outlet completely scrubbed and clarified. I have here a model of this scrubber, made somewhat after the design shown by fig. 4. The internal diameter between the corrugations of the case is 5 inches; and the height of the travel of the gas is 14 inches between the inlet and outlet.

I passed about 50 cubic feet per hour of crude gas through the scrubber, at a temperature of 120° Fahr., while it was stationary. These papers I now show you were exposed at a distance of (say) 0·1 inch from the outlet for 15 seconds by a stop watch; and they received the impression shown, from the tar in the crude gas impinging on the surfaces. Thereafter the model was set in motion; and the other side of the papers were exposed for a similar time, with a result as shown. The whole of the tarry and watery vapours had been eliminated; and the surface of the paper impinged upon remained quite clean. Having attached a meter to the outlet, both while the scrubber was stationary and in motion, it was found that there was no retarding effect to the flow of the gas during the latter as compared with the former experiments. The same volume of gas was registered each time; thus indicating

that the apparatus caused no back pressure—in fact, the water-line of the pressure-gauge remained steady under both conditions. The crude gas by this new process, having been thoroughly scrubbed and clarified, is now in a proper condition to be passed on to the coolers, generally termed the condensers.

Condensing.—Of all the apparatus used in the purification of coal gas, the designs for condensers are of the most heterogeneous description; and in some gas-works, as more surface was required for this purpose, a different form has been brought into use each time, so that sometimes the gas is partly condensed by passing through the various sections in a combination with several of the following types of condensers:—An enlarged hydraulic main; a pipe fixed round the inside of the retort-house; a pipe carried round the outside of the retort-house; an old boiler; a rectangular cast-iron box; a disused gasholder; a gasholder tank; pipe condensers by far too small; pipe condensers by far too large; horizontal pipe condensers; vertical pipe condensers; spiral pipe condensers; portions of annular condensers; portions of battery condensers, &c. It is impossible to discover the particular recommendation that accompanied each section, and decided the position of each design along the line of cooling operations.

For many years past I have experienced much difficulty in speaking in the presence of gas manufacturers of the temperature to be maintained in the cooling process; in fact, I have been frequently assured that the temperature has not in any way to be considered in the purification of coal gas, and if the condensers possessed the quality of being able to lower the temperature of the gas to that of the atmosphere, then they were considered to be efficient in every respect. Bearing on this subject, I will read to you the letter which appeared in the "Correspondence" columns in the issue of the JOURNAL OF GAS LIGHTING, dated Oct. 4, 1881.

Of all condensers, I consider that the form most destructive to the gas in its application is the pipe condenser carried in long straight lines, of a spiral form, with the pipes laid to a slight continuous fall, so that the gas might travel in contact with the tar. Then perhaps the vertical pipe condenser is the next most destructive; and along with this form, I would class the annular condenser—condensers so formed that when the temperature has fallen under 100° Fahr., the gas is passed slowly through a vessel of considerable area, and then through a small pipe, with consequently a very much increased velocity, to again enter a large vessel or chamber. This process, when repeated several times, must be very destructive to the illuminating power of the gas, and especially so as the temperature lowers, owing to the scrubbing process in these small pipes by the contact of the gas and the velocity of the impact with the cold and tarry surfaces—similar to what is frequently observable in towns where a rich gas is manufactured. The main-pipe, which is too small to permit of the district being supplied under a low pressure, and a slow delivery, has to be put under a higher pressure. The gas passing through it at a great velocity, hydrocarbon vapours are deposited; and the rich gas, by frictional contact with such a surface at a low temperature, is deprived of its light-giving hydrocarbon vapours, and is found to be of a much lower illuminating power further on than when it was sent from the gasholders.

The gas as it passes from the hydraulic main does so in the familiar condition of being accompanied, while it is still hot, by a dense brown vapour, resembling smoke; the visible matter being hydrocarbon—tarry and aqueous vapours held in suspense. Any form of condenser to which the gas in this state is led which necessitates it flowing through long straight lengths of pipe at considerable velocity, only serves as a means of carrying forward as far through the apparatus as possible these tarry vapours, because of the quick travel along unbroken lengths of pipe, and owing to the affinity tarry matter has at low temperature for the hydrocarbon vapours in the gas, the gas is lowered in illuminating value by several candles in passing through the last portion of such condensers where the temperature is low.

Some of the reasons why the annular form of condenser is one of the worst to employ as a cooler of coal gas are: (1) Because, the gas passing up or down the narrow annular space with a considerable velocity in a straight line, the tarry vapours are carried forward uninterruptedly. (2) The air space, being surrounded by the annular chamber containing hot gas, the air in its passage upwards becomes heated, so that the upper portions of the condenser tubes thereby lose much of their cooling power. (3) Owing to each individual annular tube being entirely separated from its neighbour, the changes of temperature brought about by hot rays of the sun, sudden showers of rain, by heat by day, and by cold by night. (4) Their singular form preventing thorough control over the temperature of the gas in severe frosty weather.

I have not prepared a diagram to show you what, in my opinion, is the only true principle on which to construct what would be an effective condenser; but I may be privileged on another occasion to deal with the design of condensers. Meanwhile, it is enough if I say that apparatus for the cooling of coal gas, to be effective, must, in the hands of the manager of the works, be under perfect control; and not like the annular condensers, allow the temperature of the gas to be so influenced by a sudden outburst of sunshine as to cause the thermometer to register an increase of 30° Fahr., or during a day of rain a lowered temperature by 20° or 30° Fahr. The apparatus should be so constructed, that one-fourth, one-half, or three-fourths of it may be thrown out of action at will. Some to whom I have spoken have objected to this because of the first cost, and no amount of argument could persuade them that a careful study and watchfulness over the temperatures would enable them to save

their first-class coals, and to work with a cheaper variety, and thereby the whole first cost of a proper condenser would be saved in one winter. Each section of condenser should have a series of thermometers and moveable discs encased in glass, to show at a glance the temperatures and position of the controlling appliances, which, in the hands of the manager, would be adjustable week by week, day by day, or even from hour to hour if necessary; and by the application of a system of levers to control the whole without in any way altering valves or gas passages, unless when a change of surface, by putting in or out of action a section of the condenser, is required. An apparatus of this kind must not have the error of all vertical apparatus now in use—that of the air which comes in contact with the lower portions becoming heated and ascending, and getting more heated as it rises in contact with the pipes or surfaces—extracting less and less heat from the apparatus as it reaches the top; so that in our very variable climate, in all weathers, sunny, showery, frosty, or mild, and in all conditions of the manufacture, be it large or small, the condensing apparatus should be adjustable to all variations, and in the hands of the engineer be controllable to a steady outlet temperature of 60° Fahr.

In works where the gas is still maintained at an illuminating power of anything above 20 candles, the adoption of the scrubbing process just described, and so clarifying the gas before it enters the condensers, will enable the gas to be manufactured much more cheaply; and the greatest benefit will be obtained by those who fix upon a standard of higher illuminating power. In such works, by the employment of the old method of condensation, the most serious depreciation in the quality of the gas would be experienced. The hydrocarbon and other vapours that it is desirable should be taken from the gas as soon as possible after leaving the retort having been extracted by these scrubbers, the condensers will now properly perform their functions, in simply cooling the gas from 160° or 120° down to 60°; and they will remain one of the cleanest portions of the apparatus in a gas-works. The exhausters will also be freed of gritty and tarry matter. By passing the gas too hot into the washers, the ammonia to be extracted is apt to remain in the gaseous state; and when the liquor gets heated above 70°, it loses much of the power of absorption from the loss of affinity which water has for the ammonia at lower temperatures. The temperature of the gas is reduced in the condensers to 60° in order to better prepare it for being passed on to the washers.

Washing.—The washer is an apparatus wherein water is employed to wash the gas. The water may be quiescent, and the gas caused to bubble up through it; or the water may be pumped up, or by other motive power made to drip through the gas as it passes through the vessel; or wetted surfaces may be rotated and exposed to the passage of the gas—all with the object of eliminating the ammonia and other impurities. Many managers have experienced in both mild and severe winter weather, a state of things whereby the washers act as condensers; and the liquor in the tanks rapidly becomes coated to a considerable depth with naphtha. The apparatus I am about to describe—in conjunction with the scrubber and condenser arrangements just mentioned—is designed so that the temperature of the gas would be prevented from being unduly cooled, and also the passage of any tarry naphtha to the washers would be an impossibility. The liquor would be made to do a maximum amount of duty; and the quality of the gas will not be impaired in passing through the water.

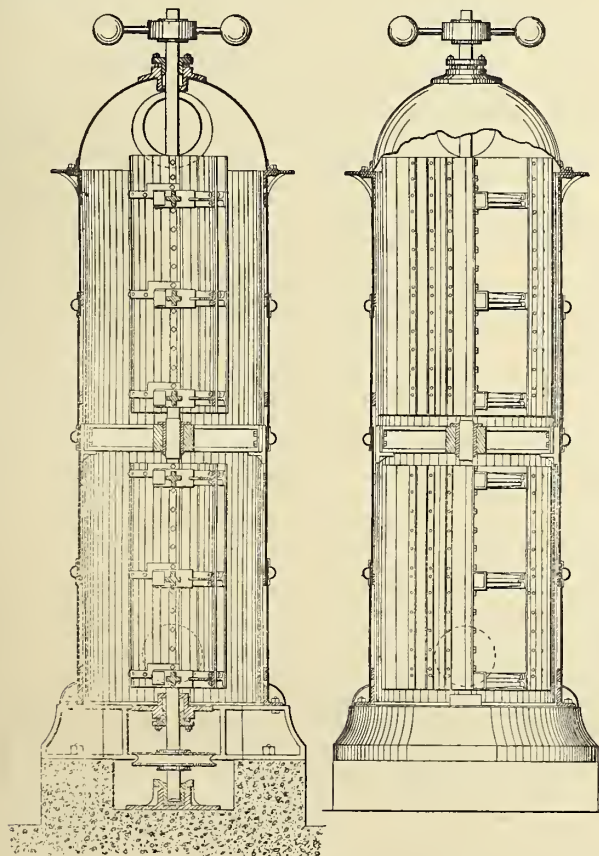


FIG. 1.

FIG. 2.

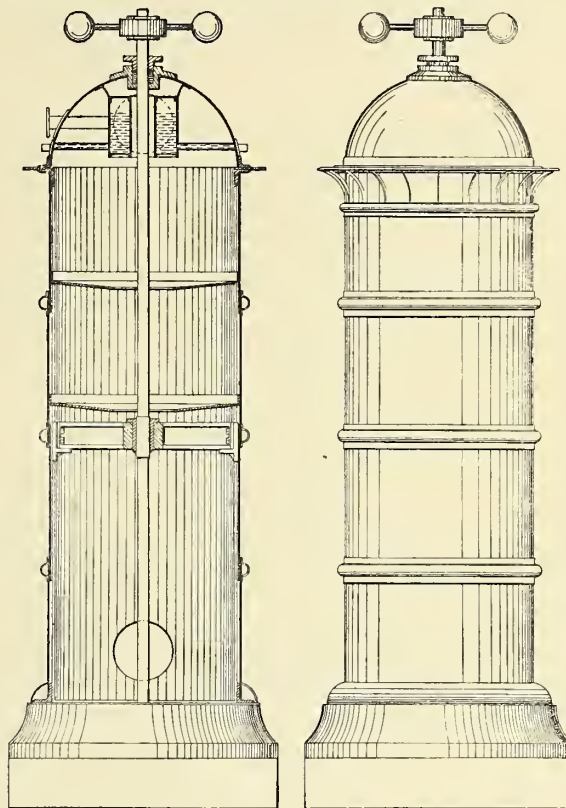


FIG. 3.

FIG. 4.

I have here an apparatus to illustrate the effect produced on illuminating gas by its coming into contact with oil, and before proceeding further will show it in action. The vessel is about 2½ inches in diameter and about 1 foot high, filled with small pebbles. I will now light two jets of equal size and brilliancy. The gas to supply one of them passes up through this small apparatus; and the gas to supply the other is branched off from the supply-pipe to it. Having now poured in the U-pipe by the filler a small portion of this crude heavy dead oil, obtained from the Clippens Oil Company's works, you will be enabled to at once observe how the flame of gas at the jet on the small scrubber has almost entirely lost its luminosity, although the shape and size of the flame remains as large as before. The gas having transferred its richest light-giving hydrocarbon vapours to the oil, of course the oil is increased in volume to the extent of the vapour extracted from the gas. This same thing takes place in the washers, and with the present form of condensers, especially in frosty weather; and the loss of the light-giving properties of the gas requires to be made up by an increase in the quantity of high-class coals used, which will often, in a single month in midwinter, represent a sum equal to the value of the whole plant employed in washing the gas. The gas, in passing through the washers and scrubbers as at present constructed, is exposed to an enormous condensing surface, and the temperature of the gas, which had left the condensers at 60°, will now be found at 40° or even lower than 35° Fahr. In

frosty weather, the contact of gas rich in hydrocarbon vapours with the oily and tarry surfaces of the scrubbing liquor as it passes through the vessels at this low temperature tends to, and does cause the quantity of tarry naphtha in the vessels to increase, with the result that the illuminating power of the gas is reduced in the same ratio.

Everyone is familiar with the beautiful display of prismatic colours resulting from the letting one drop of tar fall on to the surface of water; and you have doubtless frequently wondered at the enormous surface one drop will cover. This film of oily tar on the surface of the water is very thin; yet the water under it has received a coating which prevents contact by air or gas. If the liquid so coated be ammoniacal liquor, such a film would prevent the escape of ammonia. If coal gas therefore be admitted to the washers in an imperfectly cooled, or in an unclarified condition, the drops of water dripping through the vessel, or the wetted surfaces which the gas meets with in its course, are instantly coated with a film similarly to the water just mentioned; and the efficacy of the ammoniacal liquor for further extracting ammonia and sulphur compounds from the gas is impaired. Hence perhaps the most valuable result from the adoption of my suggested system of scrubbing and condensing will be found in the increased efficiency of the washers.

Everyone knows that if a drop of water is broken up into numberless fine particles, such as mist or spray, thousands of times more surface is exposed on such a condition as compared with the surface of the drop. From this it is plain that, to get the greatest amount of work from water, instead of allowing it to pass through the gas in drops or small streams, each drop in falling only making an imaginary line through the gas (just as you would draw a vertical line on paper with a ruler), these should be dashed into spray, so that the largest possible surface be exposed to the gas.

I have designed a washer which will not only prevent the excessive cooling of the gas, but will by its powerful application in a comparatively small space, permit of the rapid passage of the gas and the maintenance of the temperature at the outlet as near 60° as possible; and the gas will flow through the liquor that is lashed into foam or fine spray. The apparatus is shown in vertical section and cross section in fig. 3. This washer itself is very similar in design to the scrubber, but has fixed to the crown, on its underside, an annular water-tank and air vessel, to which are attached ten tubes, radiating from the tank and passed through the sides of the cover to afford access for cleaning the numerous small holes in them and in the bottom of the tank. Through these holes the water falls on to the revolving corrugated iron fans or wipers. By these the water is at once lashed into fine foam or spray, and with the gas is whirled round the corrugations of the lining of the case; and the gas will be struck by the wetted surfaces of the corrugations of the fans or wipers about 200 times ere it reaches the outlet—the centrifugal action causing the gas and spray to rapidly whirl through the wiper corrugated passages outwards. I have arranged a series of bevelled trays, whereby the gas from a lower chamber in passing upwards into the next higher one has to pass through a 20-inch opening in the centre; and the water in falling from a higher chamber to a lower is directed by the bevelled plates to the same opening. These plates have a large number of small holes, through which a portion of the water will drip on to the revolving wipers.

From the foregoing, the following claims have been brought before you as the object of my paper:—(1) That the crude gas should be led while as hot as possible, direct from the retorts to the scrubbers. (2) That a scrubber, somewhat after the design I have submitted to you, should be employed to scrub the gas perfectly clean from the tarry hydrocarbon and other vapours which it is desirable should be eliminated from the gas before it enters the condenser. (3) That the condensers should be employed solely as coolers, and not used as tar extractors. (4) The gas having first been clarified by the scrubbers, the condensers will remain clean if so used. (5) That the condensers, to be efficient in the hands of the engineer at the works, must be adjustable to alterations in the manufacture and variations of temperature; so that a steady outlet temperature of 60° Fahr. be maintained. (6) That, by these arrangements, the gas will be of higher illuminating power by its passage through the condensers in a clean state, in place of the tarry condition as at present; especially so will this be the case where the gas in the condensers has been allowed to fall to a temperature approaching that of the atmosphere in severe winter weather. (7) That by the scrubbing process and clean cooling of the gas, the washers will receive the gas in a condition to enable them to do a maximum duty. (8) The ammoniacal liquor will remain clean; and the liquor will be the more easily worked up to the desired strength. (9) The quality of the gas will not be destroyed as at present by contact with the oily and tarry surfaces of the liquor in the washers in winter.

A NEW and ingenious scheme for sinking a shaft through sand, silt, and wet sloshy grounds, and excavating it like rock, has just been successfully tried in Belgium. Large iron tubes are sunk in the sand or mud about 3 feet apart, and in these tubes smaller ones are inserted, through which circulates a cool solution of magnesium chloride. The sand is frozen for a distance of 3 feet around the tubes. It resembles rock, is hard and compact, and can be excavated in the same manner as rock. It is possible that the process can also be used to advantage in the digging of foundations where water and sand are sources of trouble.

IMPROVED APPARATUS FOR TESTING AND ANALYZING GASEOUS MIXTURES.

In the third number of the *Zeitschrift für Analytische Chemie* for the current year various improvements in apparatus for the analysis of gases are noticed. A brief description of some of them may be of interest to our readers.

An apparatus designed by Herr F. Fischer consists mainly of three upright tubes—(1) a long laboratory-tube, in which absorptions and explosions are conducted; (2) a measuring-tube or eudiometer, surrounded by a water-jacket to ensure uniformity of temperature; (3) a pressure-tube connected in the usual manner with the eudiometer. The absorbent liquids and water for cleansing purposes are admitted to the laboratory-tube from a receptacle at the top, by means of a stopcock; whilst the transference of gas from the laboratory-tube to the measuring-tube and *vice versa* is effected by raising or lowering mercury reservoirs connected to the bottom of each tube respectively, and shut off when necessary by clips. There are two stopcocks between the laboratory and measuring tubes. The one nearest the latter tube is a simple stopcock, and serves to shut off the measuring-tube; whilst the other is a three-way cock, and permits of connection being made with the external air. It serves for the introduction of the gas for analysis in the first instance, and subsequently to admit gaseous reagents, as well as for the egress of wash-water, &c. In apparatus of a somewhat similar character, Mr. Alfred H. Allen uses a Lunge's nitrometer for the measuring-tube; whilst Mr. Sinibaldi places the measuring-tube in the pressure-tube, and Mr. J. B. Mackintosh, in a modification of Elliot's apparatus, has amongst other conveniences an arrangement by which the gas under examination can be shut up in the measuring-tube during the introduction of oxygen or air for explosion, and hence avoids any possibility of loss.*

Many modifications of Bunte's and of Orsat's apparatus are proposed; but the simple arrangements, devised by Herr Franke, shown in the annexed diagram, is suggested to replace them for technical purposes, and more especially for the analysis of chimney gases. It consists of a glass tube of a capacity of exactly 100 cubic centimeters (including the wide bore of the middle stop-cock), enlarged at the upper end A, and graduated on the narrower part. The upper end terminates in quite a small tube and stop-cock, while the lower end is connected by means of a wide-bore stop-cock with a glass chamber B, which is intended for the introduction of reagents, &c., and can be closed air-tight at will by means of a hollow glass stopper, fitted with a tube and stop-cock. When in use, the apparatus is best filled by allowing the gas for examination to stream through it. If, however, only a limited quantity of gas is available, the apparatus is filled with water, the stopper fixed in, and the upper narrow tube connected with the source of gas. All the stopcocks are then opened; and when the water has run out to about half way down the reagent chamber, the upper stopcock is closed, and the whole apparatus transferred to a stand, and supported in a vessel of water, where it is adjusted so that the levels of the water both inside and out are at the same height. The wide-bore stopcock is then closed. The apparatus now contains a definite volume of gas under the prevailing atmospheric temperature and pressure; and it can be treated and agitated with various reagents in the following manner:—

Remove the stopper, and fill the chamber with the reagent; replace the stopper, open the wide bore stopcock, allow the reagent to flow into the tube, and close the stopcock before all the liquid has flowed in; then agitate well, and finally let the reagent flow into the chamber again; wash out the reagent chamber, and measure by adjusting the levels of the internal and external water and reading the graduations.

Herr E. H. Keiser has introduced an apparatus in which the weight of mercury displaced by the gas is ascertained, instead of measuring the volume of the gas in the ordinary way. Herr A. Elhrenberg has constructed an apparatus for rendering the analysis of gases by combustion more accurate.

The following simple appliance is recommended by Herr W. Thörner for the collection and direct analysis of the gases dissolved in water. A flask full of the water to be examined is connected with a measuring cylinder filled with water which has just been boiled and is still warm. The pressure in the cylinder can be increased or reduced by raising or lowering a reservoir connected with it, containing some of the same warm water. The reservoir is lowered, and the flask of water raised to boiling point. The gas collects in the upper part of the measuring cylinder; and, to prevent its being absorbed by the water, oil is run in through a funnel at the top so as to form a protective layer. The gas is readily measured, and, by means of a three-way cock at the top, beneath the funnel, may be easily transferred to any other apparatus for further examination.

When estimating carbonic oxide, it is well to remember that ethylene is also absorbed by cuprous chloride; ethylene must therefore be removed—*e.g.*, by means of fuming sulphuric acid—before proceeding to dissolve out the carbonic oxide. It is also desirable to use fresh cuprous chloride for each determination.

* An illustrated description of this apparatus appeared in the *JOURNAL* for Dec. 20, 1887 (p. 1036).

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

GAS COKE FOR STEAM-BOILERS.

SIR,—I have read with pleasure the article on this question in your issue of the 24th ult., and agree with you that coke is not sufficiently appreciated by the gas world or the general public for use as house fuel or for steam-boilers.

I have lately visited some gas-works where, having no market for their good dust coke, they have to pay a small sum per load to get rid of it, to be thrown away as dirt. At other works, however, they are so alive to its value (or there is a better market), that their coke is broken into four or five sizes, varying from dust up to pieces say about 1½ inches in diameter. Generally this careful division is not made, although it deserves more attention. The dust or *unsaleable* portion should, if possible, be burnt at the works, either for the retorts or the steam-boilers. The smallest breeze can be burnt for producing steam, and nearly always alone. In some few cases it pays to mix it with from 10 to 15 per cent. of coal dust, depending upon the local prices. The smallest breeze cannot, of course, be used for domestic purposes, nor burnt in the usual way; but it can be easily utilized by a forced draught, and it then becomes all profit to a gas company instead of a loss.

For economy in the evaporation of water into steam, it is important that the feed water should be measured into the boilers; and this can be done as easily as gas. Weekly accounts should be kept of the weight of fuel burnt, ashes, and amounts of incombustibles, &c., and such returns reasoned upon. I am glad to see that this standard of comparison is coming more and more into general use for determining the cost of fuel for evaporating 1000 gallons of water from a certain temperature. Dust coke also is being more and more burnt. When tar is used for fuel, a comparison can be easily made between the cost per 1000 gallons of water evaporated and that of coke. In gas-works, owing to the fact that cash is not paid for the ordinary coke made and burnt by themselves, the amount used is frequently disregarded, and no accounts kept. The companies should, of course, burn the least saleable portion of their coke heaps.

Bermondsey, S.E., Aug. 11, 1888.

B. DONKIN, jun.

P.S.—The results of some interesting experiments made by the great French authority M. Scheurer-Kestner with an elephant boiler and Welsh coal have lately been published in a recent number of the *Bulletin de la Société Mulhouse*.

LAYING MAINS OVER RAILWAY BRIDGES.

SIR,—A water company for whom I am acting, are at present laying a 9-inch main through a public road which is intersected by two single-span masonry railway arches belonging to different companies. One of the companies has given notice that before laying the main over their bridge, they require the water company to make application to them for their consent, and to enter into an agreement with them.

The water company is a statutory undertaking, incorporated before the railway was made; and they have the Water-Works Clauses Acts of 1847 and 1863 incorporated with their Acts. The road is a public one, and within the area of the water company's limit of supply; and the company had a main laid in the road prior to the construction of the railway.

I consider that, the road being public, the water company have the power to lay the main without the consent of the railway company, and that the latter have no ownership in the soil between the crown of the arch and the surface of the road (See 10 and 11 Vict., cap. 17, sec. 28). I have previously laid mains over railway arches without such a point being raised. Section 19 of the Railway Clauses Consolidation Act 1845 (8 Vict., cap. 20) would appear to bear somewhat on the point; but it is not as definite as could be desired.

If railway companies have the power which is claimed in this instance, it would be at the option of a railway company to prevent gas and water companies from fulfilling the obligations imposed on them by Parliament.

I am desirous of knowing if any of your correspondents have had such a question raised before; and, if so, how it has been dealt with.

Aug. 8, 1888.

WATER-WORKS MANAGER.

* * It may be of interest to give the section referred to by our correspondent, as well as the preceding one—both bearing, to a certain extent, upon the point raised by him:—"XVIII. It shall be lawful for the company, for the purpose of constructing the railway, to raise, sink, or otherwise alter the position of any of the water-courses, water-pipes, or gas-pipes belonging to any of the houses adjoining or near to the railway, and also the mains and other pipes laid down by any company or society who may furnish the inhabitants of such houses or places with water or gas, and also to remove all other obstructions to such construction, so as the same respectively be done with as little detriment and inconvenience to such company, society, or inhabitants as the circumstances will admit, and be done under the superintendence of the company to which such water-pipes or gas-pipes belong, and of the several commissioners or trustees, or persons having control of the pavements, sewers, roads, streets, highways, lanes, and other public passages and places within the parish or district where such mains, pipes, or obstructions shall be situate, or of their surveyor, if they or he think fit to attend, after receiving not less than 48 hours' notice for that purpose.—XIX. Provided always, that it shall not be lawful for the company to remove or displace any of the mains or pipes (other than private service-pipes), syphons, plugs, or other works belonging to any such company or society, or to do anything to impede the passage of water or gas into or through such mains or pipes, until good and sufficient mains and pipes, syphons, plugs, and all other works necessary or proper for continuing the supply of water or gas as sufficiently as the same was supplied by the mains or pipes proposed to be removed or displaced, shall, at the expense of the company, have been first made and laid down in lieu thereof, and be ready for use in a position as little varying from that of the pipes or mains proposed to be removed or displaced as may be consistent with the construction of the railway, and to the satisfaction of the surveyor or engineer of such water or gas company or society, or, in case of disagreement between such surveyor or engineer and the company, as a justice shall direct."

Parliamentary Intelligence.

HOUSE OF LORDS.

MONDAY, AUG. 6.

The Municipal Corporations (Local Bills), Ireland, Bill was brought up from the Commons, and read the first time.

TUESDAY, AUG. 7.

The following Bills received the Royal Assent by Commission:—Bristol Water Bill, Hexham Local Board Bill, Lancaster Corporation Bill, Llanelly Local Board Bill, Nelson Local Board Bill, Staffordshire Potteries Water Bill.

FRIDAY, AUG. 10.

The Municipal Corporations (Local Bills), Ireland, Bill was read a second time.

HOUSE OF COMMONS.

TUESDAY, AUG. 7.

METROPOLIS WATER ACTS CONSOLIDATION.

Mr. F. SEAGER HUNT (Marylebone) gave notice that on an early day he will move for leave to bring in a Bill to consolidate the Acts relating to the Water Supply of London.

THURSDAY, AUG. 9.

RETURNS AS TO GAS UNDERTAKINGS.

The usual returns relating to all authorized gas undertakings in the United Kingdom (made up in the case of companies to Dec. 31, 1887, and in that of local authorities to March 25, 1888) were presented.

SATURDAY, AUG. 11.

WATER SUPPLY STATISTICS.

A return was presented, giving the particulars in regard to water supply for which Mr. J. F. B. Firth moved on the 7th of June last (see JOURNAL for June 5, p. 1007).

Legal Intelligence.

HOUSE OF LORDS.—FRIDAY, AUG. 10.

(Before the LORD CHANCELLOR, LORD WATSON, LORD FITZGERALD, LORD HERSHELL, and LORD MACNAGHTEN.)

LORD PROVOST, ETC., OF GLASGOW v. FARIE.—THE CLAY UNDER THE CORPORATION'S RESERVOIRS.

This was an appeal from the decision of the Court of Session (First Division), reversing a judgment of the Lord Ordinary. It appeared that in 1871 the appellants, under the provisions of the Glasgow Water-Works Act, compulsorily purchased from the respondent a quantity of land, upon which they subsequently constructed two large reservoirs for the purposes of their water-works. The price paid for the land was £11,000; and the purchase was made under the general provisions of the Act, whereby the property in the coal, slate, ironstone, and "other minerals," which might be beneath the land purchased should remain in the seller, and that they should not be paid for by the purchasers of the surface soil until the seller should give notice of his intention to work such minerals. Beneath the land acquired by the appellants there was a large quantity of clay and in 1885 the respondent gave the appellants notice of his intention to work the clay as one of the minerals reserved to him under the Act. The appellants thereupon denied that clay was a mineral so reserved; and asserted that the property in it had passed to them when they purchased the surface of the land. Litigation having arisen between the parties in consequence of this dispute, the Lord Ordinary decided in favour of the appellants; but his decision was reversed by the First Division of the Court. The case was argued some time ago, when judgment was reserved. This was given to-day.

The ATTORNEY-GENERAL (Sir R. E. Webster, Q.C., M.P.) and Mr. BALFOUR BROWNE, Q.C., appeared for the appellants; Sir HORACE DAVEY, Q.C., and Mr. E. W. BRYNE, Q.C., for the respondent.

The LORD CHANCELLOR, LORD WATSON, and LORD MACNAGHTEN were of opinion that the clay in question formed part of the surface of the land, and that the right of working it had not been reserved to the seller when the property was acquired by the appellants. They thought the judgment of the Court below must therefore be reversed, and that of the Lord Ordinary restored.

LORD HERSHELL dissented; being of opinion that clay came within the term "minerals," the right to work which was reserved to the seller under the general provisions of the Act. The reservation must, he thought, be taken to extend to all such bodies of mineral substances lying together in seams, beds, or strata as were commonly worked for profit, and had a value independent of the surface of the land.

Accordingly, by a majority, the judgment was reversed, with costs.

HIGH COURT OF JUSTICE.—CHANCERY DIVISION.

WEDNESDAY, AUG. 8.

(Before Mr. Justice KEWICH.)

ARNISON AND OTHERS v. SMITH AND OTHERS.

THE CITY OF GENOA WATER-WORKS COMPANY, LIMITED.

This was an action brought by Mr. Joseph Arnison and 53 other plaintiffs, debenture stockholders in the City of Genoa Water-Works Company, Limited, against Mr. Gordon Smith, the promoter of the Company, and the Prince of Mantua and Montferrat, Admiral Sir E. A. Inglefield, Colonel Hughes-Hallett, Sir Kingsmill Grove Key, and Messrs. H. C. Maudslay, H. F. Giles, and J. Kinloch Malcolmson, the original Directors of the Company. Of the 54 plaintiffs, 12 failed to appear at the trial, and two died before the trial. The remaining 40 appeared as witnesses in support of the case alleged in the one statement of claim delivered on behalf of the 54 plaintiffs. The Company was incorporated in 1886 as a limited liability Company, with a nominal share capital of £300,000, divided into 60,000 shares of £5 each. On Nov. 30, 1886, defendants, on behalf of the Company, sent out a prospectus inviting the public to subscribe for the issue of £150,000 of 6 per cent. debenture stock in the Company. The prospectus contained the following statement:—"Share capital, £300,000, in 60,000 shares of £5 each, of which 40,000, representing £200,000, has been already subscribed." The plaintiffs' case was that this was inaccurate, not more than seven shares in the Company having been taken up or subscribed for at the date of the prospectus; and even in March, 1877, not more than 57 shares had been taken up, upon which only £265 had been paid. The plaintiffs, relying on the representations, and believing them to be true, applied for and became the holders of certain portions of the debenture stock, amounting in the aggregate to £30,200; and they claimed damages for the deceit alleged to have been practised upon them.

The defence was that the defendants made the statements in the prospectus *bona fide*, believing them to be true.

Mr. RALPH NEVILLE, Q.C., Mr. J. F. OSWALD, and Mr. W. BAKER appeared for the plaintiffs; Mr. STEWARD BRICE, Q.C., and Mr. R. BRAY for the defendant Gordon Smith; and Mr. WARMINGTON, Q.C., Mr. F. THOMPSON, and Mr. ALEXANDER for the other defendants.

Evidence having been given at considerable length on both sides,

Justice KEKEWICH, in giving judgment, described the case as a painful and a novel one. Here, he said, 53 plaintiffs combined together to bring an action against the Directors of a Company for misrepresentations in a prospectus; and the point he had to decide was whether there had been deceit in asking people to subscribe for debentures, and whether the statement that £200,000 of shares had been already subscribed for at the time of the issue of the prospectus was true. He must confess he thought the word "subscribed" had been improperly used; and he was further of opinion that there had been concealment as to the real facts of the case. Under all the circumstances, he came to the conclusion that the plaintiffs had made out their case, and were entitled to judgment, with costs as against the defendants. He must, however, make an exception with reference to the order, and that was with regard to the twelve plaintiffs who did not appear. Their actions would be dismissed, and they would pay defendants' costs.

An order was made accordingly. The successful plaintiffs were entitled to the difference between the actual value of the stock which they were deceived into purchasing, and the price which they paid for it. There were no means of assessing this then; and it was referred to Chambers.

Miscellaneous News.

THE EXAMINATIONS IN "GAS MANUFACTURE."

We have been favoured by the Organizing Director of the City and Guilds of London Institute for the Advancement of Technical Education (Sir Philip Magnus) with a list of the successful candidates in the examinations in "Gas Manufacture," which, as our readers are aware, form part of the scheme of Technological Examinations conducted by the Institute every year. It is as follows:—

HONOURS GRADE—

First Class.—Herring, W. R.—First Prize: £5, and Silver Medal.

Bromley, J. F.—Second Prize: £5, and Bronze Medal.

Second Class.—Clark, Geo. H.; Cleland, Alex. M'I.; Simmonds, H.

ORDINARY GRADE—

First Class.—Bancroft, F. J.

Botley, C. F.—First Prize: £3, and Silver Medal.

Helps, D. H.—Second Prize: £3, and Bronze Medal.

Sayner, G. S.—Fifth Prize: Bronze Medal.

Smith, A., jun.—Third Prize: £2, and Bronze Medal.

Sutcliffe, E. J.—Fourth Prize: £1, and Bronze Medal.

Second Class.—Graham, M.; Hall, L. G.; Hearson, W.; Hiller, H. K.;

Holliday, J.; Murray, J. W.; Rudge, H.; Stone, G.;

Surman, W.; Whyte, W.

THE GASLIGHT AND COKE COMPANY.

HALF-YEARLY MEETING.

The Half-Yearly General Meeting of this Company was held last Friday, at the Chief Office, Horseferry Road, Westminster—Colonel W. T. MAKINS, M.P., in the chair.

The SECRETARY and GENERAL MANAGER (Mr. J. Orwell Phillips) read the notice convening the meeting, and it was agreed to take as read the report of the Directors, with those of the chief officials of the Company (which were given in the JOURNAL last week), and the accounts for the half year ending June 30 last, the principal portions of which appear elsewhere today (see pp. 296-7).

The GOVERNOR: I have now to move the formal resolution—"That the report and accounts be received and adopted;" and I hope in this warm atmosphere that it will not be necessary to detain you very long. The report, which you have all received, expresses in short phrases the history of the Company during the past half year; and though that history has been uneventful, I think you will agree with me in regarding it as eminently satisfactory. Last half year, in addressing you, when moving the same resolution, I said that I thought then, speaking of the report for the half year ending December, 1887, that was the best report we had ever had the pleasure and privilege of laying before the shareholders. On this present occasion I can repeat that, because this report and these accounts are, if anything, still better than these we submitted last half year; and in one respect they are certainly very much better, as we recommend an additional $\frac{1}{2}$ per cent. dividend. My usual practice has been to give you the comparative figures, in order that you may see at a glance the differences in working compared with the corresponding half of the previous year. We have in favour of the accounts for this half year, as against the corresponding period of 1887, an increase in meter and stove rental of £768; in the amount received from coke, of £14,122; from breeze, of £49,911; and, in the item of tar and tar products, the large increase of £15,430. This, with a small increase of rent of £61, makes an increase in the income of £35,378. Well, then, on the other side, against the income for this half year, there is a loss on gas of £81,318; and on ammoniacal liquor and sulphate of £7094—the total loss in income for the half year being thus £91,412. Of course, this seems a very large amount; but you will at once perceive that it is accounted for almost entirely by the reduction of 3d. per 1000 cubic feet which took effect from Jan. 1 last. We have been urged very often to take more rapid strides in the way of reducing the price of gas. We have been told frequently—especially by my friend Mr. Livesey—that reduction of price means increase of consumption. I have had occasion to point out to him and to the meeting several times that this is not so in our case. It is not an invariable rule; and in the past half year, the general experience of the Company has been borne out. Our increase for the half year, in spite of the reduction of 3d. per 1000 cubic feet, has been only at the rate of just below 2 per cent.—1.94 per cent.; so that the reduction, large as it is, in the cost to the consumer has not as yet made an appreciable difference in our receipts. To us the cost of the 3d. reduction ought to have been, if there had been no increase in the consumption, £107,280—that is to say, if we had only sold the same amount of gas as in the corresponding period of the previous year. As a matter of fact, the increased consumption gave us £22,962 more. Therefore the amount of £107,000 which we stood to lose was reduced to £84,000. This, I think, is fairly satisfactory, because these changes of price do not take effect at the moment. People do not find out, until their bills go in, that there has been a reduction of price; and they do not correspondingly

increase their consumption. But, looking at the fact that so much of our gas is now used as fuel—for manufacturing purposes, engines, and also for warming and cooking purposes—a reduction of 10 per cent. must tell eventually; because a manufacturer who can get his motive power at 10 per cent. less cost, is always inclined to increase his business. That is so far as regards the income. Then, with respect to our expenditure, our coals have cost us £8297 less for the half year. This I believe you will agree is highly satisfactory, especially as we have used a greater quantity of coal in producing a larger amount of gas. The cost of coal this half year is peculiarly pleasing; because the gross price per ton is 12s. 0.7d. against 12s. 4.30d. The residuals have produced 7s. 6.69d. against 7s. 0.43d. The total net cost of the coal, therefore, this half year has been 4s. 5.38d. per ton, against 5s. 3.52d.—the largest reduction I ever remember in a half year. This accounts for the decrease of £8297 in the amount we have paid for our coals. Wear and tear on manufacture is about £1000 down; salaries and wages are £1832 less; wear and tear on distribution is £5860 down; meter and stove repairs have cost less by £5320; the item of public lamps shows a decrease of £700; rents are £200 less; and law charges are £3599 down. Of course, this is because there has been a little lull in the litigation. The expenses connected with the public testing stations are £149 less. We have therefore in favour of this half year, by the reduction in expenditure, £28,591, and also a sum of £2700 for preference dividend and interest on loans—making the total amount in favour of this half year, against the corresponding period of last year, £66,680. Then, I have given you, on the other side, £91,000 loss on gas and liquor; and in addition our salaries for manufacturing are £200 np. Manufacturing wages are £3900 np; purification is £2600 np; and various small items bring the total debit to the account to £8574. Then we have to add to this the excess of $\frac{1}{2}$ per cent. on the ordinary dividend, which amounts to £20,535, which gives altogether against the half year £120,521. The figures I gave you in favour being £66,680, the net debit for the half year is £53,841. Therefore, though we stood to lose, as I told you, £104,000, the half year is only £53,000 worse than the corresponding period of 1887. The charge for wear and tear, distribution, rates and taxes, and management are practically the same as they were; and therefore I need not go through the figures, as they vary so little that I should be only wearying you. The item of law has given us £2000 to the good, or something over $\frac{1}{2}$ d. per ton; and annuities are £1000 higher. Two or three of our older men have been pensioned off, and we have saved their salaries, though while we get the saving in salaries, it has raised the annuity fund to this extent. That is a measure not only of humanity, but of economy, because we get the work done by younger men at less remuneration; and we enable the men who are past work to retire into private life without being utterly deprived of their subsistence. With respect to the question of increased consumption, I have told you that it has been in the past half year 1.94 per cent. This at first sight might appear discouraging; but I am happy to say, with reference to the present half year, as far as it has gone, the increase has been very satisfactory. We are among those who might be looked upon as misanthropic individuals, who always benefit by the misfortunes of their fellow-creatures; and the wet, cold, and dull weather which has been so oppressive to the public at large has brought a large amount of grist to our mill. The accession of the late summer that has come upon us will probably tell upon our increase; but it has already arrived at such a figure that we may look with complacency on the prospects for this half year. You will have noticed that coke is a very satisfactory item. The addition of £14,000 in the half year from coke is a fact full of comfort; and I do not think we have seen the best of it yet. I believe that the present half year will show results quite as satisfactory, if not more so than in the past half year. The same remark, in a modified way, applies to breeze. I do not know that I need trouble you with any more figures with reference to the working of the half year. If I have omitted to give anything in the way of statistics, I shall be happy to supplement what I have already said by way of answers to questions at the end of the proceedings. The proprietors will remember that I mentioned an experiment which we had tried with regard to supplying gas to small dwellings—cottages, tenements, and so on—on the principle of finding the fittings and charging a rental for them, so as to bring the use of gas into the cottages and smaller dwellings in the East-end of London. Of course, the experiment has not yet progressed very far; but I can give you the results up to the present. We have laid on services to 96 houses and given them a supply of gas; and 85 out of the 96 have been lighted for the full period of three months from March to June. Of course, the meeting will remember that this is one of the lightest quarters of the year; and therefore the figures are not very large. The rental we have received has been £29 13s. 10d. This gives an average of, as near as possible, 7s. per house, or at the rate of 6d. per week, including the rental of fittings. I think that when the British workman can get his rooms lighted and warmed, and his fittings put in, for a payment of 6d. a week, without any trouble to him, we have a right to look for a very large development in this form of business; and, of course, it is a business which has great capabilities. When I add that there has been no trouble whatever in collecting the money from the working men, and that there has been no loss and not a penny of bad debt, we can look on the experiment as satisfactory, and as encouraging us to proceed in the same way. These 96 houses I mentioned are all in Silvertown. We now propose to adopt the same system in other parts of our district; and I hope I shall be able, at our next meeting, or the meeting after, if I am in the chair, to give the results of this further experiment. With regard to stoves, we are going on steadily. We have now 7322 stoves out that we know of—that is, our own stoves, those issued by the Company. The rental of the stoves for the half year has been £2283, against £1974. This is very satisfactory, because what we want is day consumption, so that we may utilize our plant during the 24 hours round. Of course, lighting is our mainstay; but the fuel business is progressing, as you see by these figures, in a very satisfactory way. It is the more satisfactory because, with regard to fuel, we have no competitor. The electric light we must regard as a competitor, as far as it goes, for illuminating purposes; but for fuel we have no competitor, except, of course, the ordinary coal and coke. I am reminded by the Deputy-Governor that you must not assume from what I have said that our lighting business is bad, because our meter-rental, as well as the stoves, shows an increase. I only meant to say this—that the fuel business is peculiarly satisfactory, and the lighting is equally satisfactory; but it has not that element of freedom from competition which fuel has. I think I have now dealt with all the figures which I need trouble you with. Perhaps some of the proprietors naturally look at the price of our stock from time to time; and they may have seen a sudden drop the other day. As far as we can understand, this fall occurred through the introduction of a new Electric Lighting Company—introduced to the public by some well-known scientific and other names. As far as my experience goes, the only people who have so far derived any good from electric lighting have been the people who have sold the machinery. I know of no company which is paying a dividend or interest on its lighting business; and, as I told some of my friends in this new Company, they have a long uphill game before they can make £25,000 a year to pay even 5 per cent. on the capital they are asking for.

However, the electric light will progress, and ought to progress; and we ought to feel no jealousy for it. There is plenty of room for lighting by the electric light, by oil, and by our gas; but I hope no proprietor will be so unwise, under the influence of panic, or a flaming advertisement by a new company, as to throw away his stock at a reduced value. You must look at the position of this Company. You have a 10 per cent. dividend, with a maximum price of 3s. 9d.; but your price is only 2s. 9d. You thus have 1s. margin in price before your 10 per cent. can be touched. In addition to this, you have £887,000 of undivided balance, reserve fund, and insurance fund; so that you have two years' dividend in hand at the full rate, besides the 1s. extra you might charge for gas if it were necessary for you to do so. I do not, however, suppose there will be any question of increasing the price of our gas. On the contrary, looking at the prospects of the present half year, and the satisfactory financial position we now hold, it will be our duty, I expect, to announce to the proprietors next year, when the coal and wine dues fall in, a further reduction in price, with a corresponding increase in the dividend. I have always been very careful not to prophesy, and I do not state this as a fact. But I say that the inferences, from the condition of our accounts and of our working, lead me to believe that this will be the result. *Festina lente*—go gently—has always been our motto here. We do not want to rush the price down by leaps and bounds. We want to make our position as sure as we can. We have found this policy right in the past. It is a policy which has been endorsed by our proprietors in the past; and I feel sure it will be endorsed by them in the future. Our neighbours in the South propose, I see by their report, to give the whole benefit of the abolition of the coal and wine dues—which in our case would be £91,000—to the consumers. I want to know before I deal with this £91,000 how it will come out. In the first place, we shall have, as I said last half year, if we get this duty off the coal, to make some reduction, no doubt, in the price of the coke which we sell. Then there may be taxes reimposed in the place of the dues taken away; and whatever the margin may be, I cannot tell. When we do get at the margin, however, it appears to me that our duty is to deal with it on the principle laid down by the Act of Parliament. If the sliding scale is good for anything, it ought to be worked both ways. The £91,000 would be equivalent to 1½d. per 1000 cubic feet in the price of gas, if we gave the whole of it; but as I was saying I do not think we are called upon, in a spirit of philanthropy, which is not business, to inveigh the principle of the sliding scale, which has been adopted by Parliament as a just and fair means of dealing with gas companies and their consumers. We are not called upon to invalidate this, or to go against the principle of that settlement, by devoting this money altogether to the consumer. In addition to the coal dues coming off, I am happy to say that we have made our contracts for 1889, as far as sea-borne coal is concerned, at a reduction of about 4d. per ton all round. This will give us a very handsome addition to our revenue—to the tune of about £25,000. Taking this into consideration, taking the coal dues into consideration, and remembering the increased and improving trade of the country, which reacts on our residual products, and will no doubt also add to our gas consumption, I think I am not in want of justification for my modified form of prophecy as to a reduction in the price next year, and a further increase of dividend. There is one other question which has been raised in the report—that is our litigation with the South Metropolitan Gas Company. No one can regret this more than the Court of this Company does; but we were not the attacking party. The litigation was forced on us, unless we were to sit down with a loss of £4000 a year, and meekly bear it. We have prosecuted the litigation up to the present point without success; but the judgment of the Court of Appeal decided us to go to the House of Lords. [The Governor here quoted from the judgments delivered in the Court of Appeal by Lords Justices Lindley and Bowen, which were given in the JOURNAL for Feb. 28 last, p. 377.] In the face of these judgments, was it, I ask, possible for us to refrain from carrying the litigation to the House of Lords? We were supported by the opinion of Counsel; and we were told that it was our duty to take the opinion of the highest Court. This is a question which affects the districting of the Companies, and is vital to the lighting of the whole of London; and, however deeply we may deplore being at loggerheads with our neighbour, and the money spent on law, yet it is a matter of such great importance, that I think we are bound to get a final judgment on it, and abide by it, whatever it may be. You will notice a small footnote at the end of the accounts signed by Mr. Parkes, our Official Auditor, in which he says: "A forfeiture incurred during the half year, amounting to 5s., must be borne and paid exclusively by and out of the divisible profits of the Company, and by way of reduction of dividend." Well now this fine of 5s. arose in this way: We were charged by the Chief Gas Examiner with being on one occasion below our parliamentary standard of illuminating power. We demurred to the charge, and appealed against it; and though we brought plenty of evidence, the judgment of the Chief Gas Examiner, which is final, was against us; and he declared default to have been made. Then the Metropolitan Board of Works summoned us before the Magistrate, and asked him to inflict a penalty.* The Magistrate was apparently very much surprised by this action of the Board of Works, and asked what was the evidence. There was no evidence to be brought forward. They told him: "You have simply to discharge an official duty. The Chief Gas Examiner has given his certificate that default has been made; and all that you have to do is to inflict the fine." So little evidence was there, that even the very candles by which the test had been made had been either carelessly or carefully thrown away; they were not forthcoming to prove the case against us. The Magistrate expressed his sense of the injustice of the Board of Works by inflicting a fine of 5s., instead of the statutory penalty of 40s., and a sum of 2s. for costs. I think we have great reason to complain of the action of the Board of Works in this matter. The Magistrate also seemed to have the same opinion, that we had a right to complain, because he refused them their costs. But at the very time that they were bringing this charge against us, which they did not support with any evidence, and in which they merely demanded their legal pound of flesh, and told the Magistrate that he had no business to go into the question at all, but that he was simply to inflict the fine—at that very time our neighbours on the south were admittedly, on five occasions, below their parliamentary standard, either in the case of illuminating power or in purity. One would have thought that a consistent body like the Metropolitan Board of Works (laughter) would not have made fish of one and flesh of another; but they abstained entirely from taking any action against the South Metropolitan Company, although they say that that Company's gas, when tested in the Blackfriars Road, showed "a lighting power of only 15·0 and 15·4 candles respectively, instead of 16 candles; and on three days in October the same Company's gas was found to contain ammonia to the amount of 6·6, 4·8, and 5 grains in 100 cubic feet." They go on to say: "It would, in ordinary circumstances, therefore, have been the duty of the Board to bring the matter before a magistrate, and to ask that the forfeitures pro-

vided for in the statute might be imposed on the Company. It so happened, however, that the South Metropolitan Gas Company was about that time giving facilities to the Board's officers, who were, under the instructions of a Committee of the Board, making experiments for the purpose of determining what was the most trustworthy standard of light to be used in photometry; and, as these facilities could not be claimed by the Board, and were given by the Company as an act of courtesy, it would have seemed ungracious to seek at that time to subject the Company to forfeitures in respect of defects which, although the Chief Gas Examiner was unable to certify that they were unavoidable, were yet, there was reason to believe, not due to culpable negligence. The Board confined itself, therefore, to cautioning the Company, and requesting it to use greater care in future." In the first place, they did not report their action with regard to our Company at all. They passed it over in discreet silence. In the second place, they leave it to be inferred by the public that the South Metropolitan Company were giving facilities which we refused. I can appeal to our Distributing Engineer, and other Engineers, to say that this charge—it was not exactly a charge, but an inference—was without foundation. Every facility has been given by this Company, every expense incurred, and everything done that could be done to facilitate the work of the Referees, and I think this was a most unjust proceeding. It was unfair on its merits; and it was doubly unfair when we take it in conjunction with the action as regards the other Company. However, the Board of Works, as you are aware, is a moribund body; and no doubt it wanted to show a little action before it came to an end. It is a moribund body, and, to paraphrase Sir Walter Scott—

Doubly dying, will go down
To the same vestries whence it sprung,
Unwept, unhonoured, and unsung.

(Laughter.) I think that this concludes all I have to say with regard to the report. I am reminded by the Secretary that a little difficulty arose about the fine of 5s. It is payable out of the dividend, so that, strictly speaking, it ought to have been divided into 8000 parts, and each shareholder should have paid his proportion; but as this would have entailed a considerable amount of work on our staff—who, however, are always very willing to work—I cut the Gordian knot by asking the Secretary to take the whole amount from my dividend. The steam-roller action remains the law of the land; and I think we are not likely to be troubled much more. I have reason to know that the Vestry of St. George's, Hanover Square, are anxious to get a settlement with us something on the lines of the Chelsea agreement; and I have expressed willingness, on the part of the Company, to meet them in that way, so I hope we may come to some arrangement with them. I have now dealt with the whole of the past half year. I have told you what I think about the coming half year; and all that I have to remark in conclusion is this—that the works and the plant of the Company were never in better condition than they are at this present moment. In spite of the reduction in expenditure in the wear and tear and so on, the plant and the works have been kept in perfect condition. I am bound, as a matter of justice, to say that the officers of the Company, from the highest to the lowest, have discharged their duties both faithfully and efficiently to the Company—not only in the past half year, but ever since I have had the pleasure of being Governor of the Company. It is a peculiar pleasure to me to give this testimony in the face of the proprietors, after I have given them such evidence as they have had in the report and in the accounts of the well-being of the Company. I was down at Beckton the other day; and I am very glad to be able to report that things there are going on not only very well as regards the near future of gas and the dealing with the products, but that the welfare of our workpeople there, both spiritually and from a sanitary point of view, is being well looked after. We have a very active Chaplain there, and there are ministers of every denomination, who do all they can for the spiritual wants of our people. They have a cricket-ground, a ciuder-path, and a hall where they have their meetings, concerts, &c. It has been pointed out to me, that, though there is recreation, and the means of recreation in the summer, there is a want which we might supply. They require a tolerably large shed for the winter, for drilling and gymnastics, and a swimming bath, which is almost a necessity down there. I have spoken to the Government Auditor, and he is pleased to regard favourably the proposal I mentioned; and I think if the proprietors as a whole see no objection to the expense, we might very well spend a few hundred pounds, probably £1000 in all, in providing these necessities for the recreation and welfare of our workpeople. Assuming that the meeting agree to this, and that the Board of Trade raise no obstacle, plans will be got on, and the work be done in the course of the next few months. I do not know that I have anything further to add to what I have said; but I must thank you for the kindness with which you have heard my somewhat extended statement.

The DEPUTY-GOVERNOR (Mr. H. C. Ward) seconded the motion.

Mr. JACKSON referred to the abolition of the coal dues; and said he thought that the Company ought not to be outdone in justice to the public. The abolition of the coal dues was a measure intended not to benefit the Gas Companies of the Metropolis, but the ratepayers. With the splendid dividend being paid by the Company the first six months after the last reduction in price, he thought it would be very bad policy, and unlike The Gaslight and Coke Company, if they did not "do the handsome"—in fact, the just thing—in connection with the abolition of the dues. He regarded the report as eminently satisfactory.

Mr. SIMPSON dissented from the view taken by Mr. Jackson, as to what the Company should do with regard to the benefit obtained from the abolition of the coal dues; and he expressed a hope that that gentleman's suggestion would not be acted on.

Mr. GEORGE LIVESLEY: Mr. Chairman, you will never leave me alone. You have done me many good turns; but I am afraid that the remarks you have made this morning will tend possibly to bring me before Lord Herschell for having "squared" the Metropolitan Board of Works; still I am not very much afraid of that. However, there is something to be said on behalf of the Metropolitan Board. The Gas Referees put up a new testing-station, which gave very extraordinary results; and when we were making 19-candle gas, we could hardly show 16 candles there. That accounts for the low tests recorded. I am bound to say that in defence of my own Company.

The GOVERNOR: I have not complained of your Company, but of the Board of Works.

Mr. LIVESLEY: Yes; I know. With respect to the coal dues, I agree with Mr. Jackson most thoroughly; and I put it this way: Philanthropy is not business, as you say; but justice is business. If you were going to Parliament to have your initial price fixed, and the coal dues were to be removed at the time, you could not ask for the present initial price to be renewed; because the abolition of the coal dues is equal to a reduction of 1d. per 1000 cubic feet, and therefore the public would be entitled to that penny. I think this an act of justice, and an act of wisdom. I took rather an active part on the Committee who were opposing the renewal of the coal dues. There were some eminent men on the Committee; amongst them Sir Henry Doulton, who told me repeatedly that the great obstacle to

* See JOURNAL, Vol. LI., p. 475.

the coal dues being abolished was the Gas Companies. Everyone was saying that the abolition of the coal dues would only put more money in the pockets of the gas shareholders, who had now enough; and these members of the Committee said that if it could be shown that the public would get the benefit, this argument for the renewal of the dues would be got rid of. I took upon myself—and in this I was supported by my Board of Directors—to write a letter to the First Lord of the Treasury just at the critical moment, when a deputation was going to see him; and in the course of that letter I stated most distinctly that, as far as the South Metropolitan Gas Company were concerned, the Board would recommend the shareholders not to take the additional dividend to which they would be entitled by the reduction of 1d. per 1000 cubic feet which would result from the abolition of the coal dues. I think that that is a wise thing, and a just thing. I should be the last to go for an abrogation of the sliding scale. But I say that the sliding scale has done for us more than was expected; and it is right that we should at any rate do an act of justice towards the public in this case, and I am quite sure it will redound to our advantage. There is one other matter which I should not have referred to, but for the allusions already made to the unfortunate litigation between us. You have quoted the judgments of two of the Judges; but you have not quoted the judgment of Lord Justice Cotton, who took the most decided view in the judgment. I am not going to discuss that question, as it is still *sub judice*. But it is commonly said in gas circles that everyone knows it is a personal quarrel between Mr. Phillips and Mr. Livesey; and this libel is being uttered against your respected Secretary and myself—that we are urging our respective Companies to go on with this fight simply for personal reasons. I repudiate that, as much in his interest as in my own. I feel after the transcendent services which Mr. Phillips has rendered to the Chartered Gas Company that he would not sacrifice the interests of that Company from any personal feeling whatever; and I say the same for myself. I feel, however, that you take a wrong view of the matter. You say it entirely upsets the districting arrangements. Now these districting arrangements have gone on under this system for 35 years; and whether the decision is given in your favour or is not given in your favour, I do not fear that it will upset or interfere with the districting arrangements to seriously or appreciably affect either Company. I feel that we are travelling the same road, though our horses are not in the same team. It is not a time when Gas Companies should be quarrelling amongst themselves; and I am anxious, and have all along been anxious, to see whether some means cannot be devised whereby we can put an end to this dispute. I am told that you feel sure you will win. Well, there have been two decisions against your view in the Court of Appeal—and I suppose there have been two other decisions—and in addition there is the practice of gas companies for the last 35 years. But suppose you do win, I ask "What will you win?" and if you lose, "What good will it do to us?" My Company do not want to pursue this trial for the sake of gaining the victory over you; and I cannot suppose that you want to pursue the trial for the sake of gaining the victory over us. I believe you are actuated by a desire to have the law settled and defined; and my opinion is that, by the two Boards coming together, we could settle the matter without playing further into the hands of the lawyers. You have been guided by counsel; and I am not going to say anything against counsel. I see you have them on your right and left. But counsel live by litigation; and although I would not suggest that the very eminent men engaged in the conduct of your case are actuated by this motive, still they are like doctors. If a doctor has a very serious case—such as a compound fracture or some complication of diseases—his professional pride is aroused, and he regards it as a most interesting case to him, however much the reverse it may be to the poor patient. So in this case, I fancy that counsel are urging you on because they think this a very interesting case, and that it should be carried to the highest tribunal. I am not very anxious about it—my Company has been passive from the first; we are simply waiting for any decision that may be come to. But I think it will be better for the two Companies to put their heads together, and avoid any further litigation.

The Governor: Mr. Jackson has referred to the coal dues. All that I have to say with reference to the matter is that we shall, in justice to the public, and in our own interest, reduce the price of gas as soon as we possibly can. But I see no reason why we should "earmark" the special amount which we may get for that purpose—the balance when the thing is worked out. Mr. Livesey has argued that the abolition of the coal dues was not foreseen when our initial price was fixed. I traverse that view altogether. The coal dues were not levied in perpetuity, but for a given purpose, and for a given time; and those who fixed the initial price of gas knew that these dues had a certain time to run, and they were probably able to estimate what the value of the coal dues was. As a matter of fact when the dues expired, they were extended for a short time, so as to free the London bridges. As a matter of principle, I do not see the justice of "earmarking" the amount, and handing it to the public simply because it comes out of the abolition of the coal dues. However, we must take our own course with respect to that. It is a mere matter of policy; and in the end it makes no difference, because whether the money comes from that source or any other source, we shall, when we have the money in hand, reduce the price of our gas. The only bit of grit in the wheel is the litigation between ourselves and the South Metropolitan Company; and it could all be put an end to in a moment. We say that Mr. Livesey has done a little bit of "poaching," and got into our district to the tune of £4000 a year. If he will pay us back the amount he has received, we will not go on with the case. Either the revenue belongs to him or to us. He says it belongs to him, and he has got possession, and that is nine points of the law. What we have to do is to see if the law will not give us back what we think is our own. If he thinks that the case should not go on, he has only to say, "I made a mistake. I took some of your revenue. Here it is back again." I may say that there will be no ill-feeling on the part of this Company if the High Court of Parliament and the Peers should give him the verdict, and leave us to bear the loss, which has not seriously incommoded our dividend during the past two years. We are always very happy to meet Mr. Livesey, and discuss this or any other matter with him; but those are the lines on which we should have, I think, to discuss it, in the interest of our consumers and our proprietors. I give Mr. Livesey now a direct invitation if he will come and discuss it. I would, however, ask him to postpone the matter for a fortnight or three weeks, as some of us want to go away for a little change.

The resolution was then put to the meeting, and at once carried unanimously.

On the motion of the Governor, seconded by the Deputy-Governor, the various dividends were next approved.

The Governor: That concludes the business of the meeting. I might perhaps correct what was apparently an error in one remark I made. In dealing with the "for and against" for the past half year, as compared with the corresponding period of 1887, I said that £53,841 was the net

debit. But that is only on that one account; the real deficiency is only £36,018.

A cordial vote of thanks to the Court of Directors and to the officers, for their able conduct of the Company's affairs in the past half year, was then carried unanimously.

The Governor: I am sure, ladies and gentlemen, that we are very much obliged to you for passing this resolution. We accept it with gratitude, both for ourselves and officers. We are one and all, as I have said before, actuated with but one desire—that is to make the Company in the future as great a success as it has been in the past.

The meeting then separated.

THE ACCOUNTS FOR THE HALF YEAR ENDING JUNE 30, 1888.

In the JOURNAL last week we gave the reports of the Directors and Chief Officials of the above Company for the half year ending June 30 last. We now reproduce the accounts for this period; but, following the plan adopted with the accounts for recent half years, we shall only indicate the alterations, if any, in those portions which are not subject to much variation—giving the rest of the statements in full.

Nos. 1 and 2 are statements of stock, share, and loan capital, the totals of which stand as in the previous account—viz., stock and share capital, £8,103,000; loan capital, £2,156,000.

No. 3 is the capital account, which, as far as the receipts are concerned, has not undergone any change; the total being £10,690,900 (comprising the amounts of share and loan capital above named, and £401,900 of premium capital). The expenditure is shown in the following items:—

Expenditure to Dec. 31, 1887	£10,236,324 15 7
Expenditure during the half year to June 30, 1888, viz.:	
Lands acquired, including law charges	£955 1 6
Buildings and machinery in extension of works	539 15 2
New and additional mains and service-pipes	4,038 11 6
Do. do. meters	215 16 7
Do. do. stoves	2,852 9 5
	£8,601 14 2
Less—Depreciation of meters	£3,618 0 0
Do. stoves	1,839 0 0
	5,457 0 0
	3,144 14 2

Balance of capital account	£10,239,469 9 9
	451,430 10 3
	£10,690,900 0 0

Nos. 4 and 5 are the revenue and net revenue accounts. These are given on the opposite page.

No. 6 is a statement showing how the Directors propose to appropriate the balance applicable for dividend. It is as follows:—

June, 1887.	
£55,851 .. Net balance brought from last account	£280,293 16 8
436,084 .. Net revenue for the half year	402,728 0 2
	£683,021 16 10
£491,835 ..	
(12½ per cent.) A dividend on the ordinary stock—	
334,924 ..	13 per cent. on £5,468,600
	355,459 0 0
£156,961 .. Balance carried to next account	£277,566 16 10

Nos. 7 and 8 are the reserve and insurance funds accounts. The former shows that the balance of the reserve fund on Dec. 31 last was £436,788 14s., which was increased at the close of the past half year to £495,252 5s. 1d. by the addition of £5463 11s. 1d., interest on the amount invested. The insurance fund stood at £78,092 7s. 2d. at the end of 1887; at June 30 last it amounted to £80,115 8s. 6d.

No. 9 is the depreciation fund account. It stood at £31,203 12s. 7d. at the date of the preceding report. At the end of June last it had been raised to £32,417 6s. 1d., by the addition of £750 transferred from the revenue account, and £463 13s. 6d. received as interest.

Nos. 10 and 11 are as follows; and Nos. 12 and 13 are given on the opposite page.

No. 10.—STATEMENT OF COALS USED, &c.

Description of Coal.	In Store, Dec. 31, 1887.	Received during Half Year.	Carbonized during Half Year.	Used during Half Year.	In Store, June 30, 1888.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common	951,515	779,207	886,998	827	82,897
Cannel	44,418	2,860	9,804	..	57,474
Total	335,933	782,067	896,802	827	120,371

No. 11.—STATEMENT OF RESIDUAL PRODUCTS.

Description.	In Store, Dec. 31, 1887.	Made during Half Year.	Used during Half Year.	Sold during Half Year.	In Store, June 30, 1888.
Coke—chaldrons	35,333	1,087,005	208,432	890,458	23,448
Breeze—chaldrons	12,711	120,683	52,404	75,004	6,016
Tar—gallons	603,123	10,003,787	9,178,948	927,518	505,444
Ammoniacal liquor—butts	15,157	265,802	261,120	10,862	8,977

SOUTH METROPOLITAN GAS COMPANY.

THE ACCOUNTS FOR THE HALF YEAR ENDING JUNE 30, 1888.

In the last number of the JOURNAL (p. 252), we published the report of the Directors of the above Company, which will be presented at the half-yearly meeting of shareholders to-morrow. We now give the accounts, showing the working of the undertaking in the six months ending June 30 last, the most important portions being reproduced in full on p. 298, and the following being an epitome of the remainder:—

Statements Nos. 1 and 2 show the amount of share and loan capital at the end of June. The former stood at £1,991,500, and the latter at £561,840; as against £1,977,062 and £518,540 at the close of last year.

Statements Nos. 3, 4, and 5—the capital, revenue, and profit and loss accounts—are given in full.

Statements Nos. 6, 7, and 8 show the positions of the reserve, renewal and insurance funds. The reserve fund stands at £220,544; having been increased by £185 received on the conversion of Consols, which sum remains to be invested. The renewal fund has been raised from £6737 to £6850, by an amount of £112 received for interest. The insurance fund has been increased in a similar way from £39,320 to £40,235.

Statements Nos. 9 to 11—furnishing particulars as to the manufacturing operations of the Company—are given in full; as is also No. 12, the general balance-sheet.

ACCOUNTS OF THE GASLIGHT AND COKE COMPANY FOR THE HALF YEAR ENDING JUNE 30, 1888.

Dr.				No. 4.—REVENUE ACCOUNT.				Cr.			
June Half Year, 1887.	To Manufacture of gas—	£	s. d.	£	s. d.	June Half Year, 1887.	By Sale of gas—	£	s. d.	£	s. d.
£546,650	Coals, including dues, carriage, unloading and trimming (see Account No. 10)	538,353	9 7			£1,161,625	Common gas, per meter, at 2s. 9d. and 2s. 5d. per 1000 cubic feet. . .	1,090,735	16 7		
9,861	Salaries of Engineers and other Officers at works	10,065	10 8			56,929	Cannel gas, per meter, at 3s. 5d. per 1000 cubic feet	49,510	16 6		
117,126	Wages (carbonizing)	121,112	12 1			68,550	Public lighting and under contracts—	62,747	15 2		
24,800	Purification, including £14,362 10s. 2d. for labour	27,454	3 4			2,647	Common gas	2,439	1 3		
	Repair and maintenance of works and plant, materials and labour, less received for old materials, £1437 19s. 11d.	105,279	1 9				(See Statement No. 12.)			1,205,433	9 6
106,404	Distribution of gas—			802,264	17 5	£1,289,751	Rental of meters . . . . .	..		25,577	0 0
	Salaries and wages of Officers (including Rental Clerks)	23,164	0 1			25,123	Rental of stoves . . . . .	..		2,288	5 3
24,996	Repair and maintenance of mains and service-pipes	22,470	18 8			1,974	Residual products—				
28,331	Repair and renewals of meters . . .	12,617	17 1			181,551	Coke, less £30,231 15s. 1d. for labour, &c.	195,673	0 5		
18,713	Repair and renewals of stoves . . .	3,799	18 1			4,804	Breeze, less £1853 2s. 7d. for ditto .	9,798	2 11		
2,995	Public lamps—					43,783	Tar and tar products	59,212	16 7		
	Lighting and repairing . . . . .	..				81,287	Ammoniacal liquor and sulphate of ammonia	74,193	0 11		
	Rents, rates, and taxes—					3,563				338,877	0 10
3,676	Rents payable	3,470	7 10			199	Rents receivable			3,626	12 9
72,302	Rates and taxes	72,323	13 3			300	Transfer fees			198	12 6
	Management—			75,794	1 1		Canteen account			300	0 0
2,750	Directors' allowance	2,750	0 0								
200	Company's Auditors	200	0 0								
7,040	Salaries of Secretary, Accountant, and Clerks	7,355	4 11								
14,532	Collectors' commission	14,540	19 4								
3,017	Stationery and printing	3,072	8 2								
2,029	General charges	2,051	7 7								
	Parliamentary charges . . . . .	..		29,970	0 0						
43	Law charges . . . . .	..		79	4 9						
6,798	Bad debts . . . . .	..		2,193	19 9						
8,237	Depreciation fund, for works on lease- hold land . . . . .	..		7,735	10 11						
750	Retiring allowances under amalgama- tion schemes and annuities . . . .	..		750	0 0						
12,119	Public Officers—			13,231	15 10						
	Gas Referees and Official Auditor .	1,011	8 10								
846	Public testing-stations	691	17 2								
841				1,703	6 0						
£1,030,406				1,010,389	0 11						
601,929	Balance carried to net revenue account, No. 5 .			565,911	19 11						
£1,632,335				1,576,301	0 10	£1,632,335				1,576,301	0 10

Dr.				No. 5.—NET REVENUE ACCOUNT.				Cr.			
June Half Year, 1887.	To interest on debenture stocks and bonds, accrued to June 30, 1888 . .	£	s. d.	£	s. d.	June Half Year, 1887.	By Balance from last account	£	s. d.	£	s. d.
£54,920		..		54,919	12 6	£383,927		565,230	5 5		
59,821	Dividend on the preference stocks . .	59,810	0 0			328,076	Less dividend on the ordinary capital for the half year to Dec. 31, 1887 . .	334,936	8 9		
47,500	Dividend on the maximum stocks . .	47,500	0 0							230,293	16 8
	Interest on temporary loans and sundry funds . .			107,310	0 0						
3,654	Balance applicable to dividend on the ordinary stock .			954	7 3	£55,851					
491,885				633,021	16 10	601,929	Revenue account (No. 4)			565,911	19 11
£657,780				796,205	16 7	£657,780				796,205	16 7

No. 12.—STATEMENT OF GAS MADE, SOLD, Etc.

Description of Gas.	Quantity Made.	QUANTITY SOLD.			Quantity used on Works, &c.	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lamps.
		Public Lights and under Contracts (estimated).	Private Lights (per Meter).	Total Quantity Sold.				
Common	Thousands. 9,110,131	Thousands. 439,421	Thousands. 7,964,027	Thousands. 8,403,448	Thousands. 105,406	Thousands. 8,508,854	Thousands. 601,277	45,985
Cannel	330,991	14,629	289,819	304,448	2,038	306,486	24,505	2,186
Total	9,441,122	454,050	8,253,846	8,707,896	107,444	8,815,340	625,782	48,171
June half year, 1887 . .	9,204,320	443,119	8,093,888	8,542,007	105,331	8,647,338	556,982	47,530

Dr.				No. 13.—GENERAL BALANCE-SHEET.				Cr.			
June Half Year 1887.	To Capital—	£	s. d.	£	s. d.	June Half Year 1887.	By Cash at Bankers	£	s. d.	£	s. d.
£	Balance at credit thereof . . . . .	..		451,430	10 3	£		..		158,495	0 11
457,782	Net Revenue—					169,521	Amount on deposit at interest . . .	..		400,000	0 0
491,885	Balance at credit thereof . . . . .	..		633,021	16 10	250,000	Amount invested—				
479,667	Reserve Fund—						2½ per Ct. Consoli- dated Stock . . £622,734 19 1			607,784	19 8
76,916	Balance at credit thereof	495,252	5 1			579,597	Stores on hand, viz.—				
30,007	Insurance Fund—						Coals	92,958	16 1		
	Balance at credit thereof	80,115	8 6	607,784	19 8		Coke	4,530	4 0		
	Depreciation Fund—						Tar and ammoniacal liquor and products	80,784	17 10		
	Balance at credit thereof	32,417	6 1				Sundry stores	130,913	12 9		
	Interest on debenture stocks and bonds, due on June 30, 1888 . . . . .	..		54,919	12 6		Accounts due to the Company, viz.—			309,187	10 8
54,920	Preference and maximum dividends due on June 30, 1888 . . . . .	..		107,310	0 0	102,102	Gas and meter rental—				
107,321	Unclaimed dividends due on June 30, 1888 . . . . .	..		10,915	3 2	8,548	Quarter ending June 30, 1888 . .	470,660	18 9		
10,915	Sundry tradesmen and others, for amount due for coals, stores, and sundries . . . . .	..		143,749	2 7	60,069	Arrears outstanding	21,383	14 3		
157,812	Benevolent Fund . . . . .	..		1,667	6 8	134,847	Coke and other residu# products . .	27,833	10 4		
1,667							Sundry account	15,452	17 1		
						23,504				43,286	7 5
						19,478					
1,868,892				2,010,798	11 8	1,868,892				2,010,798	11 8

ACCOUNTS OF THE SOUTH METROPOLITAN GAS COMPANY FOR THE HALF YEAR ENDED JUNE 30, 1888.

DR.

No. 3.—CAPITAL ACCOUNT.

CR.

[illegible]

No. 4.—REVENUE ACCOUNT.

To Manufacture of gas—			By Sale of gas—		
Coals, including dues, carriage, unloading, and			Common gas (per meter)—		
trimming. (See Account No. 9)	£158,527	1 10	At 2s. 5d. per 1000 cubic feet	£309,397	16 0
Purification, including £3897 for labour.	6,917	12 4	Public lighting and under contracts (see		
Salaries of Engineer, Superintendent, and			Statement No. 11).	28,581	12 6
Officers at works	5,267	5 4			£337,979 8 6
Wages (carbonizing).	39,397	19 3	Rental of meters and stoves		7,750 12 10
Repairs and maintenance of works and plant;			Residual products—		
materials and labour, less £621 19s. 8d.			Coke, less £11,938 7s. 8d. for labour, &c.	£77,672	19 4
received for old materials	35,692	0 11	Breeze, less £1643 7s. 8d. for labour, &c.	1,337	1 8
		£245,801 19 8	Tar, less £391 0s. 4d. for labour, &c.	7,566	18 10
Distribution of gas—			Ammoniacal liquor, less £640 5s. 5d. for		
Repair, maintenance, and renewal of mains			labour, &c.	20,962	7 1
and service-pipes, including labour	£10,925	2 5			107,539 6 11
Salaries and wages of Officers (including			Rents receivable		2,143 8 11
Rental Clerks)	5,840	4 4	Transfer fees		45 12 6
Repairing and renewals of meters and stoves	4,529	13 2			
		21,294 19 11			
Public lamps—lighting and repairing		6,171 10 10			
Rents, rates, and taxes		19,266 4 11			
Management—					
Directors' allowance.	£1,750	0 0			
Salaries of Secretary, Accountant, and Clerks	2,634	5 7			
Collectors	5,412	0 0			
Stationery and printing.	930	16 11			
General charges	3,276	13 0			
Company's Auditors.	112	10 0			
		14,116 5 6			
Law charges		421 2 8			
Bad debts		1,160 7 6			
Pensions and workmen's superannuation and sick fund		2,213 12 3			
Gas Referees and Official Auditor		218 13 7			
Total expenditure	£310,694	16 10			
Balance carried to net revenue account (No. 5).	144,763	12 10			
	£455,468	9 8			
			Total receipts	£455,458	9 9

No. 5.—PROFIT AND LOSS (NET REVENUE) ACCOUNT.

Interest on temporary loan and deposits	£1,157	18	9	Balance from last account	£133,635	12	10
„ bonds	289	13	0	Less dividend for the half year ended Dec. 31, 1887	128,371	15	7
„ debenture stock	13,377	12	1		<u>£5,263</u>	17	3
Balance applicable to dividend on the ordinary stock	140,032	17	5	Half-year's interest on reserve fund	4,606	0	1
				Amount from revenue account (No. 4)	144,763	12	10
				Interest on Bankers' balances	224	11	1
					<u>£154,858</u>	1	3
	£154,858	1	3				

No. 9.—STATEMENT OF COALS.

Description of Coal.	In Store, Dec. 31, 1887.	Received during the Half Year.	Carbonized during the Half Year.	Used during the Half Year.	In Store, June 30, 1888.
	Tons.	Tons.	Tons.	Tons.	Tons.
Newcastle coal.	50,829	259,765	289,985	203	20,406
Cannel coal	1,419	1,319	1,982	—	816
	52,278	261,114	291,967	203	21,222

No. 10.—STATEMENT OF RESIDUAL PRODUCTS.

	In Store, Dec. 31, 1887.	Made dur- ing Year.	Used in the Half Year.	Sold in the Half Year.	In Store, June 30, 1888.
Coke—cwt.*	131,650	3,615,979	684,937	3,055,687	10,005
Breeze—yards	4,670	51,637	1,445	54,447	415
Tar—gallons	311,936	2,955,535	1,157,702	1,875,734	234,012
Ammoniacal liquor—bushels of 108 gallons, 8-oz. strength.	4,325	92,874	—	94,343	2,956

* 1 cwt. of coke about equals 1 sack of 4 bushels, under Weights and Measures Act, 1878.

No. 11.—STATEMENT OF GAS MADE, SOLD, ETC.

Description of Gas.	Quantity made.	QUANTITY SOLD.			Quantity used on Works, &c.	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lamps.
		Public Lights (estimated).	Private Lights (per Meter).	Total Quantity Sold.				
Common	Thousands. 2,899,893	Thousands. 191,839	Thousands. 2,570,305	Thousands. 2,762,744	Thousands. 32,458	Thousands. 2,795,202	Thousands. 104,691	17,522

No. 12.—BALANCE-SHEET.

To Capital—			By Cash at Bankers			£100,347 13 8
Balance, per account No. 3	£102,091	1 2	Amount invested—			
Reserve fund—per account No. 6	220,541	1 2	Reserve fund	£220,359	0 9	
Renewal fund—per account No. 7	6,850	4 11	Renewal fund	6,530	1 1	
Insurance fund—per account No. 8	40,235	15 2	Insurance fund	39,320	6 6	
Not revenue account—for balance, per account No. 5	140,032	17 5				266,209 8
Debiture and bond interest, for amount due to June 30, 1888	13,687	5 1	Cash in hand for sundry payments			500 0 0
Sundry tradesmen, for amount due for coals, stores, and sundries	23,160	8 1	Stores in hand—			
Deposits by consumers	36,534	17 8	Coals	£12,298	19 5	
Dividend account (outstanding)	£1,161	1 11	Coke and breeze	391	14 5	
Debiture account	0 9 8		Tar and ammoniacal liquor	1,485	19 4	
		1,461 11 7	Sundry stores	55,418	5 9	69,494 18 11
			Accounts due to the Company—			
			Gas meter and stove rental, quarter ending			
			June 30, 1888	£135,818	1 5	
			Arrears outstanding	1,368	16 0	
						127,181 17 5
			Coke and other residual products			19,834 13 1
			Sundries			1,009 10 10
	£584,578	2 3				£584,578 2 3

BRENTFORD GAS COMPANY, LIMITED.

The Half-Yearly General Meeting of this Company was held last Friday, at the Charing Cross Hotel—Mr. Howard C. Ward in the chair.

The SECRETARY (Mr. W. Croxford) read the notice convening the meeting; and it was agreed to take as read the Directors' report and accounts, a reference to which appeared in the JOURNAL last week (p. 252).

The CHAIRMAN said it was his duty to move, as usual, the adoption of the report and accounts. In bringing them to the shareholders' notice, he should have very few words to say, as they spoke well for themselves. He had great pleasure in laying them before the proprietors, as it was one of their red-letter days when the Board were enabled to announce the declaration of a larger dividend by $\frac{1}{2}$ per cent. than they had done in either the last or the corresponding half year of 1887. From the time they reduced the price of gas to its present price in the district—that was the last 2d. reduction—they had not had any dividend under the sliding scale until that day. They had given the whole of the benefit to the consumers as soon as they could. Now it was the shareholders' turn, and they had the $\frac{1}{2}$ per cent. to which they were entitled under the provisions of the Act of Parliament; and he (the Chairman) would put before the meeting a resolution to authorize the payment of a dividend at the rate of $11\frac{1}{2}$ per cent. per annum upon the ordinary stock. The shareholders would see that in almost every particular—he thought he might say in every particular—the accounts presented very favourable results. There were very few items indeed which were in any way against the Company. They had certainly spent £282 more in coals, but they received in respect of that sum, in the way of gas-rental, £2595; so that he thought they would agree that this sum of £282 was very well and profitably laid out. In every particular he believed they were better. In the wear and tear on their manufacturing plant, although they had expended upon it every penny that he thought Mr. Morris (their Engineer) in his ingenuity could fairly lay out, they had still spent £706 less than in the corresponding half year. In the wear and tear in distribution, they spent £399 more; but in this sum was included an amount of £250 which had arisen from an accident that occurred, not by any neglect of the Company or of any person connected with it, but by that great bugbear of all gas companies—the steam-roller. The steam-roller of the parish of Hammersmith went up a street where there is one of the Company's mains, and the pipe was broken, and an explosion took place, by which damage was done to certain houses. Of course, the Board all believed they had a very excellent case for legal proceedings against the Hammersmith Vestry; but, although he (the Chairman) was a lawyer, he was not particularly fond of the law, and if they could manage to keep good friends with their neighbours upon reasonable terms, he thought it better to settle the thing without going into Court, and not spend their money. This extra amount of £399 on wear and tear in distribution comprised the amount they expended in restoring the houses and shops that were damaged. The general result of the half year was this—that they had a gross profit of £31,774 7s. 1d., as against £27,056 for the corresponding six months of 1887; and after they had declared the $11\frac{1}{2}$ per cent. dividend, the $8\frac{1}{2}$ per cent. upon the new stock 1881, and met the preference charges, they had on the half-year's working a surplus of £647 10s. 8d., which he considered an extremely good thing, and for which, of course, they were mostly indebted to the intelligence and energy of the officers of the Company. The net result of the whole thing was this—that the Board would pay the dividends and carry forward £35,698 18s. to the undivided profit account. The value of the residual products had been going up. Some people might think that they had now come to the time when the public would be looking for a reduction in the price of gas, because of the approach of the abolition of the London Coal and Wine Dues; but he (the Chairman) was not at all sure of the effect this might have upon the Gas Companies. It was not at all clear to him that it would be all profit to the Company, because it was perfectly plain that if these dues were taken away from the people who had to find the money, and expended it for the public benefit, the money would have to come from some other source, and they would be taxed in some other way; and this amount of money would have to be raised, of which they would have to pay a considerable part. Besides this they would lose a good deal of money on the coke, because their coke contractors and the people who took the coke had, in connection with this, a drawback of 1s. a ton from the Corporation; and when this was gone they could not pay the Company the same price for the coke which they paid now. And therefore, adding this and this together, they hardly knew how the abolition of the dues would affect gas companies. They would not affect them so as to benefit them as much as was supposed. The Board's decision, and their duty and wish, was to reduce the price of gas as soon as they could; and it would be their duty to the consumers and to the interest of the shareholders. The Company had been going on in a marvellous way. He saw the capital had increased 58 per cent. in the last ten years. The gas sold had increased just cent. per cent. This was very good indeed. The price of gas had been reduced 20 per cent. The coals carbonized had increased 78 per cent. The gas sold per ton of coal carbonized showed that Mr. Morris, who was their Engineer ten years ago—and he (the Chairman) hoped would be so in ten years' time—had managed to work such improvements that he was now able to manufacture much more gas from the coal than he was able to do ten years ago. He concluded by moving—"That the report and accounts be adopted and entered on the minutes."

Mr. J. ORWELL PHILLIPS seconded the motion, which was at once carried unanimously.

On the motion of the CHAIRMAN, seconded by Mr. PHILLIPS, dividends were declared at the rate of 5 per cent. per annum on the 5 per cent. preference stock, at the rate of $11\frac{1}{2}$ per cent. per annum on the consolidated stock, and at $8\frac{1}{2}$ per cent. on the new stock, 1881, payable on the 1st prox.

Mr. MATTHEWS proposed a vote of thanks to the Chairman and Directors.

Mr. LAXTON seconded the motion; remarking that he thought the Board had done right in recommending the additional dividend to the shareholders. He was a lawyer, and entirely concurred with what the Chairman had said in regard to litigation. It was very wise indeed on the part of the Board, in the present state of litigation, to settle the matters to which the Chairman had referred.

The motion having been unanimously carried,

Mr. LAXTON proposed, and Mr. GIVENS seconded, a vote of thanks to the Auditors (Messrs. W. Bradfield and J. W. Field); and it was agreed to.

A vote of thanks was accorded to the officers of the Company; and the proceedings then terminated.

PROPOSED PUBLIC LIGHTING OF FORMBY WITH GAS.—Last Friday, a three days' poll with regard to the lighting with gas of the roads in the Formby district was brought to a close. Up to the opening of the poll on that day the figures were 89 against gas, and 12 in favour of the scheme. At the close, the presiding officer announced the result of the polling as follows:—For gas, 31; against, 175.

BIRMINGHAM CORPORATION GAS SUPPLY.

WORKMEN'S HOLIDAYS.—SALES OF COKE.—SALARIES OF OFFICIALS.

At the Meeting of the Birmingham Town Council last Tuesday—the Mayor (Alderman Pollack) in the chair—the report of the Gas Committee, an abstract of which was given in the JOURNAL for the 3rd ult. (p. 33), was brought up for approval. In the course of the discussion, questions were introduced reflecting upon the administration of the department.

Mr. BISHOP proposed the adoption of the report. Alluding to the subject of workmen's holidays, and to the recommendation of the Committee that the memorial received from the workmen at the Windsor Street station should be "referred to the General Purposes Committee for the purpose of obtaining information as to the practice followed in the other departments," he said that this manner of dealing with the memorial was recommended because its promoters were in error as to the custom of other departments, on which, in a measure, they founded their case. The Committee were asked to depart from a principle which had hitherto been carried out in respect of the holidays in the Gas Department. They were of opinion that the best course to adopt would be to refer the matter to the General Purposes Committee, so that they might bring forward some general scheme acceptable to all departments.

Mr. BLOOR moved, as an amendment—"That the prayer of the memorialists be and is hereby conceded; and the Gas Committee be authorized to make the necessary arrangements for such holiday." He said he was surprised that a question between employers and employed should be referred to a Committee not concerned with the matter. It seemed to him that the proposal was simply an attempt to shuffle out of the application. In the same department the chief officers had three weeks' holiday; and even the gatekeeper had three days' holiday each year. The men alluded to in the memorial worked, on an average, 78 hours a week.

Mr. WHATELEY, in seconding the amendment, said it was evident that the nature of the men's work alone entitled them to a week's holiday.

Mr. STRINGER protested against the suggestion that the Gas Committee were trying to "shuffle" out of their responsibilities. In many respects he thought the question could best be dealt with by the Public Works Committee. There was also the ratepayers' view of the matter to be considered. He estimated that if the request of the memorialists were carried out, there would be an additional cost of £1650 a year to the town, or a total of £3000 in respect of the holidays of Corporation employees.

Mr. LOWE said that in his opinion the Public Works Committee could best deal with the subject.

Mr. GREEN remarked that the cost of granting the memorials would be about £800 a year, and not £1650, as Mr. Stringer had stated.

Mr. LOUGHTON suggested that the following rider should be added to the proposal of the Committee:—"And that in the meantime the Gas Committee gives to the carbonizers the week's holiday asked for, proportionate to their term of employment; but that this should not be taken as a precedent."

Mr. MARTINEAU said he could not approve of one Committee regulating the holidays to be given to the workmen under another Committee; and therefore, he should vote for the amendment.

Mr. BLOOR observed that he would accept Mr. Loughton's suggestion.

Alderman BARRATT moved, as an amendment, that the matter be referred back to the Gas Committee.

Mr. BRINSLEY seconded the amendment.

Mr. LAWLEY PARKER asked Alderman Barratt to accept the following amendment in lieu of his:—"That the question of the two memorials in reference to the holidays be referred back to the Gas Committee to be dealt with by them, and that the Gas Committee be asked to deal with the subject at once." He thought that the matter would become more complicated if it were referred to the General Purposes Committee.

Mr. BEALE said he hoped that Mr. Parker's amendment would be adopted.

Alderman MANTON considered that the discussion which had taken place was a desperate effort to gain a victory over the Gas Committee. The Gas Committee, he said, were prepared to deal as generously with their workmen as any individual member of the Council dealt with his own men; and he was sure that the matter might be left entirely in their hands.

Mr. BISHOP here intimated that he would accept an amendment referring the matter back with instructions to further consider the subject, and to deal with the same in such manner as the Committee might think advisable. In accepting this, he said that the Committee should be called together immediately; and the question of the men having a week's holiday should be at once considered.

Mr. BOWKETT inquired if Mr. Bishop would accept the following addition to the amendment:—"And that in the meantime the prayer of the memorial from those employed in the carbonizing department be granted." If the addition were adopted, he would second the amendment.

Mr. BISHOP said he could not accept the addition, for this reason—The word "carbonizers" referred to 660 men. The total cost of granting the prayer of the memorials would have been about £1000. He could not promise that the holidays would be granted; but he had every expectation that they would be.

A division was then taken; and Alderman Barratt's amendment as altered was carried, and afterwards adopted as a substantive motion.

Mr. BISHOP, referring to the discussion which had taken place in the newspapers with reference to the sale of coke by the Corporation, said that the Committee had 150,000 tons of coke to dispose of every year. It was impossible to get rid of the whole of this in Birmingham, although the Committee had directed their constant attention to developing the demand for coke in the town. Notwithstanding their utmost exertions, however, they had not been able to sell in the town more than half of the quantity mentioned. In 1877 the town sales amounted to 38,500 tons; and last year 72,000 tons. They had always had to depend on the ironmasters of the Black Country to take the remainder; but unfortunately, through the long depression, the sales to the ironmasters had been a diminishing quantity from 1877. In that year they sold to them 58,426 tons; but in 1885 only 33,000 tons. But whilst the sales to the iron trade had decreased, the sales in the town had gone up. He was glad that trade in the iron-making districts had been increasing; and in 1887 the sales amounted to 51,141 tons. The complaint was made that the Birmingham consumers had to pay higher prices than outside customers; but the Committee were ruled by the consideration that the larger the quantity taken, the lower the price. The critics of the Committee said that the undertaking should be carried on for the benefit of the ratepayers; but he wished to remind such people that the works were conducted on economical principles, and for the purpose of securing the largest profit for the benefit of the ratepayers. The Committee had come to the conclusion that it was very unwise to stack coke, in consequence of the deterioration which ensued. It was found that if they put 100 tons down, they only took up about 20 tons of good coke. They therefore resolved to clear the yards every summer; and to do this they had had to sell at such prices as they could obtain. They had done all they could to promote the sale of coke in Birmingham; and the Birmingham people had had the coke at the market price. He

thought the feeling of the Committee was that they should have winter and summer prices. This year they would make £4000 to £5000 more out of the coke than in previous years.

Alderman BARRATT, in seconding the motion for the adoption of the report, asked if it was true that extraordinary advances of salary had recently been made by the Gas Committee—in one case as much as £250, in another £300—and as the result another application for £200 advance had been received; and if so how it was the Committee had not recorded this in the report submitted that day.

Mr. BISHOP, in reply, said it was true that such increases of salary had been granted. The reason why the matter was not brought before the Council was that from the time the Committee took over the undertaking no increases had been reported. When the Committee was appointed, an elaborate scheme was drawn up, upon which they acted, except in the case of their chief officers.

Alderman BARRATT thought it was time the Gas Committee mended its ways. He had been a member of the Corporation for many years, and must confess that he never heard of any Committee not reporting such matters. He would move—"That it be an instruction to the Gas Committee to report in future every increase of salary, in accordance with the custom of other Committees."

The MAYOR pointed out that Dr. Barratt rose to second the adoption of the report.

Alderman BARRATT: I will make the proposal at a future time.

Mr. CLARKE called attention to the quality of the gas. He said that he had made a number of tests, and found that the illuminating power of the gas averaged 13½ candles—the extremes being 12 and 17 candles. With regard to the point raised by Dr. Barratt, it did not follow that because a certain system had existed for several years, it was a good one.

The TOWN CLERK, in reply to a question, said there was no standing order that any Committee should report rises of salaries; but it had been the practice of all Committees to do so, with the exception of those controlling the Gas and Water Departments. These exceptions arose from the action of the Council itself. When the Corporation took over these undertakings, it was thought necessary to delegate to the Committees in charge of them "all the powers" of the Council, and that carried with it the power to appoint such officers and servants as were necessary.

Mr. LOWE moved an amendment—"That the report of the Committee be adopted; and that it be an instruction to the Committee to furnish to the next meeting of the Council full particulars of the recent increases of salaries of the officials of the Department; and further, that the Committee in future shall report to the Council all suggested increases of salaries in accordance with the custom and practices of other Committees."

The MAYOR: The latter part of the amendment is against the previous order of the Council; so that you must give notice of it.

Mr. LOWE said he would move the former part of the amendment only, and would give notice of the latter part.

Mr. BRINSLEY seconded the amendment, remarking that no doubt the resolution mentioned by the Town Clerk was carried; but in those days certain members had great power. The £250 increase was not the worst part of it; the Committee might have reported it to the Council afterwards. He quite agreed that large salaries must be paid for head officials; and no Corporation was better officered than that of Birmingham.

Mr. JARVIS said this was an exposure of a system which was grossly irregular—"No, no."—and he held to that opinion in spite of what might be said to the contrary. Salaries had been added to a surprising extent; and he thought the ratepayers would feel that those who had not consulted the Council would deserve the strictest condemnation.

Mr. THOMASON hoped that the discussion would bring out a great many irregularities which he had complained of from time to time. The Council would do well to go a step further, and inquire into the appointment of officials, expenditure on deputations, and other matters. He considered that it would be well if these questions were referred to the General Purposes Committee.

Mr. LANCASTER inquired whether, in addition to the salaries paid to the engineers, any commission was paid upon any of their patents; also whether any of their patents were used in the Gas Department, and if so, what amount, if any, was paid for them. In regard to the subject of salaries, he thought that a man who was worth his money ought to be paid. Referring to the coke question, he asked how many tons of coke dust were taken away in canal boats last year? How was it they did not get more than one-half they ought to obtain from coke, which was the largest residual, and one which should pay the most?

Mr. CLAYTON pointed out that the Gas Committee had the control of two millions of capital; and whether they gave to two or three officials a hundred or two more for extra efficiency, it was of very little importance. It did not affect the rates; and considering the enormous amount of risk there was involved, they ought to get the very best officers. He hoped the Committee would not be "heckled" in its work by too great a reference of details to the Council itself. Until they had done something egregiously wrong, let them give the Committee their full confidence, and not trouble them by worrying them to come up for the approval of every small detail.

Mr. GRAMER remarked that he had not heard of anything the Committee had done which had excited so much indignation as this advance of salaries. They might be certain that the matter would be brought forward again, and that a motion would be made in October for the reduction of the salaries to their former amounts. Many members, moreover, were of opinion that Mr. Hunt alone would manage the two concerns much more efficiently. The Engineers would both run away together to The Gas Institute—neglecting their work, and dragging the name of Birmingham through the mire at the same time.

Mr. BLOOR asked whether it was in accordance with the common practice of the Corporation to allow officials to trade outside the Corporation, or to pay commission or royalties to them.

The MAYOR said that no Engineer or employé of the Corporation had a right to exact a commission from the Corporation. No such commission or royalty had ever been or could be paid.

Alderman COOK did not wish to dispute the great powers given to the Committee; but it seemed to him the very reason why they should make the Council their confidants. In his opinion, they ought to have reported immediately after making these large advances. Alderman BARRATT had done a public service in raising the question; for it was a matter of common talk outside. He did not think that the justness of the advances would have been disputed, for he believed that they had been well deserved; but that was the very reason why the Council should have been told of them.

Mr. BISHOP said that he would accept the amendment. The Committee had had no indisposition to report these things. The Council had not asked for a report before; but the Committee would be very happy to give such reports in future.

Mr. WHATELEY asked Mr. Bishop to give them some reason for increasing the salaries, so that they could in turn afford the information to their constituents.

Mr. BISHOP observed that the salaries had been increased because of the

good work which those who received the increases had done. Some gentlemen said that they had never heard of a secretary of a gas undertaking receiving so much as Mr. Smith; but some of the London secretaries received a very much larger sum. In "Field's Analysis" they would find that Birmingham stood almost at the lowest point in the matter of salaries when the amount of gas was taken into consideration. If they added to salaries other matters, they would find that Birmingham was at the lowest point when compared with other towns in the kingdom. With reference to the tests of the gas spoken of by Mr. Clarke, the Committee's results were diametrically opposed to those given by that gentleman. At the same time that he found an illuminating power of 13 candles, the Committee's test gave 17 candles.

The report was then approved, and the resolution carried.

A meeting of the Gas Committee was held last Thursday morning to consider the question of the workmen's holidays, in accordance with the resolution passed by the Town Council. Subsequently the Mayor and the Chairman of the Committee (Mr. Bishop) communicated the result of the meeting to the representatives of the various newspapers. The Mayor explained the action of the Committee hitherto upon the question; commencing with the decision last year not to employ the men on Sundays except on urgent occasions. The promise of extra remuneration for Sunday labour was of little avail to the men, and therefore the Committee announced that they intended to give the stokers and carbonizers a holiday during the summer months. The matter was debated in the Council; and it being resolved that the men should be paid 1½ days' pay for Sunday work, the Committee's proposal fell through. After reading extracts from the newspapers in reference to the vote, the Mayor went on to say that immediately afterwards the stokers at Adderley Street and Swan Village memorialized the Council in favour of holidays instead of extra Sunday pay, but as the Council had in the previous year negatived indirectly the Committee's proposal, they thought it advisable to refer the matter to the General Purposes Committee to lay down a general principle applicable to all departments of the Corporation. At the last meeting of the Council the matter was referred back to the Committee, and they therefore passed the following resolutions at the meeting that morning:—"Resolved, that a holiday of one week (equal to 6½ days) in each year be given during the summer months to the firemen, stokers, machine men, coke wheelers, and odd men—such men being described as carbonizers, or men working in the retort-houses—who have been employed not less than ten months in the year ending June 30; it being understood that such holiday is to be an actual holiday, or rest from work, and that no money compensation is to be paid in lieu thereof."—"Resolved, that a holiday on Christmas Day, Whit Monday, and the first Monday in August, or other days in lieu thereof, be granted to all workmen who have been for not less than ten months in the year ending June 30 in the direct employment of the department, other than the carbonizers, who have been dealt with in the previous resolution; it being understood that such holiday is to be an actual holiday or rest from work, and that no money compensation is to be paid in lieu thereof."

EDINBURGH AND LEITH GAS COMMISSIONION.

A Meeting of the Edinburgh and Leith Gas Commissioners was held last Tuesday—Bailie TURNBULL presiding.

A conversation arose regarding the appointment of Mr. J. M. Jack as interim Clerk; the qualifying word being objected to by the Parliamentary Agent. To avoid complication, it was agreed to state in the minutes that Mr. Jack was appointed Clerk during the pleasure of the Commissioners; the appointment being in the meantime for three months.

The minutes of several Committees were read. One of them stated that the Committee appointed on the 27th ult. to confer with the Committee of the Directors of the Edinburgh Gaslight Company as to the arrangements for the transfer of the Company's undertaking, met in the premises in Waterloo Place on the afternoon of the 30th. The Company's Committee made the following suggestions for the consideration of the Commissioners:—(1) That Mr. Watson, on behalf of the Company, should be allowed, by himself and an assistant, to occupy his present room until the Company's affairs were wound up; (2) that a statement should be made by the Company and submitted to the Commissioners of the accounting between the Company and the Commissioners, and that this statement and all questions connected with the accounting should be submitted to Mr. J. A. Molleson, C.A., as sole arbiter; (3) that Mr. George Livesey, C.E., should be appointed sole valuator and arbitrator under section 20 of the Act; (4) that the Company's present collectors should, at the Company's expense, collect the accounts for the spring quarter due to the Company; (5) that the proportion of the current quarter's accounts for gas due to the Company should be calculated from an average date, so as to determine in a fair and equitable manner the amount due to the Company up to the 1st of August, and which should be collected by the Commissioners at the same time as they might make their first collection—the Commissioners paying to the Company its proportion, less a commission of 10 per cent.

A meeting of the Works Committee was also held on the 31st of July with the Edinburgh and Leith Gaslight Company. After discussion the parties agreed to recommend as follows:—(1) That Mr. George Livesey, C.E., should be appointed sole valuator and arbiter under section 20 of the Act; (2) that Mr. Livesey shall determine the proportion of gas-rental due to the Company as at the 1st of August 1888, and the terms upon which the rental shall be calculated and paid by the Commissioners to the Company; (3) that Mr. Linton shall at twelve o'clock to-night note the quantities and kinds of coal, coke, lime, waste lime, and stock of gas within the gasholders and pipes; (4) that Mr. Linton and Mr. Gibb shall, until other arrangements be made, continue in the service of the Commissioners at the salaries they are presently receiving from the Company—Mr. Linton as Engineer and Manager of the Leith works, and Mr. Gibb as Treasurer at the Edinburgh office.

Bailie ARCHIBALD explained that the two Companies took different methods of determining the quantity of gas due to them at the 1st of August. The Edinburgh Company began a survey of all their meters on the 19th of July; and they would calculate on the quantities eleven days before and eleven days after the 1st of the month. The Edinburgh Company wanted the Commissioners to take over their bad debts; but the Commissioners did not wish to prosecute people for money which the Company had not been able themselves to collect. The Leith people, on the other hand, did not take the accounts of any meters at all. The register at midnight on the 1st of August was taken; and the Commissioners had agreed to allow Mr. Livesey to determine what was the amount due to the Leith Company, as at the 1st of August, and the terms upon which this was to be paid for.

The CLERK stated that, as the Leith Company's inventory appeared to contain a number of articles, in the shape of tools and material which did not, in the opinion of the Committee, come into the category of "stores" under the 20th section of the Act, he was instructed to make a

preliminary objection on this point to the arbiter, and to ask him to exclude from the valuation every article which had been used, and was being used. The same would apply to the inventory of the Edinburgh Company. He was also instructed to ask Mr. Beveridge, the Parliamentary Agent, to make objection on this point.

Mr. COLSTON having quoted from the Act, Bailie ARCHIBALD said the real question was, whether implements such as barrows, shovels, &c., which had been used as "stores," were within the category. The Committee said they were not; and therefore they had advised that an objection should be taken before the arbiter on the point at issue. If it was argued that barrows, shovels, picks, and tools required by the men were included, they might take in the meters and pipes also.

The minutes were adopted. The Finance Committee reported that £10,000 of the mortgage debt of the Leith Company fell due at Martinmas. By the 11th inst. they would require to give notice whether they would renew these loans, or whether they would pay them off. The loans were at 4 per cent. The Committee recommended the Commissioners to renew the loans, for five or seven years, at 3½ per cent. The Finance Committee further recommended that at the next meeting they should appoint a Treasurer and collector.

The recommendation was adopted.

GLASGOW CORPORATION GAS SUPPLY. ANNUAL REPORT.

The Glasgow Corporation Gas Committee have within the past few days completed and passed their nineteenth annual report and financial statement, which applies to the year from June 1st, 1887, to May 31st, 1888. It will this week be issued to the members of the Town Council generally; but as August is a "holiday" month with them, it will not formally be brought forward for final approval till the meeting of the Gas Trust in September. There is every probability, however, that all the recommendations made by the Committee will be accepted without any material modification. A number of the facts dealt with in the report have from time to time been incidentally mentioned in the JOURNAL; but it may be convenient here to give a full summary of the report as prepared by the Gas Committee.

In that portion of the report which deals with finance, it is stated that

The gross revenue amounts to	£383,566	3	7
The gross expenditure to	£285,125	10	8
To this is added depreciation written off capital	49,379	8	9
Interest on borrowed money (including £7414 19s. 1d. of interest on redeemed mortgages paid into sinking fund)	2,000	0	0
Sinking fund	2,000	0	0
	381,191	14	9
Leaving a surplus on the year's operations of	£2,374	8	10
To this falls to be added the balance at the credit of profit and loss account carried from the previous year's account	2,826	13	4

Makes a sum to be carried forward to next year's accounts of £5,201 2 2

This summary of the financial arrangements which have commended themselves to the Gas Committee does not seem to indicate much prospect of the proposal which Bailie Shearer has before the Gas Trust, which is to take a sum of £5000 from the year's profits to be devoted to the purposes of the "common good" of the city, or for carrying out public improvements. It would almost appear as if the members of the Gas Committee had determined that the balance to be carried forward should be reduced to such an amount (by writing off for depreciation, &c.) as to leave little or no encouragement for that gentleman to proceed with his motion when the accounts come up for consideration.

The Committee state that they advertised for tenders for coals to be supplied during the current year, and that they have bought the greater portion of the quantity required on terms equally favourable with those of last year. On this account chiefly, they have agreed to recommend that a reduction be made in the price of gas from 2s. 10d. to 2s. 8d. per 1000 cubic feet; this reduction to take effect retrospectively as from the date of the last meter-survey. The probability of a reduction being made in the price of gas to the extent of 2d. per 1000 feet was mentioned in the JOURNAL a fortnight ago.

During the past year the amount of gas sold or accounted for was 2,427,078,000 cubic feet; being an increase of 6·21 per cent. over that of the year 1886-7, when it was 2,285,136,000 cubic feet. The quantity of gas made during the year was 2,705,440,000 cubic feet, as against a make of 2,596,470,000 cubic feet in the preceding year. The report states that the sinking fund now amounts to £204,518 0s. 3d.

Under the head of "Works" the report informs us that the exhaustor machinery mentioned in the preceding report in connection with the Dalmarnock works was completed and put in operation during last winter. All the apparatus at these works has been kept in thorough repair. Additional ground has been purchased, and will be utilized in the future development of these works. As regards the Dawsholm works the Gas Committee state that the new scrubbers and station meters mentioned in the report for 1886-7 were completed in time to be put in operation last winter. No further extensions have been made at these works; but the apparatus has all been kept in thorough repair. As anticipated in the preceding report, a scheme for the reconstruction of Tradeston works was submitted to, and approved of by the Town Council; and an Act was obtained in the present session of Parliament authorizing the extension of the works proposed in the scheme. Plans are now being prepared; and estimates will shortly be submitted for the bridges and other preliminary works, and the reconstruction contemplated will be commenced as soon as possible after next mid-winter.

During the past year the loss by unaccounted-for gas amounted to 10·29 per cent., which is less than that of any previous year. As compared with that of the year 1886-7 it shows a decrease of 1·7 per cent. In the year 1885-86, it was 11·32 per cent.; and in the preceding year it was 10·66 per cent. If we mistake not, the last-mentioned result was obtained in the year after the service-pipes and street mains had undergone a thorough overhaul.

The greatest quantity of gas consumed in a period of 24 hours during the year 1887-8 was 16,287,000 cubic feet, as compared with 16,266,000 feet in the preceding year. At the end of the past financial year, the number of meters in use was 130,237; being a decrease of 362 as compared with the total in use at the same time in 1887. During the year 18,603 meters were repaired at the Walls Street workshops; and in the course of the year 14,768 were examined while in use, and found to be in a satisfactory condition, and 2202 were found defective and removed. New mains of a

total length of 13,901 yards (or well-nigh eight miles) were laid during the year. As regards the hiring and sales of stoves and other gas appliances, satisfactory progress continued to be made during the past year. The hires included 1465 stoves, &c.; and the gas heating and cooking appliances sold during the year amounted to 1193.

Some more detailed reference may now be made to the various accounts embraced in the financial statement. The stock capital created in the shape of "Glasgow Corporation Gas Annuities," when the works and interests of the Glasgow Gaslight Company and the Glasgow and Suburban Gas Company were taken over by the Corporation in the year 1866, was £300,000, bearing perpetual annuities at the rate of 9 per cent. per annum, and £115,000 rated at 6½ per cent. per annum. Collectively, the yearly annuities or dividends amount to £34,762 10s. The loan capital authorized is £1,000,000; but only £287,345 has actually been borrowed—leaving the sum of £712,565 as still available. The major portion of what has been borrowed—£188,435—consists of mortgages redeemed out of the sinking fund, which is composed of revenue set apart to be used in the redemption of mortgages and annuities. It is provided in the Corporation Gas Act that to what extent mortgages are redeemed out of it, to the same extent the borrowing powers of the Gas Trust shall be cancelled. The Act further provides that interest shall accrue to the sinking fund on the mortgages so redeemed, which is also to be applied in the same way.

In the statement dealing with the capital account, it is shown that the Dalmarnock station and works and the Dawsholm station and works are now valued, respectively, at £96,501 14s. and £141,536 7s. 6d.; the amount written off for depreciation during the year being in each case 5 per cent. The same percentage has also been written off the value of the Tradeston station and works, which are now rated at £51,910 15s. 2d.; but in addition the sum of £12,000 has been written off as an "extra" for the purpose of meeting renewals, so that they will now actually stand in the books at the value of £39,910 15s. 2d. In the statement of accounts issued at this time last year, the amount written off for depreciation was in each case 7½ per cent., which is the rate for depreciation written off at this time in making valuations of several other large items of property. The workshops in Walls and Stirling Streets, with depreciation and additions during the past year, are now rated at £10,931 13s. 3d.; and the Chemical works at Dawsholm are valued at £7911 8s. 7d. With extensions made during the year and the high rate of depreciation, the pipes and cost of laying are put down as being valued at £178,732 6s. 4d. As regards the gas-meters belonging to the Gas Trust, depreciation has been made at the rate of 6 per cent.; and with additions during the year amounting to £8097 15s. 10d., the total value is now set down at £108,579 5s. 3d. The net value of the gas-stoves, &c., on hire and in stock is given at £11,833 7s. 6d. When these various items and those referring to property in Partick, offices in Virginia Street, workmen's dwelling-houses at Dawsholm, counting-house furniture, &c., are taken into account, together with a balance of £91,165 0s. 7d., there is a grand total of £702,435.

Coming to the statement under the head of Revenue account, we find that 276,447 tons 6 cwt. of coal were used last year, the cost of which (with carriage) was £143,273 12s. 7d. Including the cost of purifying materials, &c., the salaries of engineers, superintendents, and officers at works, workmen's wages, repairs and maintenance of works and plant, machines, apparatus, tools, materials and labour, and carting and stabling account, there was a total expenditure for manufacture of gas amounting to £227,082 11s. 6d. In like manner, the distribution of gas involved an outlay of £32,227 12s. 8d. The rents and feu duties, rates, assessments, and taxes are set down at £16,147 6s. 6d. For salaries and other expenses connected with the management in the Treasurer's department in Virginia Street, there is a total of £7975 15s. 6d. Law and Parliamentary charges are set down at £1275; and the retiring allowances to old servants of the Gas Companies at £417 4s. 6d. With the sum of £49,379 8s. 9d. written off for depreciation of works, pipes, meters, etc., the grand total is £334,504 19s. 5d. For sales of gas, and including a sum of £4442 16s. of arrears of previous years recovered over the estimate, there was obtained the sum of £338,498 7s. 6d. The coke sold realized £16,105 16s. 7d.; and the income from ammoniacal liquor and tar was £26,637 7s. 10d.—or together the residual products yielded £42,743 4s. 5d. For waste lime a sum of £972 9s. 10d. was obtained. These and several other items made up a revenue of £383,566 3s. 7d.; so that there was a balance of £49,061 4s. 2d. to carry to profit and loss account.

Under the head of profit and loss account (net revenue), we find the annuities on stocks for the year ending Whitsunday, 1888, set down at £33,748 11s. 10d., after deducting £1013 18s. 2d. in the shape of income-tax. Then we have interest on mortgages, and redeemed mortgages, &c., for the same year, amounting to £10,988 3s. 6d. The sum carried to sinking fund, as already mentioned, was £2000. These items, together with the balance of £5201 2s. 2d. carried to next year's account, make up a total of £51,887 17s. 6d., which is exactly the amount of last year's balance brought forward and that of £49,061 4s. 2d. just referred to as having been brought from revenue account, and which is profits.

The general balance-sheet shows on the one side a balance of £91,165 0s. 7d. at the credit of capital account; a balance of £5201 2s. 2d. at credit of profit and loss account; a sum of £14,766 6s. 5d. in the shape of deposits in security of gas-rents, &c.; a benevolent fund amounting to £3272 13s. 11d.; accounts due to sundry tradesmen and others for coal, &c., amounting to £12,193 1s. 6d.; sinking fund, £204,518 0s. 3d.; and a small item in the shape of unpaid annuities. All these give a total of £331,143 19s. 5d., which sum also appears on the other side of the balance-sheet, and includes various outstanding revenue assets, £56,233 4s. 2d.; stocks on hand, horses at stables, &c., £20,586 15s. 11d.; sinking fund, £202,518 0s. 3d.; temporary loan of £30,000 to Corporation of Glasgow; balance in bank, £21,294 17s. 9d.; outstanding accounts for stair fittings, gas-stoves and fittings, and hires, &c.

CORK GAS CONSUMERS' COMPANY.—The Directors of this Company, in the report to be presented to the shareholders at their meeting to-day (which bears the signature of the Secretary, Mr. Denny Lane), state that the accounts to the 30th of June last show a satisfactory and steady business, without any remarkable features. There was a small increase of £142 in the rental from private consumers; while the revenue from public lighting decreased by £44—leaving a net increase of income of about £100 for the six months. The Directors have added £350 to the depreciation fund, and after this allocation the balance of profit and loss amounts to £5720 13s. 8d. Out of this it is proposed to pay the usual dividend at the rate of 8 per cent., which will require about £5688, and leave about £32 to be added to the reserve, which will then stand at £11,911. The Directors' report is accompanied by that of the Company's Consulting Engineer (Mr. G. Anderson), who states that, with the exception of the painting of the external ironwork, which has been delayed in consequence of the very bad weather, the works are in good condition. He considers that the manufacturing operations have been economically conducted; a larger return having been received for residuals than is usual on other works.

ABERDEEN CORPORATION GAS SUPPLY.

THE ALLEGED INCREASE OF GAS ACCOUNTS.

In his recent communications, our Edinburgh Correspondent has referred to the agitation by gas consumers in Aberdeen over the alleged increase of their accounts, notwithstanding the reduced price charged for gas. The result of a deputation of consumers to the Town Council on the subject, it may be remembered, was a promise on the part of the latter body to inquire into the matter; and they accordingly appointed Dr. Wallace, of Glasgow, to report upon the coal used for the manufacture of gas during the year ending May last, and also on the coal purchased for next season, and the City Chamberlain (Mr. Cran) and the Gas Manager (Mr. A. Smith) were instructed to examine the books, and to prepare a statement setting forth the amount of the gas accounts of householders in different streets for the last and the preceding two half years.

A meeting of the Gas Committee was held on the 2nd inst., when the report by Dr. Wallace, to which reference was made by our Edinburgh Correspondent last week, was brought forward. A report on the subject was also tabled by the Gas Treasurer.

Dr. Wallace, in his report, stated that he had found that the average of 32,000 tons of coal, including fourteen varieties, for the year ending May 15, 1888, taking the respective quantities of the coal into account, should give, according to the published analyses of the coals, 10,775 cubic feet per ton, and an illuminating power of 27.60 candles; and the average of 33,000 tons of coal, including fifteen varieties, for the year ending May 15, 1888-9, 11,078 cubic feet, and 27.31 candles—the durability being 57 min. 40 sec. and 57 min. 44 sec. respectively. These figures showed that the coal for the two years, though not identical, were very much alike; and the quantity of gas to be slightly greater for the latter year, but the illuminating power rather less. The durability of the gas was practically identical. The quantity of gas actually obtained per ton of coal during the year ended May, 1888, was stated to be 10,253 cubic feet; and as there was an almost exact relation between the quantity and quality of gas, at least within reasonable limits, the quality of gas during the past year should have been exactly 29 candles. If the same heats and modes of working were adopted during the present year, the quantity of gas per ton of coal would probably be about 10,524 cubic feet, and the illuminating power 28.75 candles. The coals selected for the present year gave a large yield of gas of excellent quality. In Glasgow the illuminating power had been reduced from 26½ to 23 candles; and it was an absolute fact that, since the reduction took place, there had been a marked diminution of complaints as to the quality of the gas supplied by the Corporation. What was wanted, therefore, for the satisfactory supply of a city or town was not so much a high quality of gas as a sufficient supply at all times from the works, and a constant supervision of the different districts, to see that the mains were of a size requisite to give the necessary pressure at the point of ignition. A high illuminating power was not good for either heating, cooking, or motive power; and a fair compromise in the case of the city of Aberdeen would be an illuminating power of 25 candles, and this Dr. Wallace was of opinion would give satisfaction to all parties. Referring to the pressure at the burners, the report states that it should be about 9.10ths. If the pressure at the point of ignition exceeded 11.10ths or thereabouts, there was a decided loss of illuminating power in proportion to the quantity of gas consumed. With regard to the quantity and quality of gas obtainable from the various coals, it was scarcely to be expected that in regular working results equal to those obtained in special trials should be obtained; and a discount of 5 per cent. from the number of pounds of sperm per ton of coal would be a reasonable allowance. That was to say, if, during the year just ended, the gas produced was 10,253 cubic feet per ton, the illuminating power should have been not less than 27.5 candles.

The report by the Gas Treasurer showed the amounts of the accounts of consumers for the three years ending May last in Causewayend, Market Street, Ferryhill Place, Watson Street, and Frederick Street. It stated that in Causewayend, 59 accounts had increased and 56 decreased; in Market Street, 34 had increased and 19 decreased; in Ferryhill Place, 17 had increased and 7 decreased; in Watson Street, 62 had increased and 38 decreased; and in Frederick Street, 40 had increased and 22 decreased. The increase in 1887-8 of gas consumed over 1886-7 was 2.33 per cent.; the decrease in 1887-8 on the amount paid in 1886-7 was 2.01 per cent.

The Committee deferred consideration of Dr. Wallace's report until the specific statement as to increases in the gas accounts had been received.

GAS PROFITS OF THE BURY CORPORATION.

The much-disputed question as to the form which the accounts of the Bury Corporation Gas Department should assume seems to be now in a fair way for settlement. The point, which was debated at length at several Council meetings held in the summer and autumn of last year, was whether the Gas Committee were not making out their balance-sheet in such form as to result in a double payment of income-tax on a moiety of the actual profit realized each year. To some extent the difference of opinion arose out of the interpretation put upon a section of the Local Gas Act, which directs that the profit is to be equally divided between the consumer and the ratepayer—the former to receive his share in a "reduction of the price of gas for the then next ensuing year." The contention of the Finance Committee was that, in carrying out this arrangement, the accounts were so manipulated that the same profit was taken credit for in two successive years, and was thus subjected to double taxation. Although the Gas Committee opposed this view very strongly, the local Income-Tax Commissioners upheld it; and the result was that a deduction was made from the last year's accounts for the sums brought forward from the profit of the previous year. An appeal was threatened to the Commissioners of Inland Revenue, against the decision of the local Commissioners; and the Finance Committee seem at the same time to have given notice of a claim for the return of the excess of taxation paid as they alleged in previous years. The following letter from the Inland Revenue Office, dated the 25th of July, appears, however, to promise a settlement of the whole matter:—"With reference to the letter of the 9th of May last, on the subject of the additional income-tax assessment on the Corporation of Bury, for the year 1886-7, in respect of gas profits, I am directed by the Board of Inland Revenue to acquaint you that the case demanded by their Surveyor on the appeal of the Corporation will not be proceeded with on the understanding that, as stated in your letter, the Corporation withdraw their claim to return of duty for former years." The letter was entered on the minutes of the Finance Committee which were adopted at the last Council meeting; and as there was no comment upon it, it may be assumed that the accounts will be so presented in future as not to admit of the possibility of the question being re-opened.

The Newcastle and Gateshead Gas Company have declared an interim dividend of 4½ per cent. for the past half year. Some further works extensions are contemplated.

The Wardle Local Board decided last Thursday not to entertain the terms submitted by the Public Lighting Company for the lighting of the district with oil instead of gas.

WARRINGTON CORPORATION GAS SUPPLY.

BOROUGH TREASURER'S ANNUAL REPORT.

The Annual Report of the Borough Treasurer of Warrington, lately issued, furnishes some information as to the result of the working of the gas undertaking during the year ended the 25th of March last. The receipts on cash account amounted to a total of £65,640 14s. 3½d.; the items being as follows:—Sales of gas and meter-rents, £26,500 10s. 1½d.; fittings, £936 19s. 3d.; coke, £2260 17s. 7d.; tar, £750 4s. 10½d.; sulphate of ammonia, £2457 11s. 6d.; purifying materials, £216 5s. 5d.; sundries, £251 15s. 6½d.; cottage-rents, £288 0s. 10d.; rent of stoves, £49 14s. 11d.; deposit on tar contract, £300; consumers' deposits, less amounts repaid, £158 6s. 4½d.; bankers' cash and sundries, £31,635 3s. 11d. On the expenditure side the items are as follows:—Wages for gas manufacture, £2550 14s. 2d.; repairs, £1490 9s. 2d.; coal and cannel, £10,385 10s. 9d.; purifying, £302 6s. 4d.; water, £260 3s. 7d.; retorts and fire-bricks, £553 4s. 1d.; meter inspection and repairs, £632 17s. 8d.; lamp repairs, £143 5s. 7d.; lamp lighting, £525 18s. 1d.; salaries, £1246 13s.; rates and taxes, £1598 8s. 2d.; office expenses, £99 19s. 6d.; fittings, £782 11s. 10d.; cottage repairs, £35 10s. 10d.; rates on cottages, £41 16s. 9d.; law expenses, £2 8s. 2d.; interest on deposit account, £2 16s. 6d.; interest on deposit on tar contract, £6; sulphate of ammonia, £500 12s.; capital expenditure, £32 14s. 9d.; general expenses, £145 4s. 2d.; sundry payments to bankers, £33,964 11s. 7d.; payments to Borough Treasurer, £10,008 1s.; cash in hand, £11 1s. 7½d.

Mr. James Paterson, F.G.S., the former Gas Engineer of the Corporation, has furnished the following statement respecting the work of the department during the year and its predecessor:—

	Year ended March 25.	
	1888.	1887.
Coal and cannel carbonized	22,224 tons.	20,558 tons.
Gas made	214,000,100 c.ft.	200,933,700 c.ft.
Do. per ton of coal carbonized	9,621 "	9,632 "
Do. sold per meters and accounted for	180,147,150 "	172,845,430 "
Gas distributed per mile of main	5,132,500 "	5,021,460 "
Do. rental per 1000 cubic feet of gas made	2s. 10.63d.	2s. 11d.
Do. do. received for every 1000 cubic feet sold	3s. 5.00d.	3s. 5.00d.
Do. do. per mile of main	£774 4 0	£627 14 0
Capital employed in works and plant	£175,126 2 0	£178,181 14 10
Do. do. per ton of coal carbonized	7 17 6	8 11 9½
Do. do. per million cubic feet of gas made	818 7 0	886 9 6
Do. do. for every £100 of gas-rental	567 0 11	602 1 3
Gas-rental for every £100 expended in capital	17 12 8	16 11 3
Do. do. for every £100 expended in coal and cannel	284 8 0	294 16 0

THE MANAGEMENT OF THE GAS-WORKS.—VOTE OF CONFIDENCE IN THE GAS COMMITTEE.

At the Meeting of the Warrington Town Council last Tuesday—the Mayor (Alderman Sutton) presiding—the Gas Committee reported that eight of their number, including the Chairman, had resigned, in consequence of the adverse vote of the Council at the previous meeting, on the proposition to appoint Mr. J. Paterson, F.G.S., the retiring Engineer and Manager of the works, as Consulting Engineer to the Gas Committee.

Alderman HOLMES, in proposing that the minutes be confirmed, referred specially to the resignation of himself and other members. Alluding to what took place at the previous meeting, he said an amendment was proposed to the Committee's recommendation, asking them to withdraw the resolution which they had proposed, and bring in another, recommending that the allowance to Mr. Paterson should be continued for only twelve months. It was utterly impossible for the Committee, having considered the question so closely, to bring forward a fresh scheme. They had told the Council very emphatically that the scheme they proposed was what they deemed to be the best, in the interests of the Committee, and of the ratepayers at large. They, therefore, considered that there was no other course open to them than to place themselves before the Council, to give them a chance, if they saw cause, to accept their resignations; or if they did not feel inclined to do so, then the Committee would see that they had, as they believed they ought to have, the confidence of the Corporation. They were not at all adverse to fair criticism, but they thought they should have a fair amount of confidence reposed in them, or else the life of the Committee would not be worth having. If the Council chose to accept their resignations, well and good; but if, on the other hand, they chose to retain their confidence in the Committee, the latter would continue to work in the interests and for the welfare of the town, as they had endeavoured to do in the past.

Alderman DAVIES, who said his motive was to lift the blind which was upon the eyes of the people of Warrington as to the advantages which the purchase of the gas-works conferred upon the town, went at some length into the history of the undertaking. He said that when the Corporation bought the works, the total quantity of gas made was 119,008,500 cubic feet, of which 102,005,206 cubic feet were sold; showing a leakage of 17,003,294 cubic feet, or 14.8 per cent. So that the management of the works well under the control of the Committee had not shown any depreciation whatever. The leakage mentioned included the loss on the public lamps—that was, the difference between the quantity of gas charged for and that actually consumed. This had remained to the present day; and there had absolutely been a loss to the Committee on the charge for the lighting of the lamps in the borough. In a report published at the time the works were purchased, he read: "We may here observe that the Company's properties and effects are in first-class order and condition; indeed, we have learnt that the plant has been almost entirely renewed during the last twelve years." This statement upset the theory that they were buying old and dilapidated works. The next thing was that they not only bought an undertaking which was producing £6661 a year, but they bought a concern which had a balance of £10,600 to its credit. He admitted that it was effected by a loan of £5000, and likewise by a sum of £2700 which they paid in cash; but the fact remained that there was a surplus of £6600, for which they gave £6120, leaving a margin of about £500 in the interests of the borough. The Committee who drew up the report from which he had quoted, estimated that the investment would end in a profit of £7128 to the Corporation. Had this hope been realized? At the end of last year, after the annuities and sinking fund (which amounted to £10,008) had been paid, the surplus was not £7128, but £15,319. In addition to this, they had reduced the price of gas no less than 6d. per 1000 cubic feet—that was,

6d. per 1000 feet less than perhaps it would have been had the Company still owned the works.

Mr. MONKS: You cannot tell that.

Alderman DAVIES admitted that he could not; but he thought the Committee were entitled to take credit for what they had done. He could well understand that the Committee had been very much annoyed and grieved at the action of the outside public, who had contributed letters to newspapers. These letters and the action of the people to whom he had referred had done a great amount of injury; for they appealed to the unthinking portion of the public, and put them against those who were trying to do good to the town. Taking everything into consideration, he thought the Council would be perfectly justified in passing an amendment declining to accept the resignations, and stating that the Council have unabated and unreserved confidence in the Committee, with the earnest request that all the members will continue to give their valuable services as heretofore for the benefit of the Corporation, town, and neighbourhood. He proposed an amendment to this effect.

Mr. PLATT seconded the amendment, and expressed his belief that if they were to go through Warrington they could not pick out ten better men than those now on the Committee. In moving his amendment on the previous occasion, he had no intention of expressing any want of confidence in the Committee.

Alderman CROSFIELD said Alderman Holmes had been one of the most valuable servants of the Corporation for the last 30 years; and it would be base ingratitude on the part of the Council if they did not respect him.

Alderman HARRISON said the action of the Council was not intended to lead the Gas Committee to suppose that confidence in them had been lost. He did not believe there was a Committee of the Council which took a more earnest or a more conscientious interest in the welfare of the town and in the duties entrusted to them than the members of the Gas Committee.

The Mayor said he was glad there had been such an expression of confidence in the present Committee, because it would be a great loss to the town to be deprived of the services of such experienced gentlemen as those whose names appeared in the minutes. Alderman Davies's amendment was then put and unanimously agreed to.

DARWEN CORPORATION GAS SUPPLY.

THE NEW GAS-WORKS.

The erection of the new gas-works at Shorey Bank, Darwen, which was authorized by the Darwen Corporation Act, 1887, is being briskly proceeded with; and it is expected that they will be in full working order by the beginning of the winter. The works are being built on the latest and most approved principle; and, in fact, every suggestion for the saving of time and money is being adopted. The whole of the work has been personally supervised by the Gas Engineer (Mr. T. Duxbury) and Mr. F. Arnott, of Leeds. Mr. T. Newbighing, C.E., of Manchester, has acted as Consulting Engineer for the Corporation throughout; and the result has been the production of a system of gas manufacture second to none in East Lancashire. The idea of new gas-works was mooted by the late Alderman Snape, who calculated that the outlay would bring in a profit of 5 per cent., whilst the money could be borrowed to carry out the work at 3½ per cent.; thus giving a clear saving of 1½ per cent. He counselled the Corporation to secure the power to do the work; and when the Darwen Corporation obtained their new Act last year, it was determined to proceed with it at once. The Act cost the Corporation £2878 18s. 9d. Excavating for the new works was commenced in June, 1887; and, judging from appearances, the works will be finished in about six weeks' time. They are built on a piece of land about 7 acres in extent, abutting on Robin Bank Road, and are separated from the old gas-works by the River Darwen. They are close to the railway line; and a siding has been constructed direct into the works. The first rail takes the coal into a large store, built on girders, over the top of one of the coal-stores. Here the coal will be weighed on a 20-ton weighing-machine which has been erected. Half the coal will be emptied into the store below; and the remainder taken on another elevated railroad outside the works, and shunted into a corresponding store on the opposite side of the building. Other waggons may be taken down an inclined plane into the lower store of the works, or on to the siding. The second or middle storey is divided into three portions. On each side are the coal-stores; and in the centre are the retorts. There are 28 furnaces, with seven retorts to each furnace, which are capable of producing about 1,372,000 cubic feet of gas in 24 hours. The retort-house is 182 feet long, 62 feet across, and 28 ft. 6 in. in height. The roof is ventilated; and there are two large chimneys springing from it to a height of 87 feet from the bottom storey on the Duckworth Street side of the building. The bottom is far below the level of Robin Bank Road, and will be used at present solely for storage purposes. It has been erected, of course, to allow of the ready adoption of a regenerative system of firing. Space is also left on each side of the retort-benches, in order to allow of the use of mechanical stokers. The building throughout is of plain brick, with stone dressings. The foundations are all of stone; and the walls vary in thickness from 2 ft. 9 in. to 2 ft. 4½ in. The floor of the retort-house is covered with thick cast-iron plates. Extending from the main building on the Frederick Street side is a small structure of rather less elevation, two storeys in height. Railway waggons can be run into the top storey from the coal-store near to the railway; and waggons of oxide of iron, lime, and other materials for the old gas-works will be conveyed there. Two tips will be provided; so that the Corporation carts can be taken into the room below and readily loaded. They will then cart the goods to the old gas-works; and by this means a large amount of loading will be saved. At the top of the works are large tanks for water and gas tar. The tar will be pumped by steam power from both works into the tanks; and afterwards, by opening a valve, will be poured into the boiler waggons in the sidings below. Here another saving of cartage will be effected, as in the past the tar had to be conveyed from the works to the station by horse power. After the gas has been manufactured, it will be taken by means of pipes to the old works, where the washing, scrubbing, and general purification will still be carried on. There is an extensive vacant space between the new works and the River Darwen. A large portion of this will be paved, and used for the storage of pipes and other requisites. The river is to be covered with iron girders and arched over; and this again will provide a capital storage place. There will be a very large quantity of pipes from one works to the other. They will include a duplicate set of 20-inch mains to convey the gas to the purifiers, tar-pipes, acid-pipes, and steam and water pipes. These are to be carried across the river on a trestle-girder bridge, which is now being built, and has a clear span of 70 feet; and there will also be another bridge for the passage of carts containing oxide of iron, lime, &c. This bridge will have a span of about 20 feet, and will be about 20 feet wide. In the old gas-works a number of alterations are also being made; and sulphate plant is being put down. Altogether, the gas-works, when completed, will doubtless be a source of great saving to the town, and will justify the Corporation in their recent action of reducing the price of gas by 6d. per 1000 cubic feet.

RECENT SALES OF SHARES.

At a sale of shares in the *Scarborough and Malton Gas Companies*, held by Messrs. Botterell and Son at Malton last Tuesday, some unprecedentedly high prices were realized. The first parcel submitted for competition consisted of 35 original £10 shares in the Malton Gas Company. The first lot was knocked down for £25 5s. per £10 share; the second for £25 7s. 6d. per share; and the five succeeding lots, at £25 10s. per share. The shares all went to one purchaser, who also gave £165 for a lot of £90 stock in the Scarborough Gas Company, and £8 15s. for a £4 lot. On the following day, Messrs. Renton and Renton, of Harrogate, sold by auction, at Knaresborough, a number of shares in the *Harrogate, Gainsborough, and Brigg Gas Companies*. A parcel of £160 of "A" stock in the first-named Company was disposed of at the rate of £325 per cent.; and £500 of "B" stock at £230, £235, and £237 per cent.; being an average of £233 8s. The 1887 dividend on the "A" stock was 14½ per cent.; on the "B" stock, 10½ per cent. A few fully-paid £10 shares in the Brigg Gas Company, Limited, on which 10 per cent. has been paid, were sold for £20 5s. each; some £3 shares in the same Company fetching £5 17s. 6d. each. Some original stock of the Gainsborough Gas Company was knocked down at the rate of £201 per cent.; three new £20 shares in the same Company (£12 paid) fetching £26 10s. each. With the exception of the last, the shares were all sold *cum div.* A further parcel of three £100 lots of "A" shares in the Harrogate Gas Company was afterwards submitted to competition, and realized £321 and £322 per cent. At the Mart, Tokenhouse Yard, on the same day, Messrs. Fox and Bousfield sold some £10 shares in the *West Kent Gas Company* (carrying a maximum dividend of 10 per cent.) at £19 15s. per share.

GAS-METER TESTING IN EDINBURGH.

We have been favoured by the Chief Inspector of the Edinburgh Gas-Meter Testing Department (Mr. G. F. Blackie) with certain statistics relating to the work of the department in the 27 years which have elapsed since its establishment. Taking the last twelve months (from Aug. 1, 1887, to July 31, 1888) first, we find that 13,022 new wet meters, 2903 repaired meters, and 123 consumers' meters were tested; making a total of 16,048. Of these 131 were incorrect, being 1 in every 122·504. Of dry meters there were 11,738 new meters, 5231 repaired meters, and 280 consumers' meters tested; making a total of 17,239. Of these 277 were incorrect, being 1 in every 62·234. The total number of meters tested during the year was 33,287, of which 408 were incorrect, or 1 in every 81·586. The amount of fees drawn was £1098 8s., being an average of 7·55d. per meter. There were 5418 less wet meters, and 2086 less dry meters tested in the year just closed, as compared with the preceding twelve months; and the fees paid were also less by £269 16s. 6d. The fees ranged from 6d. to 60s. There were 349 less wet meters, but 180 more dry meters repaired; making 169 less meters repaired in the year 1887-8. The following are the totals for the past 27 years:—Wet meters: Total number tested 667,359; incorrect, 2770—or 1 in 241·092. Dry meters: total number tested, 311,010; incorrect, 2342—or 1 in 132·797. Aggregate of meters tested: 978,669; incorrect, 5112—or 1 in 191·445. Total fees paid: £29,504 13s. 6d. or 7·24d. per meter; the fees ranging from 6d. to 150s. The first meter tested was on Sept. 16, 1861. The greatest number tested in one year was in 1887-8, when 47,833 passed through the department; the fees paid amounting to £1402, or at the rate of 7·03d. per meter. The least number was in 1873-4, when 29,085 meters were tested; the fees paid amounting to £878, or at the rate of 7·24d. per meter.

AN ELECTRIC LIGHTING SCHEME FOR CHELTENHAM.

At the Meeting of the Cheltenham Town Council last Tuesday, the principal business was to receive a report from the Electric Lighting Committee, which was appointed in November last, at the instance of Mr. G. Norman, who afterwards became the Chairman. The Committee have held many meetings, and have visited Taunton, Eastbourne, and other towns where electric lighting is in use. As the result of their investigation, they agreed upon the following report, which was laid before the Council:—"That, in the opinion of the Committee, it is desirable to try the experiment of lighting a portion of the town with the electric light. [The area was defined.] It is considered that 36 lamps, each of 1200-candle power, will suffice to efficiently light this area, and that about 170 gas-lamps will be thereby rendered unnecessary. Assuming that the lamps can be supplied, either by the Corporation itself or by contract, at the price of the tender accepted by the Bath Corporation for 70 similar lamps for a term of seven years—viz., £18 17s. 6d. per lamp, exclusive of the standards—the annual cost to the Corporation, exclusive of the standards or brackets, would be £679 10s. From this would have to be deducted the cost of the gas-lamps superseded, which at the present cost per lamp of £2 13s. 6d. would amount to £444 15s. per annum. That it be referred to the Committee to consider and report as to the best mode of carrying out the foregoing recommendation—whether by the Corporation itself or by contract. If the former alternative is considered preferable, to report as to the best means of carrying the works into effect; if the latter, to procure tenders." In moving the adoption of the report, Mr. G. Newman called attention to the plans prepared by the Surveyor (which were hung on the walls of the chamber), and promised that a more elaborate statement would be laid before the Council at a future meeting. It would then be in their power to accept or reject the scheme. Subject to this, the report was of an important character, as it asked the Council to say that the lighting of the streets by the electric light was desirable, if a proper scheme were submitted; to approve of the experimental area stated; and to give the Committee freedom of action in the carrying on of the lighting scheme, either by a private company or by the Corporation themselves. The experimental area included the principal streets of the town, and touched every ward. After dwelling at some length on the advantages of the electric light as a street illuminant, Mr. Norman expressed himself as strongly in favour of the Corporation undertaking the provision and supply of the light, in preference to entering into a contract with a private company, which might lead to the creation of a monopoly. The resolution approving the report of the Committee was agreed to; and it was referred to the Committee to report as to the best means of carrying out the scheme.

REDUCTIONS IN PRICE.—The *Richmond Gas Company* have given notice that the price of gas will, as from the 30th of June last, be reduced from 3s. to 2s. 10d. per 1000 cubic feet.—The *Kingston Gas Company* have informed the New Malden Local Board of their intention to reduce the price of gas 2s. per lamp as from Midsummer last.

ADOPTION OF OIL LIGHTING AT GRAVESEND.—At the meeting of the Gravesend Town Council last Wednesday, it was decided to substitute oil for gas in the lighting of the public thoroughfares, and the tender of a local firm to do the lighting with oil at the rate of 50s. per lamp, with a right to the Council to terminate the contract at one, two, or three years, was accepted. It was stated that this substitution would effect a saving of £250 per annum to the ratepayers.

ST. HELEN'S CORPORATION WATER SUPPLY.

THE NEW WORKS AT KIRKBY.

Reference was made in last week's JOURNAL to the laying of the foundation stone of the new pumping station at Kirkby, which work, when finished, will complete the water supply scheme which the St. Helen's Corporation have been carrying out during the past few years, under the powers of the Act obtained by them in 1882. A few particulars regarding the new works will be of interest; and these may be prefaced by saying that the St. Helen's water district extends over 12,000 acres, the population within which is estimated at about 68,000. It is computed that, when these additional works are completed, 5 million gallons of water per day will be yielded. In 1877 the average consumption of water was 2½ million gallons. The site at Kirkby is near to the main line of the Lancashire and Yorkshire Railway; and there is no public well nearer than Aughton (Ormskirk), which is four miles away. In the pebble beds of the new red sandstone formation, two wells similar to those at Knowsley have been sunk. Each well is about 11 feet in diameter, and 150 feet deep; being connected by a heading of 9 ft. by 6 ft., and a bore-hole 24 inches diameter, diminishing to 18 inches diameter, sunk from the bottom of one of the wells to a total depth of 510 feet from the surface of the ground. The Corporation have concluded negotiations for the supply and erection of a compound vertical rotary engine, two boilers, and other work connected therewith. At the completion of the sinking in September last year, it was estimated that the yield from the wells would be 1 million gallons per day, and from the bore-hole from 2½ to 3 million gallons in addition. The building, when finished, will measure 48 ft. by 48 ft.; and an octagonal castellated water-tower will rise to an altitude of 80 feet from the surface of the ground. In the tower, above the engines, there will be a travelling crane; and above that a compensation tank, which must always contain 30,000 gallons of water to meet the requirements of Lord Sefton's tenantry. The boiler-house will adjoin the tower. The engine foundations will go to a depth of 30 feet underground. The engines are expected to have a capacity equal to raising 1½ million gallons per day, or, on the assumption that each gallon of water weighs 10 lbs., no fewer than 15 million pounds. When the Kirkby works are ended, the Corporation will have at their disposal pumping power capable of delivering about 4½ million gallons of water per day; and according to estimate, there are in addition to this from 2 to 2½ million gallons available in the Kirkby wells if required. The parliamentary estimate for the carrying out of the whole of the works was £95,000; and the Water Committee believe that they will be able to complete the scheme at considerably less than the estimated cost. The Knowsley station cost £19,000; the Kirkby station will cost £500 less than that sum; and then there must be added to this £18,000, the cost of the pumping mains from Kirkby to Eccleston Hill and Brownedge reservoirs; £4,000, for parliamentary expenses; and £6,000, for compensation mains; as well as the charges imposed under the Act to satisfy the requirements of the Earls of Derby and Sefton. There are certain other works, included in the parliamentary estimate, which have not yet been carried out—principally the duplicate engines and house, which may not be required for many years, and will probably cost £20,000. From these figures, it will be seen that the Committee are a little less than £10,000 under the parliamentary estimate, apart altogether from the extra cost of providing compensation pipes and tanks.

WEYMOUTH GAS CONSUMERS' COMPANY.—In the report on the working of this Company in the six months ending June 30 last, which will be presented to the shareholders at their meeting next Thursday, the Directors state that notwithstanding the reduction in the price of gas which took effect from the 1st of January last, the consumption has remained almost stationary; the increase being very slight. The revenue from the sale of gas therefore shows a diminution as compared with the corresponding half of the previous year. The balance of profit on the revenue account is sufficient to pay the interest on the debenture bonds, and a dividend at the rate of 10 per cent. per annum on the ordinary "A" stock, and of 7 per cent. per annum on the ordinary shares; and at these rates (less income-tax) the Directors recommend the dividend for the half year to be declared.

THE PUBLIC LIGHTING OF UXBRIDGE.—In the JOURNAL last week reference was made to a discussion which took place at the meeting of the Uxbridge Local Board on the 31st ult., and to a suggestion made that a trial should be made with an oil-lamp. Complaints were made by several speakers of the inferiority of the lighting, but it was pointed out that this was a matter which it was quite within the power of the Board to alter, without resorting to oil. It would be well for the members to watch for a short time the progress of the Erith experiment, to which their attention was called before deciding on abandoning gas. In the meantime they may be reminded that the regulator burners in their public lamps only consume 3 cubic feet of gas per hour; and if, as was stated by one member, the Board do not wish to "go back to oil," the improvement in the street lighting might be easily effected by employing larger burners.

THE NORTHERN COAL TRADE.—There has lately been an improved demand for coal, and especially for gas coal. The shipments of coal from the Tyne Dock have been of late fully 12,000 tons weekly above those of last year, and the coals so sent out are chiefly gas coal, which is being very largely despatched to the Mediterranean ports. More gas coal is also being forwarded to London; but it will be a month before anything like heavy quantities are sent there. The local gas companies are now appreciably extending their requirements; and the Durham gas collieries are beginning to be well employed, though there are exceptions, and there is no pressure. Steam coals are rather quieter—about 7s. 6d. per ton being the price for best qualities; whilst the increased production of small coal has lowered its price to about 2s. 6d. to 3s., according to quality. The coke trade is fairly brisk; the quantities sent out being large. Gas coke still finds ready sale at the cement-works, and the price is firm, though the increased production must soon weaken it.

SUFFOCATION BY GAS.—Last Thursday, at the Sussex Arms, Sussex Street, Strand, Mr. Langham held an inquest upon the body of William Chaplin, aged 35, late of 16, Fort Road, Bermondsey, a gas-fitter, who was suffocated by gas on the previous Monday afternoon at Somerset House. The evidence of Joseph Heath, a bricklayer, was to the effect that he was assisting the deceased with some work in the basement of Somerset House. The deceased was engaged in taking off the cap of the gas-main, as they could not move the valve. Witness left him for ten minutes, and on his return found him lying helpless on the ground—to all appearance dead. The gas was escaping from the main, from which the deceased had removed the cap. Thomas Mann, foreman of works at Somerset House, stated that the deceased had been employed there about 2½ years, and on the day in question was instructed to examine the coals to see whether they were all in working order. The deceased ought to have turned off the gas in the street before examining the coals, and he went out to do so; but by some unaccountable reason he made a mistake, and turned off the wrong cock. Medical evidence was given which showed that the deceased's death was due to suffocation by gas; the jury returned a verdict of "Accidental death."

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

Though not exercising in the least degree a disturbing influence upon the working out of the gas-works transfer in Edinburgh and Leith, a question has arisen between the parties which they are unable to settle, and which Mr. Livesey, as sole Arbitrator, will be called upon to determine. The point is whether tools and implements which have been in use are to be paid for by the Commissioners, or whether they are included in the undertakings which they have taken over. As it was stated at the meeting of the Commissioners, it seemed to be a small matter—so small, in fact, as to be scarcely worth disputing over. Bailie Archibald's expression was that it referred to such articles as picks, shovels, barrows, &c. But the fight is not over such things as these. There are other and more valuable articles—such as meters—which have been in use, and have been returned to store; and if the Commissioners' reading of the Act of Parliament is right, then these, having been in "in use," must be held to be already the property of the Commissioners. Clause 20 of the Act says that the Commissioners are to pay, after valuation, for, among other things, "implements, meters, and pipes in store or in hand." It is a pity the expression was not made more explicit; but, as it is, Mr. Livesey will have no difficulty in determining, by precedent, how it should be read. Both Companies possess a valuable property in gas-stoves, many of them hired out, and others returned after hire. These will be lost to them if the reading of the Commissioners holds good.

At the meeting of the Aberdeen Town Council last Monday, the report of the Gas Committee stated that in the month of July there were three testings of the gas made by Dr. Matthew Hay; and these showed the quality to be 27·98, 28·75, and 29·12 candles respectively. Mr. Cook, a member of the Committee, in supporting the adoption of the report, said he thought these figures proved that Aberdeen was being provided with as good gas, and he thought better, than nine-tenths of the other towns were getting. He went on to point out that in their carbonizing process they were now getting about 100 cubic feet more per ton out of the coal than they did a year or two ago. Bailie Gordon remarked that the citizens never obtained better value for their money than at the present moment from the gas. The Committee's report was adopted. With reference to the agitation which has been going on outside in regard to the alleged increase of gas accounts, in the course of the proceedings Mr. Cook said he would not enter upon the consideration of Dr. Wallace's report [an abstract of which is given elsewhere to-day], although he said he was prepared to do so when the time came. The time, I consider, has come. If there is any foundation for the agitation, the Gas Committee have had sufficient opportunity to ascertain what it is; and their course should be to acknowledge that such was the case, and have it remedied. If, as I incline to think, there is not much foundation for the agitation, then the sooner it is checked the better, because its continuance is prejudicial to the confidence of the public in the gas supply. The Committee who are promoting the agitation are not slow to move. They have already objected to Dr. Wallace's report on the ground that the Doctor did not visit Aberdeen and investigate for himself, but was supplied by the Town Council with the information upon which he proceeded. As soon as the agitation arose, the Gas Committee were urged to face it, and show that its foundation was a very narrow one. The Committee have not, but the agitation Committee have themselves demonstrated this; because, after a public request that consumers who had been aggrieved by their gas accounts increasing in amount should send particulars to Mr. Adam Pratt, who may be called the leader of the agitation, Mr. Pratt has been able to furnish the Town Clerk with only 134 cases of alleged overcharge. There are more than 24,000 consumers' names in the books of the Gas Committee. In these circumstances, comment is needless. Mr. Pratt's latest move is an attempt to work up the public upon the fruitless question of the accuracy of gas-meters. In a letter to the local press, published yesterday, he states that, having had all his three meters tested, not one of them has been found to be correct. He does not state how much they are incorrect. Intelligent people will consequently estimate his communication at what it is worth, but ignorant people will probably not be able to read between the lines; and the agitation will thus go on.

At the meeting of the Alva Police Commission last Monday, the Gas Manager (Mr. Chalmers) reported that the new works were in a forward state, and that he anticipated they would be completed in another month. Satisfaction was expressed at this state of matters; and, on the suggestion of Mr. Chalmers, the Commissioners visited the gas-works on the following day and inspected them. The alterations, it is expected, will greatly facilitate the manufacture of gas, and reduce the cost of production.

In the death last week of Mr. Alexander Cruickshank, of Turfrie, the local Gas Company have lost a Manager who has shown much enterprise in the conduct of a small concern. When he was appointed to the post a number of years ago, he found the plant almost worthless and the revenue exceedingly small. He has succeeded in relaying nearly all the street mains; and in the course of his tenure of office he first doubled and then quadrupled the producing and storage power of the works. The Company's business thrives immensely under his management; and it now pays a respectable dividend—5 per cent., if I mistake not. Although carrying out all these improvements, it was noteworthy, and probably the reason of the prosperity of the Company, that they were so well financed that the price of gas was throughout kept at a moderate rate.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

At the last monthly meeting of the Kilsyth Police Commissioners, it was reported that the amount of gas passed through the station meter during the month of June was 175,000 cubic feet, as compared with 159,100 feet in the corresponding month of last year; so that there was an increase of about 16,000 feet. But from what cause the increase had arisen, none of the Commissioners were able to say. It was stated that the average amount of gas yielded per ton of coal was 9943 cubic feet, which was regarded by Mr. T. Wilson, Gas Engineer, of Coatbridge (who was present), as being exceedingly satisfactory. Mr. Frew spoke about the number of complaints regarding the gas; and Mr. Wilson, in reply, said that a great number of the complaints were due to faulty fittings and burners, and that in Coatbridge the burners were supplied free. The expense was not great; and the consumers obtained a better light. To do so in Kilsyth might cost the Commissioners from £3 to £4 per annum. The suggestion was talked over, and left with the Works Committee for consideration. From the contents of the annual balance-sheet which was submitted to the meeting, it was thought that the Commissioners would be warranted in taking 5d. per 1000 cubic feet off the price of the gas.

On Wednesday evening the annual report on the Kilmarnock gas undertaking was before the Town Council. Bailey Bain thought that it was a very satisfactory report, alike from the amount of progress shown and the reduction of 5d. per 1000 cubic feet in the price of the gas, which was double the quantity which had been anticipated by a number of the members. One gratifying feature in the report is the increased revenue

derived from the chemical works—a rise having taken place in the value of the residual products during the past year. The profit during the year was £3649. The report was adopted.

The ratepayers of the Dalmine division of the burgh of Clydebank are not altogether satisfied with the gas supplied to them in their ward, and with the price which they are charged for it. They lately appointed, at a public meeting, a Committee to inquire into the cheapest and best mode of lighting the streets during the coming winter. The Committee have since presented a very full report; and at the meeting where the report was received and considered, it was agreed that the Ward Committee should approach the Burgh Commissioners, and request them to open communication with the Glasgow Corporation Gas Trust; the Commissioners to lay the pipes, provided that the Gas Trust would supply gas at the same price as that at which it is supplied to the other wards of the burgh. In the event of this plan not being agreed to, a large and influential Committee was appointed to form a Company for the supply of oil gas to the ward—the electors considering this gas to be cheaper and better than that supplied by the Dalmine and Old Kilpatrick Gas Company. At the usual monthly meeting of the Commissioners, which was held on Thursday, it was reported by the Lighting Committee that they had received and considered the communication from the Dalmine ward, and that they had resolved that it was inopportune to make any approach to Glasgow for the present season, but to keep the matter in view for further action.

Every year, about this time, correspondence appears in the local newspapers regarding the lighting of the common stairs and closes in some of the suburban burghs. At present it is the southern burgh of Govanhill in which the grumbling is taking place in reference to the charge made upon the tenants for the gas consumed, as compared with that levied under similar circumstances on the stair tenants within the burgh of Glasgow. It is the practice in the suburban burghs to suspend the lighting for a portion of the year, and to charge the tenants at a higher rate for it than is charged for the city where the stair lighting is continued throughout the whole year. It is urged that this levying of a differential rate for stair lighting is continued with the view of helping to concuss the residents in the outside burghs into advocates of annexation to Glasgow.

At the last meeting of the Airdrie Town Council, it was suggested by Mr. Rankin that the street lamps of the burgh should be lighted continuously for the eight months (including moonlight nights), or lighting season, at the same rate as for six months' lighting, after deducting 60 days from the eight months for supposed moonlight nights, the total extra cost being only about £32 15s. If the Council would agree to that suggestion, he anticipated that the Gas Company would light the lamps at 9s. 4d. each, all the year round, in place of at 7s. for eight months—the total extra cost being the amount just mentioned. The Provost remarked that there was no doubt that they sorely needed light on some of the moonlight nights. The Council unanimously agreed to the suggestion; and it was remitted to the Fire and Lighting Committee to make the requisite arrangements with the Gas Company.

The ordinary shares of the Partick, Hillhead, and Maryhill Gas Company were quoted yesterday on the Glasgow Stock Exchange at 87s. 6d. per share, sellers; but buyers could not be induced to go beyond 82s. 6d. The preference shares were quoted by sellers at £6 10s.; and buyers were offering 5s. less per share.

At the recent ordinary meeting of the Helensburgh Police Commissioners, Mr. Whyte stated that the water-works extensions would be commenced at once; a contract having been settled with ex-Provost Murray of Maryhill, the amount of which was £3547. It was expected that the extensions would be finished early in the spring; and care would be taken that during the time that the operations were in progress, there would be an abundant supply of water always available.

During the past week the Glasgow pig iron warrant market has generally been quiet, but steady, with a moderate business doing from day to day. The fluctuations in price have ranged between 38s. 11d. paid on Tuesday and 39s. 5d. paid on Thursday; the closing price for Scotch iron yesterday being 39s. 4½d. cash buyers. There are now 87 blasting furnaces in actual operation, as compared with 84 at the same time last year.

Business continues steady in the local coal trade; but there is scarcely the same briskness in making sales as was shown two or three weeks ago. Shipments are fairly satisfactory at the Clyde and Ayrshire ports; and prices may still be said to rule firm. Main coal is quoted at 5s. 6d. to 5s. 7d. per ton f.o.b.

ABANDONMENT OF THE MANUFACTURE OF SULPHATE OF AMMONIA AT HEYWOOD.—At the meeting of the Heywood Town Council last Thursday, the Gas Committee recommended the acceptance of a tender for tar and ammoniacal liquor made at the gas-works during the ensuing year. It was stated that for the past year or two they had been converting the liquor into sulphate; but this year the Committee had decided to sell it, as they thought it would be more profitable to do so than to manufacture sulphate, particularly as the plant was not in very good order.

THE PUBLIC LIGHTING OF ACCRINGTON.—Mr. G. Hale, the Superintendent of the Lighting Department, has submitted to the Watch Committee of the Accrington Corporation a report as to the cost of lighting the street lamps during the winter months, without taking notice of the duration of moonlight. He estimates that if the lamps were lighted every night from the middle of August to the middle of May, the cost would be £1240—viz., gas, £965; and lighting and cleaning the lamps, £275. This is £319 more than the cost last year, when £690 was paid for gas, and £231 for cleaning, &c. As an alternative, he submitted a proposal for lighting the lamps night after night in the four months of November, December, January, and February, which will cost £202 more than was paid last year. The Committee decided to recommend the Council to light the lamps in the four winter months, irrespective of the various phases of the moon.

DORCHESTER GAS COMPANY, LIMITED.—In the report of the Directors of this Company to be submitted to the shareholders at their half-yearly meeting to-day, it is stated that the consumption of gas in the six months ending June 30 last showed a slight increase as compared with the corresponding period of last year. The consumption then was 12,144,800 cubic feet; and for the past half year it was 12,309,200—an increase of 164,700 cubic feet. The Directors consider that, as in the first six months of the year the consumption of gas, through the unpleasant weather and dullness of trade, was with most provincial companies less than in the similar period of the preceding year, even this small increase is satisfactory. The results of the past half-year's operations (with Mr. Frank Osmond at the head of the works) have been kept up to the usual standard; and there has been a further slight improvement in the prices of residual products. The profit is sufficient to pay the same dividend as in the previous half year—viz., 11 per cent (free of income-tax)—and carry over a small balance to the next account. The Directors therefore recommend the declaration of a dividend at this rate.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Aug. 11.

Sulphate of Ammonia.—While the tone of the market remains steady, the business is of a very limited compass; and the scarcity of foreign orders is very remarkable. When the shipments since July are taken into consideration, it seems to become self-evident that consumers abroad cannot be fully supplied; and the only conclusion to be drawn is that they methodically retard their orders, feeling either uncertain about their sales, in view of an unfavourable season, or preferring to take the orders for manures before buying the sulphate. Great uncertainty therefore prevails; and such a condition is not conducive to the favourable disposal of spot parcels, for which somewhat lower prices have consequently been accepted. It can only be repeated that the quantity offering is by no means large; but as long as it supplies the demand an improvement in prices is not within reach. The business this week at Hull has been principally at £11 10s.; but there are hardly buyers thereat to-day. At Liverpool and Leith £11 7s. 6d. is quoted.

LONDON, Aug. 11.

Tar Products.—This market is decidedly quiet; and buyers do not quite see their way to pay the advanced prices which are being quoted. Makers are somewhat indifferent, and do not press sales. The following prices may be taken as to-day's value: Tar, 17s. 6d. to 21s. per ton. Benzol, 90 per cent., 2s. 10d. per gallon; 50 per cent., 2s. 4½d. per gallon. Toluol, 1s. 8d. per gallon. Solvent naphtha, 1s. 2d. per gallon. Creosote naphtha, 30 per cent., 1s. per gallon. Light oil, 3½d. per gallon. Creosote, 1½d. per gallon. Pitch, 12s. to 13s. 6d. per ton. Carbolic acid (crude), 3s. 5d. per gallon. Cresylic acid, 10d. per gallon. Tar salts, 15s. per ton. Anthracene 30 per cent., "A" quality, 1s. 5d. per unit; "B" quality, 1s. 3d.

Ammonia Products.—Sulphate is undoubtedly weaker, and sales have been made during the week marking a fall of nearly 10s. per ton—the current price being for sulphate of ammonia £11 5s. to £11 10s. per ton, less discount. Gas liquor (5° Twaddell), 8s. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 2d. per lb. Carbonate of ammonia, 3½d. per lb. Muriate of ammonia, brown, £18 per ton; white, £28. Sal ammoniac, £30 per ton.

[From the Chemical Trade Journal, Aug. 11.]

Sulphate of Ammonia.—The sulphate of ammonia market is very dull; and prices are easier all round. Business has been done at Hull on Wednesday last at £11 10s.; and Leith and Liverpool may be stated at £11 8s. 9d. to £11 10s. Business at Leith continues brisk; over 460 tons having been shipped from this port during the week ending Aug. 4, the major portion of which has been forwarded to Hamburg. Beekton price is now £11 12s. 6d., though £11 13s. 9d. is reported to be asked for London outside makes.

Tar Products.—All tar products remain *in statu quo*; at least in so far as prices are concerned. If there is any tendency to change in any way, it is towards weakness in several articles. Benzoles keep up their value; and to-day's price may be taken as 2s. 4d. to 2s. 10d., though it is possible that large orders may be treated more leniently by sellers, especially for forward business, where all is mystery. Benzol, keeping up so well, has made it good for the gas industry. Wigan tar has just been let for 26s. 6d. at the gas-works; so it is pleasant to find somebody thinking that the old horse is not played out yet. Crude carbolic, following in the wake of crystal carbolic, is decidedly weaker; and 3s. 4d. for crude is not now a tempting price for buyers. Pitch stands much the same as in our previous reports but there has been a fair business doing lately.

THE PRICE OF GAS AT RAMSBOTTOM.—At the last meeting of the Ramsbottom Local Board, Mr. Whitaker, in accordance with notice, drew attention to the price now charged for gas by the Ramsbottom Gas Company. He said he did not wish to press the Company too hard, but thought they might sell gas at the same rate as other companies in the neighbourhood. The Bury Corporation were at present supplying some portions of Ramsbottom with gas at 2s. 11d. per 1000 cubic feet, and in the same district the Ramsbottom Company were charging 3s. 11d. In answer to a question by a member, the Clerk said the only power the Board had was to buy the gas undertaking. Eventually a Committee was appointed to interview the Directors of the Company at their next meeting.

FATAL ACCIDENT AT THE LEICESTER GAS-WORKS.—A workman named Wale, 21 years of age, met with a shocking death at the Leicester Gas-Works, on Thursday, the 2nd inst. He had been in the employ of the Gas Department as a labourer since last September, and on the day in question was engaged in painting the ironwork of the liquor tank. Several other men, who were working near, heard a splash, and on turning round found that Wale had disappeared. A ladder was immediately procured, and the discovery was made that he had fallen through the manhole into the tank, which is 12 or 14 feet deep, and contained about 8 feet of tar and ammoniacal liquor. Within a minute or two of the accident assistance was rendered, and an attempt was made to save the unfortunate fellow; but before the body could be recovered death had taken place. At the inquest held on the following day, it was suggested that Wale endeavoured to cover up the manhole unassisted. This was the work of two men; and the regulations prohibited anyone attempting to do it alone. Deceased was a good and steady workman. The jury returned a verdict of "Accidental death;" the Manager of the works (Mr. A. Colson, Assoc. M. Inst. C.E.) stating that he had already taken precautions which would prevent the recurrence of such an accident.

NEW WATER-WORKS AT THORNTON.—New water-works constructed by the Thornton Local Board were opened last Wednesday by the Chairman of the Board—Mr. D. Craven. Hitherto the supply of water to the village has been obtained entirely from the Bradford Corporation and from private wells. In the year 1866 sanction was obtained by the Board to a loan of £5000 for the construction of a storage reservoir, into which the Corporation have run the water for the supply of the village; and since then there has been little modification of the system until the present time. Thornton, however, stands at a very high level, and during the drought of last year the failure of the Corporation adequately to supply the village was so marked that the desirability of constructing works for the supply of the Local Board district solely was mooted. The notion appears to have been favourably received; and Mr. J. Craven, M.P., gave substantial encouragement to the proposal by making a gift to the Board of between three and four acres of ground on the high land known as Hill Top, in Thornton. The plot contains a quarry, into which the water from a large number of springs finds its way; and the Board have sunk a shaft at the bottom of the quarry and erected a pumping-engine for raising water from it. The works are therefore of a very modest character; but the supply to be obtained by their means promises to be both copious and of good quality. The opening ceremony consisted in starting the pumping-engine, which was done by Mr. Craven, in the presence of several members of the Local Board and some visitors. After the ceremony, the company dined together in celebration of the event.

THE LARGEST GAS EXHAUSTERS IN THE WORLD.—Messrs. R. and J. Dempster, of Newton Heath, Manchester, have in hand an order for three exhausters, each capable of passing a million cubic feet of gas per hour.

THE DISPOSAL OF GAS PROFITS AT WORKINGTON.—At the meeting of the Workington Local Board last Tuesday, the Chairman (Mr. G. J. Smith) moved that the price of gas be reduced from 2s. 11d. to 2s. 6d. per 1000 cubic feet. He said he thought it would still further develop and increase the sale of gas if this reduction were adopted. Mr. Towers seconded the motion. Mr. Iredale moved, as an amendment, that an annual sum of £600 be paid from the gas-works profits to the credit of No. 1 district of the town, to partially meet the heavy expenditure of this district in redeeming the old debt existing at the time of the Provisional Order of 1878. He thought this was only fair to the district; and if the price of gas was reduced to 2s. 6d. there would not be sufficient profit left for this purpose. The amendment was carried.

THE PUBLIC LIGHTING OF YORK TOWN.—A further step was taken last week by the Lighting Inspectors of York Town in the direction of lighting the public lamps with oil (see *ante*, p. 251). At the meeting of the Inspectors last Wednesday, they had received tenders from Messrs. Defries, and also from the Stringfellow Patent Company, of Birmingham; and it was decided to make further trial with the Company's lantern, with a view to its adoption. The patentee's offer was to convert the old lantern heads (square ones), and to find oil, and keep clean, light, and extinguish the lamps for the first year, at £2 per lamp; second and third years, £1 5s. per lamp. With respect to the round-headed lamps, he offered to put on a new lamp head, similar to one produced, at an additional charge of 3s. 4d. per year. If the Board decided to keep the lamps at the end of three years, they were to pay a royalty of 5s. per lamp in one lump sum for the use of the patent.

BURY ST. EDMUNDS GAS COMPANY.—On Friday, the 3rd inst., the 78th half-yearly meeting of the Bury St. Edmunds Gas Company was held at the gas-works—Mr. W. Salmon presiding. The report of the Directors was read; and the recommendation that a dividend for the past half year, free from income-tax, of 12s. per £10 share on the 1849 capital, 9s. 6d. per share on the 1859 capital, and 9s. per share on the 1879 capital, be paid, was adopted. The half-yearly statement of accounts to June 30 showed a balance of £2577 brought forward, and £2392 carried forward after appropriating £1620 to the payment of dividends. The principal receipts were: For gas and meters, £5998; coke, £882; ammoniacal liquor, £235; tar, £123; interest on reserve fund, £91. The principal expenses were: Coals and freight, £1477; wages and salaries, £928; rates and taxes, £790; repairs, £113. The report was adopted.

BARNET DISTRICT GAS AND WATER COMPANY.—In the report of the Directors of this Company, which will be presented at the half-yearly general meeting of shareholders next Thursday, dividends at the rates of 7 per cent. per annum on the "A" and "C" stocks, 6 per cent. per annum on the "B" stock, and £4 18s. per cent. per annum on the "D" (water) capital are recommended. The business of the Company continues to increase. The price of gas to private consumers has been reduced 3d. per 1000 cubic feet (from 4s. 6d. to 4s. 3d.) as from Lady-day last, and the price of gas, supplied on the average meter system, for the public lighting has been brought down to 4s. per 1000 cubic feet. With regard to the water portion of the undertaking, it is stated that the sinking of the new well, the erection of the engine-house, and the placing of the pumps in position are still in progress. In accordance with an agreement with the Barnet Rural Sanitary Authority, mains have been laid for the supply of water to the village of South Mimms. Reference is made to the accession of Mr. James Galsheir, F.R.S., to the chair, *vice* Mr. J. F. Bontems, whose recent removal by death, under painful circumstances, is referred to elsewhere. Accompanying the report are the accounts, prepared by the Secretary and Accountant (Mr. Alfred Lass, F.C.A.), and certified by the Auditors (Messrs. F. Lennard and A. G. Hounsham).

THE PUBLIC LIGHTING BY OIL AT ERITH.—At the meeting of the Erith Local Board last Wednesday, the subject of the public lighting of the district by oil, an account of which was given by Mr. R. P. Keys, in his letter which appeared in the last issue of the JOURNAL, was considered, on the presentation of a report by the Lighting Committee. The Committee (consisting of the entire Board) met on the 27th ult., when Mr. Defries, one of the contractors for the oil lighting, was present. Although the night was a very boisterous one, the Committee made a thorough inspection of the district, and took notes of the details and work requiring the attention of the contractors; Mr. Defries promising to do all he could to make the lighting perfect in every particular as speedily as possible. The Committee expressed satisfaction with the oil-lights, where they had been properly turned up; though, through inexperience on the part of the lamp-lighters, this was not done in many cases—a great deal more strength, care, and skill being needed as compared with the lighting of gas-lamps. The Committee suggested that the Board should fix the 15th inst. as the date on which they would require the contractors to have all the lamps burning according to the terms of the contract; the Committee to again inspect the district, and invite Mr. Defries to be present. This was agreed to. [It should be pointed out that in Mr. Keys's letter, above alluded to, the hour at which he arrived at Erith on the evening of the 28th ult. was given as six, instead of eight.—Ed. J. G. L.]

EAST WORCESTERSHIRE WATER WORKS COMPANY.—The eighteenth meeting of the shareholders of this Company was held on Thursday at the offices, Waterloo Street, Birmingham—Lord Windsor presiding. The report stated that during the six months ending in June last, 150 additional services had been laid on, which brought the total up to 16,022. The Directors wished to impress upon the shareholders the necessity of doing something to convert the Company from a non-paying concern to one paying a dividend. All the capital was paid up; and, in consequence, the shares were at a discount, because they had no money to carry out the work which was called for. There was £800 standing to the credit of revenue account, which was more than equal to a dividend of 1½ per cent. on the whole capital. In order to enable the Directors to carry out the extensions, they proposed to issue one new share for every five of the original issue, and only call up £5 on each share. This would help them to carry out the work desired, and to pay a dividend, and would enable them to save £120 they now had to pay as interest. The Chairman, in moving the adoption of the report, said that he wished to draw the attention of the shareholders to the important proposal which had been made in the report. It was hardly necessary for him to remind the shareholders of the present condition of the Company. It was a very serious one, and more capital was wanted. Several applications for extensions had been received, and were engaging the attention of the Directors; and it was desirable to comply with these applications. Distinct advantages would be derived by all from the adoption of the proposals made. The dividend at first would be small; but the signs were encouraging, and they might proceed. He trusted the proposals would be heartily accepted. Mr. C. P. Noel seconded the motion, and endorsed the remarks of the Chairman. Dr. Gibbs Blake supported the motion, which, after a few questions had been asked, was adopted unanimously.

THE DISPOSAL OF METROPOLITAN SEWAGE.—At the meeting of the Metropolitan Board of Works last Friday, the Works Committee reported that they had had before them a suggestion by Sir Henry Roscoe, that an exhaustive examination—chemical, physical, and microscopical—should forthwith be made of the condition of the foreshores of the Thames from Barking down the river to the mouth, including the whole of the estuary. He considers it to be of great importance, in view of the proposal to carry the sludge out to sea, and of questions which may arise thereon, to be in possession of scientific data of an accurate character as to the condition of the foreshores at the present time. Sir Henry suggests that Sir Joseph Bazalgette should be instructed to send an assistant to examine and report from an engineering point of view, whilst the Board's Chemist (Mr. W. J. Dibdin, F.I.C., F.C.S.), and his assistant, together with Sir H. Roscoe's assistant, who he states has had experience in such work, should be called upon to make the chemical inquiry. Sir Henry, for his part, will undertake to superintend the whole work, to draw up instructions as to the details of work to be done, and to report to the Board on its completion. This was agreed to.

CROYDON CORPORATION WATER SUPPLY.—At the meeting of the Croydon Council on Tuesday last week, Mr. Morland, in moving the adoption of the Water Committee's report, took the opportunity of referring to the cost of the new water-works, the inauguration of which by the Archbishop of Canterbury was noticed in the JOURNAL last week. He said that, as the Council were aware, certain difficulties arose in connection with the sinking of the well, which caused an expenditure above the estimate of £6400. The original estimate for the whole work was £46,000; and if they added to this the further expense of £6400, they arrived at £52,400 as the estimated expenditure on the whole work. He expected the actual expenditure would be about £52,000, which was exceeding near the estimate. He should also observe that a great deal of additional work had been done, which was not reckoned for in the original estimate. The engine-house had been made nearly twice the size originally intended, in order that, whenever they required another engine (as they were pretty sure to do in a few years time), one could be put in the present house without incurring more outlay for building. They had also expended a large additional amount on new mains. The Council desired the extension of the mains in Norwood, with the view of supplying water there for sanitary purposes; and the mains from the reservoir had been made much larger than at first estimated for. They had, in fact, in this respect done half as much more work than was originally expected; but the cost had not been proportionately more—the price of iron having been so low that they were able to do more work for the money than at first anticipated.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST. (For Stock Market Intelligence, see *ante*, p. 283.)

Issue.	Share	When ex-Dividend.	Dividend of Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.					£ s. d.
GAS COMPANIES.								
590,000	10	12 Apr.	10½	Alliance & Dublin 10 p. c.	10	183-191	..	5 7 8
100,000	10		7½	Do. 7 p. c.	10	183-184	..	5 7 2
300,000	100	2 July	5	Australian (Sydney) 5% Deb.	100	110-112	..	4 9 3
100,000	20	30 May	10	Bahia, Limited	20	23-25	..	8 0 0
200,000	5	11 May	7½	Bombay, Limited	5	7-7½	..	5 0 0
40,000	5		7½	Do. New	4	5-5½	..	5 9 1
380,000	Stock	15 Feb.	11½	Brentford Consolidated . . .	100	225-230	..	5 2 2
110,000			8½	Do. New	100	165-170	..	5 2 11
220,000	20	14 Mar.	10½	Brighton & Hove, Original .	20	43-45	..	4 13 4
320,000	20	12 Apr.	11½	British	20	45-47	..	4 15 9
50,000	10	14 Mar.	11	Bromley, Ordinary 10 p. c.	10	20-22	..	5 0 0
39,000	10		8	Do. 7 p. c.	10	133-144	..	5 10 4
328,750	10	30 May	8	Buenos Ayres (New) Limited	10	134-144	..	5 10 4
200,000	100	2 July	6	Do. 6 p. c. Deb.	100	106-109	..	5 10 1
150,000	20	10 Aug.	7	Cagliari, Limited	20	25-27	..	5 8 8
550,000	Stock	12 Apr.	13½	Commercial, Old Stock . . .	100	266-271	..	4 19 8
130,000			10½	Do. New do.	100	205-210	..	5 0 0
121,234		28 June	4½	Do. 4½ p. c. Deb. do.	100	120-125	..	3 12 0
557,320	20	14 June	12	Continental Union, Limited .	20	45-46	..	5 4 4
242,680	20		12	Do. New '69 & '72	14	294-304	..	5 10 0
200,000	20		9	Do. 7 p. c. Pref.	20	35-37	..	4 17 3
75,000	Stock	28 Mar.	10	Crystal Palace District . . .	100	205-215	..	4 13 0
234,060	10	27 July	13	European, Limited	10	25-26	..	5 0 0
120,000	10		13	Do. New.	7½	18-19	..	5 2 7
354,000	10		13	Do. do.	5	12-13	..	5 0 0
5,468,350	Stock	15 Feb.	13½	Gaslight & Coke, A, Ordinary	100	254-258	..	5 0 9
100,000			"	Do. B, 4 p. c. max.	100	100-105	..	3 16 3
665,000			10	Do. C, D, & E, 10 p. c. Pf.	100	263-268	..	3 14 7
30,000			5	Do. F, 5 p. c. Pf.	100	127-132	..	3 15 9
60,000			7½	Do. G, 7½ p. c. do.	100	185-190	..	3 18 11
1,300,000			"	Do. H, 7 p. c. max.	100	170-175	..	4 0 0
463,000			10	Do. J, 10 p. c. Pf.	100	261-266	..	3 15 2
1,061,150		14 June	4	Do. 4 p. c. Deb. Stk.	100	119-122	..	3 5 7
294,850			4½	Do. 4½ p. c. do.	100	125-130	..	3 9 3
650,000			6	Do. 6 p. c. do.	100	175-178	..	3 7 5
3,600,000	Stock	11 May	10	Imperial Continental	100	205-208	..	4 16 1
75,000	5	14 June	6	Malta & Mediterranean, Ltd	5	42-54	..	5 14 3
550,000	100	3 Apr.	5	Met. of Melbourne, 5 p. c. Deb.	100	114-116	..	4 6 2
541,920	20	14 June	6	Monte Video, Limited	20	20-21	..	5 14 3
150,000	5	30 May	10	Oriental, Limited	5	94-95	..	5 2 7
60,000	5	28 Mar.	7	Ottoman, Limited	5	6-7	..	5 0 0
People's Gas of Chicago—								
420,000	100	2 May	6	1st Mtg. Bds.	100	104-109	..	5 10 1
500,000	100	1 June	6	2nd Do.	100	95-104	..	5 0 0
100,000	10	26 Apr.	10	San Paulo, Limited	10	16-17	..	5 17 8
500,000	Stock	29 Feb.	15½	South Metropolitan, A Stock	100	315-320	..	4 16 10
1,350,000			12	Do. B do.	100	244-249	..	4 16 4
141,500			13	Do. C do.	100	250-260	..	5 0 0
550,000		28 June	6	Do. 5 p. c. Deb. Stk.	100	135-140	..	3 11 5
60,000	5	29 Feb.	11	Tottenham & Edm'ton, Orig.	5	11-13	..	4 4 0
WATER COMPANIES.								
717,467	Stock	28 June	9	Chelsea, Ordinary	100	252-257	+1	3 10 0
1,730,560	Stock	12 Apr.	7	East London, Ordinary . . .	100	196-201	+1	3 9 8
700,000	50	11 June	9	Grand Junction	50	123-128	..	3 10 4
708,000	Stock	10 Aug.	10½	Kent	100	267-272	+2	3 17 2
1,013,800	100	28 June	9	Lambeth, 10 p. c. max. . . .	100	267-268	..	3 8 8
406,200	100		7½	Do. 7½ p. c. max.	100	200-205	..	3 13 2
200,000	Stock	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	117-120	..	3 6 8
500,000	100	27 July	12½	New River, New Shares . . .	100	347-352	+4	3 8 10
1,000,000	Stock		4	Do. 4 p. c. Deb. Stk.	100	123-127	..	3 8 0
302,300	St. k.	14 June	6	S'hwk & V'xhall, 10 p. c. max.	100	161-166	..	3 12 3
126,500	100		6	Do. 7½ p. c. do.	100	157-162	+6	3 14 1
1,155,066	Stock	14 June	10	West Middlesex	100	264-269	..	3 14 4

* Ex div.

† Next dividend will be at this rate.

SOUTH STAFFORDSHIRE WATER-WORKS COMPANY.—The following is the report of the Directors, to be submitted to the proprietors at the meeting to be held at Birmingham, on the 23rd inst.:—"The number of houses laid on during the half year ended June 30, 1888, was 1500; making the total supplied 65,641. The gross amount of water-rates for the half year was £33,973 10s. 9d., as against £32,707 2s. 2d. in the corresponding period of the previous year. After providing for interest on debenture stock and preference stock, the amount remaining for division (including £2299 7s. 6d., the balance brought from last half year) is £13,130 11s. 3d.; and your Directors recommend the declaration of a dividend for the half year on the ordinary stock at the rate of 5 per cent. per annum, less income-tax. The amount required for the dividend being £12,433 14s., there will remain £696 17s. 3d. to the credit of next half year. The Directors regret that the Bill in Parliament, promoted under the authority of the meeting of proprietors held on the 16th of February last, was defeated in the House of Commons, although it had been previously passed, after a lengthened inquiry, by the House of Lords.

POLLUTION OF A BROOK WITH GAS-WORKS REFUSE.—At the Bromsgrove Petty Sessions last Tuesday, before Messrs. Smallwood and White, the Bromsgrove Gas Company were summoned for allowing, on the 29th of May last, liquid matter to flow into the Spadesbourne Brook, a tributary of the Severn, in such quantities as to kill fish. Mr. F. Holyoake appeared for the Severn Conservators; and Mr. J. R. Horton defended. Alfred Lacy, a stoker in the employ of the Company, was called as a witness against his employers; but his evidence went to show that no liquid ran from the Company's works into the stream, nor was it possible for anything to pollute it. There was but one drain connected with the brook; and this received only exhaust steam and the water which the men had used for washing themselves. All other refuse entered the main drainage. Sergeant Emms, who had examined the gas-works in company with Sergeant Cooper, gave a very different version of the state of affairs, and alleged that Lacy had told him the Manager (Mr. Wheeler) had recently given instructions that the refuse from a certain pipe should be caught in buckets. Two witnesses deposed to seeing boys taking dead fish from the brook. Most of them were small; but one weighed about 1½ lbs. Cooper, the water bailiff, having given evidence, Mr. Horton addressed the Bench for the defence, contending that nothing of an offensive character went down the drain which ran into the brook. The residual tar was a valuable product; and it was not likely the Company would waste it. Some of it was used for heating the retorts. The Manager and another witness gave evidence to show the impossibility of polluting the stream as alleged; and it was stated by two men that they had seen boys getting dead fish from the brook 200 yards from the Company's works. The landlord of a neighbouring public-house testified to a pail of tar being overturned in his yard on the 19th of May, and to the contents being swept into the brook. The Bench nevertheless fined the Company £1, and £2 7s. 6d. costs.

THE LIGHTING OF THE TEES BY GAS.—At a meeting of the Tees Conservancy Board last Wednesday, the Secretary (Mr. Amos) read a communication he had received from the Trinity House to the effect that a Committee of the Elder Brethren had visited the Tees, and did not see any objection to the adoption of Pintsch's system of lighting by compressed gas for any station on the river at which it might appear to the Conservancy Board to be desirable. They suggested, however, that in the adoption of gas-buoys it was essential that a spare buoy should always be available in case of accident. A resolution was submitted, authorizing the Committee to carry out the lighting scheme so far as it had been approved by the Board; and this was agreed to.

THE SOWERBY BRIDGE LOCAL BOARD AND MESSRS. WHITWORTH AND CO.—The difference which the Local Board of the Sowerby Bridge district have had with Messrs. Whitworth and Co., Limited, from whom they recently bought the gas-works situated at Luddenden Foot, is in a fair way of settlement. It will be remembered that Messrs. Whitworth claimed to be supplied with gas at the same price as was being charged in Sowerby Bridge itself; and, failing this, they threatened to resume the manufacture of gas for their own works and tenants. At the last meeting of the Gas Committee, however, a letter was received from the firm, offering to pay 3s. per 1000 cubic feet for gas supplied to them; and the Committee resolved—"That the offer be accepted—viz., 3s. per 1000 cubic feet net, from the March quarter, so long as the gas remains at the present price, and that the price up to that time be 3s. 9d. per 1000 feet, less the usual discount." The resolution was confirmed by the Board at their last meeting.

TRURO WATER COMPANY.—At the half-yearly meeting of the Truro Water Company held last Wednesday, under the presidency of Mr. A. C. Williams, the Chairman congratulated the shareholders on the gradual improvement in the position of the Company. On revenue account the balance had risen from £321 to £334; and there had been an increase in water-rents from £447 to £470. On the profit and loss account he was glad to say there was a great improvement. The balance against them last half-year was £133, which had been cleared off altogether, and there was now a credit balance of £310. It was the first time they had "turned the corner;" and it represented on a capital of £16,000 about 2 per cent. profit on the half year. They might congratulate themselves on this. It was a day they should remember; and he hoped it was an earnest of what would be done in the future. The Directors had gone into the matter of providing additional storage at the reservoir and works. They had had two schemes before them of making reservoirs to store a two months' supply, supposing the rivers ran dry. The cost of one scheme would be about £1200, and of the other about £1500, exclusive of the land. At present they had not come to any definite conclusion on the matter. There was an ample supply now; but the time would come when they would have to make some such outlay. The Directors' report was adopted.

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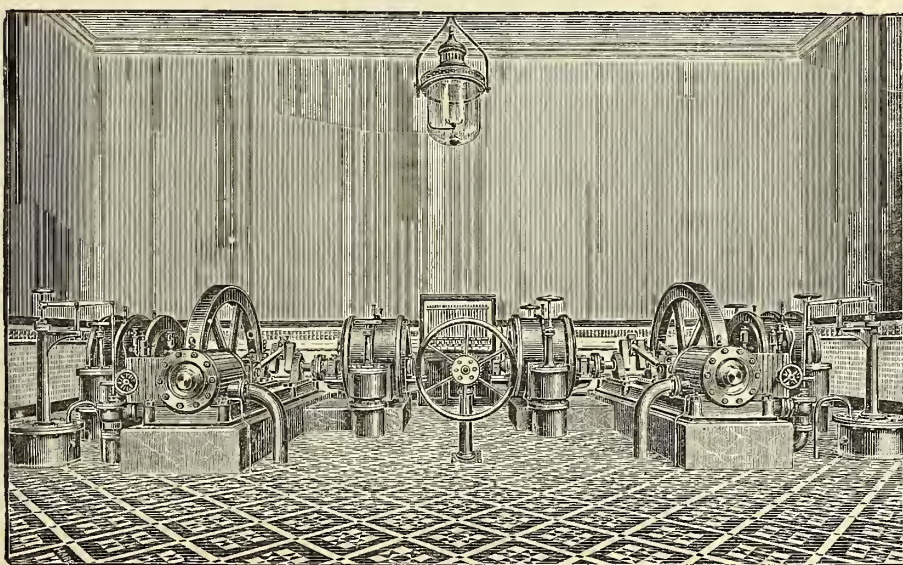
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* * See Advertisement on Page III. of the Wrapper of this week's issue.

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Address, stating age, to G. C., Post Office, Luton, BEDS.

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FOR SALE—Two Purifiers 6 ft. by 4 ft.;

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OFFERS invited for "Journal of Gas Lighting," 1854 to 1897 inclusive, bound. Gas Institute Transactions, 1882 to 1887 inclusive. Report of British Association of Gas Managers, 1881; and Reports of Gas Engineers and Managers' Associations, 1884 to 1887 inclusive. Also Vol. I. of "King's Treatise." Apply at the Gas-Works, DUDLEY.

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WM. ALLEN, Secretary.

New Romney, Kent.

THE Truro Gas Company invite Offers for purchase of about 40 tons of SPENT OXIDE. Sample sent free on application to the Manager.

CORPORATION OF SOUTHPORT.

THE Gas Committee are prepared to receive TENDERS for all the WROUGHT and CAST IRONWORK required for a Retort-Bench containing 48 through Retorts.

Specification and plans may be seen on application to the Engineer, Mr. John Booth, or copies of the same will be supplied at a charge of half-a-guinea per set.

Tenders, endorsed "Retort-Fittings," to be in the hands of the undersigned not later than Monday, the 3rd of September next.

J. H. ELLIS, Town Clerk.

Town Hall, Southport, Aug. 4, 1888.

SOEWERY BRIDGE LOCAL BOARD OF HEALTH.

(GAS DEPARTMENT.)

THE Gas Committee of the Sowerby Bridge Local Board of Health invite TENDERS for the purchase of the surplus TAR which may be produced at their Gas-Works, at Sowerby Bridge and Luddenden Foot, during One or Two years, from the 1st of September, 1888.

Tenders to be sent in not later than Tuesday, Aug. 21, 1888.

Specifications and forms of tender can be obtained by applying to the Manager, at the Gas-Works.

The Gas Committee do not bind themselves to accept the highest or any tender.

JOHN MARSLAND, Engineer and Manager. Gas-Works, Sowerby Bridge, Aug. 2, 1888.

HEREFORD CORPORATION.

(GAS-WORKS DEPARTMENT.)

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee are prepared to receive TENDERS for the surplus TAR produced at their Gas-Works for a term of One, Two, or Three years, from the 1st of January, 1889.

Particulars and form of tender can be had on application to the undersigned.

Sealed tenders, addressed to the Chairman of the Gas Committee, Mansion House, Hereford, and endorsed "Tender for Tar," must be sent in not later than the 1st of September, 1888.

The Committee do not bind themselves to accept the highest or any tender.

By order,

WILLIAM PARLEY, Gas Engineer and Manager. Gas-Works, Hereford, Aug. 9, 1888.

WALLASEY GAS-WORKS.

TO TAR DISTILLERS AND OTHERS.

THE Wallasey Local Board are prepared

to receive TENDERS for the purchase of AMMONIACAL LIQUOR (about 2200 tons per annum), and also of the surplus GAS TAR (about 1000 tons per annum), produced from time to time at their Gas-Works, Great Float, near Birkenhead, during a period of One, Two, or Three years from the 30th of September next.

Any further information may be obtained on application to Mr. H. Ashton Hill, Gas and Water Manager to the Board.

Sealed tenders, endorsed "Tar, &c." and addressed to The Chairman of the Gas and Water Committee, to be left at my Office as below, not later than Five o'clock in the afternoon of Monday, the 27th inst.

The Board do not bind themselves to accept the highest or any tender.

By order,

WM. VICKERS, Clerk to the Board. Public Offices, Egremont, Cheshire, Aug. 9, 1888.

TENDERS FOR GAS COAL.

THE Gas Committee of the Stockton Corporation invite TENDERS for the supply, in whole or in part, of 23,000 tons of clean, well-screened, or TREBLE NUT GAS COAL, similar in quality to sample wagon, to be supplied to the Gas Committee if so requested.

The Coal to be delivered free from all dues in the Gas-Works Siding, in a dry state, free from dirt, shale, or other impurities, and in such daily quantities as may from time to time be directed by the Gas Manager.

Payments will be made monthly after each Council meeting. The Gas Committee do not bind themselves to accept the lowest or any tender.

Tenders, specifying the quantity and description of Coal offered, to be sealed and endorsed "Tender for Gas Coal," to be lodged with me on or before the 22nd of August, 1888.

WM. FORK, Manager.

Corporation Gas-Works, Stockton-on-Tees, Aug. 1, 1888.

BROMLEY GAS CONSUMERS' COMPANY.

NOTICE is hereby given that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held at the Bell Hotel, Bromley, Kent, on Thursday, the 30th day of August inst., at Six o'clock precisely, to receive the Report of the Directors, the Balance-Sheet confirmed by the Auditors, to declare a Dividend, and for General Business.

The Transfer Books will be closed on the 16th day of August until after the Meeting.

By order of the Board,

GEORGE H. OSBORN,

Secretary and Manager.

Offices at the Works, Bromley, Kent, Aug. 14, 1888.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is hereby given that the Annual

ORDINARY GENERAL MEETING of the Shareholders in this Company, will be held at the Company's Offices, Willoughby Lane, Tottenham, on Saturday, the 25th day of August inst., at Three o'clock in the afternoon precisely, to receive the report of the Directors, the Statement of Accounts for the Half Year ended the 30th of June, 1888, to declare Dividends for the same period, and for the Election of Two Directors and an Auditor for the ensuing year, and for transacting such other business as the Act of Parliament directs.

The Transfer Books will be closed from the 11th to the 27th day of August, both days inclusive.

By order of the Board,

JAMES RANDALL, Secretary.

Offices of the Company, Willoughby Lane, Tottenham, Aug. 10, 1888.

MITCHAM AND WIMBLEDON DISTRICT GAS LIGHT COMPANY.

(INCORPORATED BY ACT OF PARLIAMENT, 1867.)

NOTICE is hereby given that the FORTY-THIRD ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held in the Board-Room at the Works, Mitcham, in the County of Surrey, on Tuesday, the 28th day of August inst., at Three o'clock in the afternoon precisely, to receive the Report of the Directors, and a Statement of the Accounts for the Half Year ended the 30th day of June last, to declare a Dividend, and for General Business.

The Transfer Books will be closed from the 13th inst. until after the meeting.

By order,

BENJAMIN GREEN,

Secretary and Manager

Board-Room, Mitcham, Surrey, Aug. 7, 1888.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Invention may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

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Clerks, and Collectors to Gas and Water Companies at lowest rates of Premium. Large Reductions made when several Officials in one Company are Guaranteed.

The Bonds of the Company are accepted by the Lords Commissioners of H. M. Treasury, Local Government and Inland Revenue Boards, Board of Trade, &c., &c. Quotations invited.

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Head Office: Mansion House Buildings, London, E.C.

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ALFRETON IRON-WORKS DERBYSHIRE,

AND

WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter; and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, AUGUST 21, 1888.

A DISCUSSION ON GAS-BURNERS.

THERE was an interesting discussion (given elsewhere), at the North British Gas Managers' meeting, upon Mr. Geo. R. Hislop's paper on gas-burners, already published, in the course of which one or two observations were made that suggest a few words of comment. Mr. A. Macpherson, of Kirkcaldy, displayed righteous indignation against the itinerant sellers of gas-burners, who victimize ignorant gas consumers by selling to them, at 4d. or 6d. each, common articles of this description worth only 4s. 6d. a gross. The mischief done by these men is doubtless still considerable; but there is reason to believe that the modern practice of hiring out gas-stoves, &c., by Gas Companies has had a marked influence upon the trade of the gas-burner pedlars. We are assured that these gentry are not by any means so troublesome as they used to be, when consumers thought that the Gas Companies, who left their

internal fittings "severely alone," were their natural enemies. Time was—and not so very long ago—when a peripatetic vendor of gas-burners was sure of a sale for any rubbish that he chose to describe to his victims as disliked by the Gas Company. It was almost universally believed that the vendors of gas were pleased to see their product wasted, so long as it had passed through the consumer's meter. We do not say that this idea is extinct in all places, for there is nothing so long-lived as ancient error; but the most pessimistic student of humanity in these little manifestations must admit that there is a general improvement. Of course, it may not be all traceable to the cause we have named; but it would not be right to restrict this influence to its immediate effect, and there is reason to believe that the view we have stated is amply justified. Hawking gas-burners is not so popular a resource of the lazy or "out-of-work" mechanic as it was; and those who still take it up are compelled to deal in a better article. The so-called "duplex," or double-jet batwing burner, is still the main stock-in-trade of these itinerant vendors; but while these appliances find a place in respectable exhibitions it would be unfair to blame the pedlars too severely for trafficking in them. Self-lighting burners, generally well made, and good enough of their kind, are also hawked extensively; although how the vendors manage to persuade their patrons of their superior economy is a mystery. Economy is the great pretension under cover of which this trade is prosecuted. The burner only costs a few pence, or a shilling at the outside; and it is warranted to save so many shillings, or even pounds, in the course of a year! Another thing worthy of remark is that as the hawkers have become fewer, so there is less variety in their wares. The day of *bizarre* forms in gas-burners is past, never to return. The high-class Argands and regenerative gas-lamps shown in public offices, banks, and the better class of shops, have had their effect in educating the public mind in the principles which they exemplify. The utmost the wandering pedlar can do is to lay claim to a modicum of their excellences for his humble wares; and therefore, relic of a superstitious age as he is, he cannot do as much injury as lay in his power when there was little or nothing outside the gas-works to counteract him.

While referring to the discussion upon Mr. Hislop's paper, it may perhaps be worth while to draw attention to a term used by Mr. Macpherson with regard to some remarks made by Mr. W. Key upon the influence of the size of the internal bore of a burner on the illuminating power of the gas-flame. The point was well brought out by Mr. Key; and Mr. Macpherson, in acknowledging this, said, by way of explanation, that he believed, from experiments, "that a large chamber "below the point of combustion acts on the regenerative principle." Now there is here a misuse of the word regenerative which is not confined to Mr. Macpherson, although his speech affords an opportunity for making the necessary correction. What he meant in this case is that a large chamber inside a gas-burner allows the gas to become heated. This has nothing whatever to do with regeneration, however, which is a word meaning, in the case of furnaces or gas-burners, the returning to the point of combustion of the dark and otherwise waste heat of the products of combustion. It is of the first importance, in the interest of precision of knowledge and expression, that the word should be restricted to this meaning, and not used loosely, as there is a tendency to do, in connection with any gas-burner in which there is some device for heating the air or gas. If this heating is effected at the expense of the living flame itself—whether by conduction of the heat of the flame through a metal body containing the gas before ignition, as in the case stated by Mr. Macpherson, or otherwise—the burner has no claim to be called a regenerator, as any effect it produces is not by regeneration.

THE MEETING OF THE SOUTH METROPOLITAN GAS
COMPANY—MR. BRAY APPEARS AGAIN.

THE Ordinary General Meeting of the South Metropolitan Gas Company was held on Wednesday last; and the usual report of the proceedings will be found in another column. The speech of the Chairman, Mr. George Livesey, in moving the adoption of the report, does not present much matter for comment. He had evidently read the remarks which appeared in last week's JOURNAL upon the wearisomeness of the detailed comparison of entries in new accounts with others a year old; and he most scrupulously refrained from giving occasion for similar complaint in his own case. With the single exception of the cost of coals—which, as he pointed out, were 4d. per ton cheaper—Mr. Livesey did not do any mental subtraction sums. The principal part of his speech was devoted to a

statement of the part he took in connection with the movement for the abolition of the Coal Dues; but this was only an amplification of what he said at the recent meeting of the Chartered Company. The statement respecting the organization of cookery lectures by the Company, and the immediate results of this step, was most instructive. Mr. Livesey claims that by this means the Company have succeeded in placing out 1000 additional stoves; and as a gas-rental of £5 per annum per stove is not an extravagant estimate, it follows that the Company stand to gain an increase of business from this source of not less than £5000 a year. The chief interest of the meeting, however, to those who were present was the personal attack made by Mr. George Bray upon Mr. Livesey. It is much to be regretted that Mr. Bray has not chosen earlier the opportunity afforded by these meetings for showing his rancour against Mr. Livesey. He has been seen in the room on previous occasions; and as one of the counts of his indictment of the Chairman referred to business that transpired several years ago, he might have raked the matter up at any time since he became a shareholder on April 1, 1886—and, it may be remarked in parenthesis, with equal success. He might just as well have tried his strength against Mr. Livesey here as elsewhere. On Wednesday he prefaced his stale matter with a restatement of the ridiculous fable about the East Greenwich Gas-Works sinking into the ground, which, in its absurd inflation upon the thinnest possible basis of fact, is of a piece with most of Mr. Bray's "charges." Nobody can surpass Mr. Bray in the art of blowing bubbles. Give him a drop of soapy water, and he will blow the most surprising bubbles of all sizes and shapes, and link them together so cunningly that, to his own perverted vision, they appear like a chain cable of damnable evidence. His conduct on Wednesday was characteristic to a degree. He preferred a vague "charge" against the Directors, of withholding "sound and true information" from the proprietors. When ruled out of order, he contended that he was in order. He threatened that unless he was satisfied then and there, the Directors would hear more of the matter; and he coolly ordered the Chairman when to reply to him. By no stretch of charity can it be held that his remarks were inspired by regard for the prosperity of the Company; and if he wanted to learn how such a variation upon the ordinary business of a shareholders' meeting as he provided is regarded by the proprietors generally, he had his lesson from Mr. G. Howlett and others. As we said before, however, these meetings afford him a capital opportunity for showing the spirit in which he regards Mr. Livesey; and it is to be hoped he will take the fullest advantage of them. Has he overlooked the possibility of becoming a shareholder of the Crystal Palace District Gas Company, where he would have the additional advantage of vilifying Mr. Livesey as a Director, and Mr. Magnus Ohren and Mr. Charles Gandon as respectively Secretary and Engineer of the Company? If so, we make him a present of the suggestion. Seriously, however, what an extraordinary spectacle is presented by this behaviour of Mr. Bray towards those whom he elects to distinguish by his hate! Where is there a parallel to it? Mr. Bray is one of the phenomena of the age, if he only knew it.

NORTH OF IRELAND ASSOCIATION OF GAS MANAGERS.

The First Annual Meeting of this Association, held at Lisburn last Tuesday, was in every respect a satisfactory inauguration of what we cordially hope will prove a career of increasingly useful work. The whole of the arrangements for the reception of the members were carried out by the President (Mr. E. Stears) and Mr. James Whimster, of Armagh, with the latter of whom originated the idea of forming the Association, and who has since undertaken the duties of Honorary Secretary and Treasurer. Under the direction of these two gentlemen, an attractive programme of business had been settled; and, with the exception of one item, it was completed before the members dined together as a fitting close to the day's proceedings. A visit to the works of the Lisburn Gas Company was made by most of those attending the meeting; and this enabled them to follow with interest and greater profit the account of the works given by the President in his opening address. Thereafter three highly practical papers were read—by Mr. W. B. Featherstone, of Dundalk, on the utilization of tar for various purposes upon and outside gas-works; by Mr. A. Waddell, of Newtownards, descriptive of his experience with Hislop's regenerative furnace for the heating of retorts; and by Mr. J. Robb, of Limavady, giving an account of his arrangement of retort-setting specially adapted for small works. Discussions

of a conversational character followed the reading of the papers; and the authors of them were complimented for the trouble they had taken in their preparation. It should be mentioned that consequent on the half-yearly meeting of the Cork Gas Company being fixed for the same day, Mr. T. Travers was unable to be present to read the paper he had promised on the question, "How can we best Assist our Consumers?" A strong Committee was elected to carry on the work of the Association during the coming year, with Mr. Featherstone as President; and, out of compliment to him, it was arranged to hold the next meeting at Dundalk. In closing this brief notice of the gathering (reported elsewhere to-day), we cannot but congratulate the Executive on the success that has attended their efforts to launch the Association—the healthy tone of friendliness pervading the whole of the proceedings auguring well for the future of the Society.

THE BRITISH ASSOCIATION MEETING.

The scientific world is looking forward to the forthcoming meeting of the British Association for the Advancement of Science, which is this year to be held at Bath under the presidency of Sir Frederick Bramwell, who is called by a writer in *The Times* "one of the most popular members of the Association." It is rather a remarkable thing that the climax of a successful Civil Engineer's career appears to be election to the three honourable offices of President of the Institution of Civil Engineers, Chairman of the Council of the Society of Arts, and President of the British Association, which usually follow fast on each other. This was the case with Sir William Siemens; and the experience is repeated by Sir Frederick Bramwell. No doubt Sir Frederick will be able to give the world an interesting Inaugural Address. He may not find much to say about gas, although his connection with it must have been very profitable; but he is certain to say something about his newer love, electric lighting. One feature of the meeting is expected to present unusual interest. A number of discussions have been arranged for upon specified subjects, and much expectation has been excited respecting the outcome of this experiment, which is decidedly worth trying in other scientific societies. It has of late been complained that the time allowed for the discussion of papers contributed in most of the sectional meetings of the Association has been insufficient, and it remains to be seen whether, by the device stated, discussion can be reinstated to its proper place as one of the chief attractions of a meeting of scientific authorities. It always seems a matter for regret when the time of such meetings is too much occupied with the reading of papers, many of which must be of inferior interest and value to much that a few of the audience who are condemned to silence could advance on the same subjects. It is not within our province to discuss in advance the topics that are likely to be dealt with in the various sections. It may be mentioned, however, that Lord Bramwell is to preside over the Section of Economics; and as his Lordship is known to be a determined opponent of the socialistic tendency of the age, the debates in this department of the Association bid fair to be pretty lively. Professor Foxwell is to contribute a paper on "The Tendency of Competition to Result in Monopoly," as to which the history of the gas supply of London and many other towns may be cited as potent examples likely to occur to the minds of our readers. Mr. L. L. F. R. Price is down for a paper on "The Relations of Sliding Scales to Economic Theory," which also has a familiar sound. Mr. W. H. Preece is to preside over the section devoted to Mechanical Science, and is expected to review the practical applications of electricity, with special reference to lighting. In this section Professor G. Forbes is to explain the Westinghouse system of electric lighting, for the first time in England. Altogether, if not exceptionally brilliant, or likely to be rendered remarkable by the announcement of any great discovery, the meeting bids fair to be of average interest.

GASHOLDERS WITH MODIFIED GUIDE-FRAMING.

THE Rotherhithe gasholder experiment, and the observations we made upon it, have drawn an interesting criticism from the correspondent who has chosen on previous occasions to call himself "Theory and Practice"—a *nom de plume* which fits him better than most appellations of the kind. We have nothing particular to object to in the severity of the condemnation which the critic meets out for our own remarks. So long as this class of subject is discussed with that amount of interest which leads to useful developments either of theory or practice, it is idle to cavil at expressions denoting individual differences of opinion. There is nothing like a question of strains to evoke such expressions among engineers who

habitually study these matters, as anyone may see by the correspondence columns of the general engineering periodicals. He would be a rash man who would expect to obtain a consensus of professional opinion respecting the amount and direction of the strains in a three-legged stool, and how much more diversity of doctrine may be permitted in regard to such a complicated structure as a telescopic gasholder! Our esteemed correspondent accuses us of confusing between the load upon a cantilever and the method by which the load is sustained. It is possible that, in the endeavour to be direct and simple in expressing the most obvious results of the Rotherhithe experiment, we may have erred in this way; but the impeachment does not weigh very heavily upon our conscience. When we remember how recondite the theory of beams may appear when treated *au fond* by such writers as Rankine, and how intelligible to the most ordinary capacity the principle of the lever is made by Tait and other elementary teachers who, for the immediate purpose, ignore the theory of "couples," it may perhaps be pardoned if it is sought to render the first semi-popular statement of such a novel result as that of Rotherhithe more readable and striking than profound. We have not pretended to conceal the fact that in this structure, with shortened guide-framing, the top unsupported lift is required to transmit, through its own substance, whatever overturning stresses it may have to endure to its base, instead of transferring them to a separate supporting framework. All that we were concerned to show was that this self-sustaining power can and does exist. Nobody will deny that the top lift of a holder can and generally does press against its guide-framing—or, as it might be stated, that the guide-framing does sometimes press against the holder. The question is, Is this pressure necessary to the stability of the structure? and this question the Rotherhithe experiment answers in the negative. We are left in doubt whether our correspondent really wishes to uphold what we have apparently offended him by calling the "old theory" of gasholder framing or not. This theory, as we endeavoured to define it, is that because a gasholder presses, under certain conditions, against the top of its guide-frame, therefore the latter must be carried to the full height of the holder's path. With all deference to our correspondents' objections to the way in which our observations were worded, we maintain that but for some such modification of this view as that which we have dared to distinguish as the "new theory," the practical effect would have been that guide-framing would have been carried to the full height so long as gasholders continue to be built. Our correspondent accuses us of misrepresenting the position occupied last year with reference to this point by Mr. Corbet Woodall and Mr. Foulis; but will he contend, from anything either of these eminent Engineers is reported to have said at this time, that they would have been prepared to do what Mr. Livesey has done at Rotherhithe? We repudiate the allegation that anything we remarked upon the Rotherhithe experiment was intended to upset any established principle of mechanics, and cannot find any colourable excuse for the reproach. Our critic is hardly fair, moreover, in falling as he does upon our statement (intended merely to enforce a certain view expressed in the context) respecting the ability of a gasholder that will stand in fair weather to do so in a storm. What we meant by this rather daring observation was merely to emphasize the inherent instability of such structures, the effect of which, as we argued, is much greater than the accidental overturning strain of an external force. It was a confessed exaggeration, designed to attract attention to a factor of the general problem that seemed to require to be brought into prominence. In conclusion, we may be permitted to point out that, in his haste to find fault with our observations, the critic has allowed himself to fall into something very like self-contradiction. In one place he defends the promulgation of "theories" against the incredulity of unreasoning persons; and yet he winds up by quoting a remark of Mr. George Livesey's addressed against theorizing, merely because it can be done "at a desk"—the remarkable thing being that in this particular theory Mr. Livesey himself was deeply interested, and was more than half inclined to accept it!

In order that there may be no misunderstanding as to the consumption of gas at Reading during the summer months, it should be pointed out that the "four settings of eights," which it was stated in the article in the JOURNAL last week (p. 284) were sufficient to meet the requirements of the town at the time of the writer's visit, were "through" settings, or 64 mouthpieces.

Water and Sanitary Affairs.

THE accounts attached to the report of the Thames Conservators for the past year show that the contributions from the Metropolitan Water Companies towards the revenue of the upper navigation amounted to £15,050, in addition to £1450 in aid of the lower navigation. The dividing-line between the two sections is at Staines; and the upper navigation extends to Cricklade, in Wiltshire. The Conservators state in their report that the funds provided for the maintenance of the river above Staines have hitherto been found inadequate to enable them to carry out the duties imposed upon them by Parliament; and to this fact they have frequently called attention. But they are now in a position to announce that, with a view to overcome this financial difficulty as far as possible, they have arranged with five of the Metropolitan Water Companies for these bodies to enlarge their contributions. The Conservators express their belief that the extra revenue thus obtained "will aid very materially in the maintenance of the navigation, and in securing the purity of the water supply." Perhaps the chief benefit will appertain to the navigation; for it appears by the report that, at the time this arrangement was made, the Conservators had so successfully exercised their powers as to enable them to say that, "excepting from the town of Staines, and some minor instances which are being remedied, there is practically no pollution passing into the river above the intakes of the Water Companies." So far as Staines is concerned, the Conservators have indicted the Urban Sanitary Authority in the Court of Queen's Bench. The facts are admitted; but there are points of law to be settled in the Court for Crown Cases Reserved. We are glad to find the Conservators dealing vigorously with the numerous house-boats and steam-launches on the Thames, by serving notices on the owners, and instructing their officers to keep a strict watch over these vessels, so as to detect any case of pollution therefrom. Accordingly, there is a prospect that the river will not only be kept as clean as heretofore, but will even be subject to further improvement. The precautions requisite with regard to the water supply throughout the country are adverted to in a memorandum drawn up by Dr. George Buchanan, F.R.S., and issued within the last few days by the Local Government Board. In this document there is no reference to the Metropolis; and we presume there was no intention on the part of Dr. Buchanan to include the London Water Supply in his remarks. Everyone will agree with him that "no impure water" should be drunk—understanding by impurity that which is of a "dangerous organic" character. But one or two remarks might be strained into a meaning adverse to the use of any water taken from an open river. We do not suppose this was intended as a reflection on the character of the London Water Supply; and it is to be hoped that the public mind will be in no degree disturbed on this point. The drinking supply of London, after being tested chemically, biologically, and physiologically, proves itself to be a wholesome water, and, as such, fulfils every reasonable requirement. So far as the source is concerned, that is being guarded with increasing care; while the treatment which the water undergoes before it reaches the consumer interposes what appears to be an insuperable barrier against the passage of anything hurtful. One thing has been made clear—that the Water Supply of London has undergone a remarkable degree of improvement, for the maintenance of which there is the fullest guarantee in the shape of a most rigorous supervision, official and semi-official.

If the Corporation of London are in agreement with the report which has been drawn up by the Gas and Water Committee of that body in respect to the constant supply, the attitude of the City authorities on this subject is somewhat remarkable. The Vestries of sundry City parishes have sent in petitions, asking the Corporation to notify the Water Companies that a constant supply is required. The Committee of the Corporation having conferred with the New River Company, who supply the greater part of the City, have found the Company perfectly willing to make the supply constant as soon as the premises to which it is to be given are provided with the requisite fittings. The reasonableness of this requirement is shown by a statement in the Committee's report, that there is some danger of pipes bursting when "charged with the high pressure of the constant supply." Such a casualty in a City warehouse might involve serious damage to costly goods. But the Committee have a supreme

consideration for the cost of the fittings, and are of opinion that the expense would be more than the householder would care to incur. Another apprehended difficulty is that of doing away with all the old fireplugs; rendering it necessary that the number of hydrants should be doubled. Fire-plugs will not stand high pressure, and hydrants must be substituted. But there are so many hydrants in the City already, that we should have thought a moderate addition to their number would have sufficed to take the place of the remaining fire-plugs. Moved probably by a kind of sympathetic instinct, the Committee took counsel with Mr. Archibald Dobbs, who told them "he felt very strongly that the "citizens would regret it, if the petitions in favour of a constant supply were acceded to." Why they should regret it does not appear, except on the ground of expense, which the Committee estimate as exceeding £5 per house, though it is by no means certain that this would occur in every case. Outside this pecuniary consideration, it is curious to find the Committee of the Corporation using an old argument in favour of the intermittent supply—viz., that it promotes the flushing of the drains. The Committee, "for these "and other reasons," are of opinion that it is not expedient, in the interest of the petitioners and the citizens generally, to take any steps in the direction indicated. Perhaps there are "other reasons" more cogent than those which have been published. We presume it is a matter of indifference to the New River Company whether people have a constant supply of water or one that is intermittent. But it seems rather strange that the Corporation should manifest so little zeal in bringing about a change which has been persistently urged by sanitarians and recommended in Parliament. Perhaps the City Vestries will consider the matter a little further, and will conclude to lay their case before the Local Government Board, in accordance with section 11 of the Metropolis Water Act, 1871. Or they may await the advent of the County Council, in whose deliberations superior wisdom may be found. With 52 per cent. of the houses in the Metropolis in possession of the constant supply, it seems a little singular that the City, with all its wealth, should think the cost of such a boon too great for its inhabitants to bear.

THE Commissioners of Sewers will, says *Money*, make another attempt in the coming winter to waste the ratepayers' money in introducing the electric light into the City. "The Anglo-American Brush Company are desirous," our contemporary remarks, "of offering the worthy Fathers every facility; but we fancy that the common sense of the Corporation will again stop the experiment."

At a specially-convened meeting of the Salford Town Council held last Wednesday, Mr. John Graves, who has been Town Clerk for a number of years, tendered his resignation. After some discussion, the Council (by a narrow majority) decided not to accept it; but to refer to the Finance Committee the matters with regard to which his resignation had been tendered.

It is reported that Mr. D. Ford Goddard, Assoc. M. Inst. C.E., formerly Engineer, and now one of the Directors, of the Ipswich Gas Company, intends to offer himself at the next election as a candidate for the representation, in the Liberal interest, of the borough with which his family have been associated for so many years. Mr. Goddard is already a member of the Town Council.

WE learn that Mr. John Chamberlain, who has been for the past eight years engaged at the Beckton Gas-Works, will leave England in about a month, to take the appointment of Assistant Engineer (under Mr. J. T. Wynne) at the West Melbourn station of the Metropolitan Gas Company. We understand that these works are about to be considerably extended; and that the selection of Mr. Chamberlain is due to the experience he has had at Beckton in the erection of both gas manufacturing and chemical plant.

At the meeting of the Newbury Town Council last Tuesday, the salary of the Gas Engineer and Manager (Mr. R. M. Couper) was increased by £25 per annum. The Chairman of the Gas Committee (Mr. C. Lucas), in asking the Council to sanction the advance, which he said had had the careful consideration of the Committee, he remarked that though Mr. Couper's salary was the same as that of his predecessor, the work of the undertaking had increased something like 33 per cent., and two substantial reductions had been made in the price of gas.

ACCORDING to a paragraph which appeared in the *Lancaster Gazette* last Saturday, the satisfactory results of the management of the Corporation gas undertaking in the twelve months ending June 30 last has enabled the Gas Committee to recommend another reduction, to the extent of 3d. per 1000 cubic feet, in the price of gas. Taking off the discount allowed for prompt payment, the price will stand at 2s. 3d. per 1000 feet. Our contemporary heartily congratulates the Engineer and Manager (Mr. C. Armitage, F.C.S.) on the results he has achieved, and expresses the hope that the Committee will show in some practical way their appreciation of his efforts.

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(FOR STOCK AND SHARE LIST, see p. 349.)

As usual at this time of year, business on the Stock Exchange is rapidly becoming more and more restricted. Last week was, on the whole, very quiet; and the general tendency in the principal departments was to reduce prices. This was partly by way of reaction from the recent rise, and partly owing to lack of support, while towards the close some degree of uneasiness regarding the aspect of Continental affairs, rather accentuated the downward tendency. It was also thought probable that the Bank-rate might have been raised further on Thursday; though, in fact, it was not. The Gas Department has been an exception to the general rule—exhibiting great firmness. Several quotations have advanced, while only one Company shows a decline. The aggregate of business done has not been large; but the Metropolitan Companies have had their full share of it. Gaslight "A" continues steadily to regain the position from which it was so unreasonably displaced on the appearance of an Electric Lighting Company's prospectus; and the quotation shows an improvement of $1\frac{1}{2}$, with business marked at 259 $\frac{1}{2}$. South Metropolitan has been moderately active, and the stocks have changed hands at good figures; the top price being repeatedly marked, though the quotation is nominally left unchanged. Commercial has been unusually busy, and shows out firm; the new stock marking a rise of 2. The Suburban and Provincial undertakings do not exhibit any change, though the reports of two of them—the Tottenham and Edmonton, and the Brighton and Hove—just issued are highly favourable. The former are enabled to reduce the price of their gas by 2d. per 1000 cubic feet for the current half year, and the latter to make a similar reduction in the coming half year. Taking these facts in connection with what we said last week about the Commercial, we believe the past half year will prove to have been a very favourable one for many Companies. Of the Foreign division, Imperial Continental are 1 better; Europeans, $\frac{1}{2}$; and Malta, $\frac{1}{4}$. The only relapse is in Alliance and Dublin. The Water Companies have been so extremely quiet as to admit of no daily record of business done in them. Quotations, however, still creep up by small degrees.

In Gas the daily operations were: Monday's business was very fair, and mostly in South Metropolitan. Tuesday was much quieter. European old rose $\frac{1}{2}$. There was renewed activity on Wednesday, especially in Gaslight "A," which was in good demand. Imperial Continental rose 1. Lambeth Water also rose 1. On Thursday, Gaslight "A" was again in request, as also Commercial; the former changing hands at higher figures than the quotation. Gaslight 4 per cent. debenture advanced 1. In Water, Kent rose 2; and East London and Chelsea, 1 each. Friday's business was more restricted, but prices rose—Commercial new advancing, 2; Gaslight "A," $1\frac{1}{2}$; European new, $\frac{1}{2}$ each; and Malta, $\frac{1}{4}$. Alliance old fell $\frac{1}{2}$; and the new, $\frac{1}{4}$. Saturday was even more than usually quiet, and two or three transactions at firm figures were all.

ELECTRIC LIGHTING MEMORANDA.

ELECTRIC LIGHTING AT THE BRITISH ASSOCIATION—TROUBLES AT LEAMINGTON—THE HISTORY OF THE ELECTRIC LIGHTING AT PADDINGTON STATION—FALSE NEWS.

As if electric lighting had not been sufficiently talked about, in proportion to the amount of work done, the scientific electricians are preparing for a grand effort at the forthcoming meeting of the British Association. The chair of the section devoted to Mechanical Science is to be occupied by Mr. W. H. Preece, the Electrician to the Post Office, who may be depended upon to say everything about electric lighting except how much has been spent upon it at St. Martin's-le-Grand, and why it has not been more successful there. The paper by Professor Forbes, upon the Westinghouse system of electric lighting as carried out in America, is looked forward to with considerable interest, although it is difficult to see what he can say about it that is fresh to readers of the electrical journals. When an example of the system is practically working in England, it may be possible to learn something more about it. Sir Frederick Bramwell, as President of the Association, will probably say something to justify the title of electrician which he has assumed of late years; and it is to be hoped, for the sake of his reputation, that in this case he will make a better job of it than in the paper on electric lighting which he read some time back before the Institution of Civil Engineers, and which gave censorious people ground for remarking that it is not every man who can take up successfully with a new trade late in life. On the whole, however, we gravely doubt whether either Sir Frederick Bramwell, Professor Forbes, or Mr. Preece will be able to tell the people of Bath much to the purpose about that system of lighting which Mr. Massingham, the ex-shoemaker, proposes to bring to their doors. It seems a great drop from Sir Frederick Bramwell and his scientific satellites to Mr. Massingham, of Bath, Taunton, and elsewhere; but we should be puzzled to state which knows most about the more important side of the subject—that which touches the pocket.

We all know that even a worm will turn at last, when too heavily trodden upon; and so Mr. Arthur Chamberlain, albeit no more resembling the lowly worm than any other gentleman of his name, has been moved to give the Town Council of Leamington "a piece of his mind." As is generally the case under such

circumstances, however, the "piece" is not a very good sample; and the giver would have done better if he had kept it to himself. The authorities of Leamington were very complaisant to Mr. Chamberlain in their earlier dealings with him, and gave him a great many facilities for displaying what he could do in the way of lighting the town by electricity. As frequently happens with local authorities and their favourites, however, length of time and mutual experiences have not tended to an increase of cordiality between the parties. Some of the Town Council have said very ugly things about the electric lighting of the streets, and this body, as a whole, have lately displayed an awkward wish to have their own way about the public lighting. Consequently, Mr. Chamberlain has become utterly disgusted with them; and he has rashly seized an opportunity for telling them so in writing. He complains that his "motives are not appreciated," and emits a long growl which cannot do the Council any harm or himself any good. The actual subject-matter of the dispute between Mr. Chamberlain and the public lighting authority of Leamington is, of course, mainly of local interest. The general lesson which promoters of new-fangled means of lighting may deduce from them is one of caution how they rush in when they find a local authority at loggerheads with the gas company. It may be taken as an axiom that a town council that cannot keep upon good terms with the gas company on account of the public lighting will seldom be found permanently amiable with electricians.

For a long time nothing has been heard of the electric lighting installation at the Paddington terminus of the Great Western Railway, which was designed by Mr. J. G. H. Gordon, for the Telegraph Construction and Maintenance Company, who, after having lighted their own factory at East Greenwich, contemplated the addition of an electric lighting department to their business, under Mr. Gordon's management. Last week the *Electrical Review* published a brief history of this experiment, with which the Telegraph Construction Company began and ended their electric lighting aspirations. We are therein told, what we always suspected—that the Company had enough of electric lighting in this, their first contract, and that they "suddenly closed the electric lighting department, dispensed with the services of the Manager, and prematurely closed their engagement with the Great Western Railway Company." Not a word of all this has even been allowed to transpire at the ordinary general meetings of the Company; and the proprietors are therefore in ignorance respecting the amount of money lost by this unfortunate contract. Mr. Gordon figures prominently in connection with the Metropolitan Electric Lighting Company, which is very dubiously regarded by our contemporary. They freely admit that there has been something retarding the advancement of electric lighting which electricians have not yet been brought to acknowledge. We always say simply that there is "no money" in the business, as it must be carried on under the conditions prevailing in Great Britain; and it would probably be found, upon investigation, that there is not much difference of opinion on this point between the *Electrical Review* and ourselves, if the whole truth were revealed.

Having just said a good word for the honesty of purpose of the conductors of the *Electrical Review*, it is rather a pity that we must follow this up by a protest against the same journal of disseminating false intelligence. Yet in the same issue in which the history of the Paddington electric lighting experiment is truly told, there appears an altogether misleading report respecting the circumstances of electric lighting in Paris. We are told that "the use of electricity in every-day life in Paris is becoming more and more manifest." This may or may not be true in a general way; but the writer goes on to assert that the principal thoroughfares of the French capital will soon be lighted by electricity, but that the great stumbling-block is the city Gas Company, which is working tooth and nail to resist the innovation. Its losses have already been considerable, and the Directors are doing all in their power to retain custom by constantly lowering the price of gas. The shops which still burn gas are in an insignificant minority." It would be difficult to condense more blunders into as many words. It must suffice, by way of correction, however, to remark that the Paris Gas Company are established upon the basis of a concession under which a large proportion of the profits are divisible between the shareholders and the Municipality, and that accordingly the price of gas has not been reduced by a centime for more than thirty years. It might have been thought that no resident in Paris could have remained in ignorance of the troubles which the Gas Company have had with their customers upon this very point. Our contemporary has been egregiously misled in this matter, as our readers scarcely require to be told.

ONE of the largest firms of producers of gas coal in Durham have just intimated their intention to raise the price of their coal to 7s. 6d. per ton, less 2½ per cent.; and it is expected that others will follow the same course. For best gas coal the demand is very large; and it is anticipated that there will be higher prices known this winter, now that an advance is obtainable so early in the autumn.

THE gas industry in France has lately lost an able member in the person of M. Meizel, who for a long time filled the position of Chief Engineer of the St. Etienne Gas Company. M. Meizel was associated with M. Cadel in carrying out the series of experiments in hot condensation, of which an account appeared in the *JOURNAL* a few years since; and his name has occasionally come before our readers in connection with improvements in gas manufacturing appliances.

SACCHARINE AS A SUBSTITUTE FOR SUGAR.

ACCORDING to reports which have reached us from various sources, the substitution of saccharine—the recently discovered sweetening material produced from coal tar—for sugar is not attended with the advantages which were at first claimed for it. Mr. J. Michels, writing lately in *Health*, stated that he had been using saccharine instead of sugar for domestic purposes for about a month, and had found it difficult to dissolve, even in boiling water, although soda was added, and other means were taken according to formula, for making a perfect solution. Mr. Michels says this trouble has been spoken of by all who have made use of the substance. Saccharine is not altogether odourless or tasteless; but in use it does not impart any particular flavour, and he found its sweetening property all that could be desired. He thought it convenient to make a solution of sufficient strength that a teaspoonful would sweeten a breakfast cup of tea. Using it in this manner, tests were made in many ways—such as making lemonade, custards, puddings, mixing with acid fruits, and various kinds of domestic cooking. In all such cases the saccharine imparted an agreeable sweetness, but did no more than counteract or neutralize acidity. Now, it is well known that sugar not only has a sweetening property, but seems to be possessed of a power of bringing out an increased flavour of the substance it sweetens—in other words, the flavour is intensified. Mr. Michels found that the use of saccharine, on the contrary, appeared to deaden the flavour of the substance sweetened; and this is a great disadvantage. Attention has also to be drawn to the fact that sugar is a food—a quality not possessed by saccharine, which passes through the human body unaltered and never digested, affording no nutrition to those who take it. For these reasons it can never replace sugar as an article of diet, however cheaply it may be produced. It, however, will be a blessing to those persons afflicted with diseases in which the use of sugar is prohibited. Mr. Michels does not recommend the unlimited use of saccharine; not being altogether sure of its inert property while passing through the human system. He therefore advises those who are prohibited from taking sugar to use saccharine very sparingly, and only when necessary to counteract great acidity. He trusts that the day is far distant when saccharine will be produced at a cheap rate, as it will in that case be largely used as an adulterant in the place of sugar; and then it will be very difficult indeed for the public to distinguish the difference.

The Council of Hygiene and Salubrity of the Seine have definitely settled, on the basis of the reports of experts appointed by them, the certainty of the unwholesomeness of saccharine as a sweetener. These gentlemen stated that the sensation of sweetness produced by saccharine on the tongue lasts much longer than that produced by ordinary sugar; but it is much less agreeable, inasmuch as it leaves an after-taste of bitter almonds and a dryness of the throat. It is quite possible, they say, that to its method of preparation, and the impurities which cannot be entirely separated from it, may be attributed the ill-effects resulting from the use of saccharine. But it is equally possible that it is dangerous in itself, by reason of its intrinsic properties. At all events, its antiseptic qualities, by which the fermentation of substances with which it amalgamates is arrested, may become a positive danger. For the proper digestion of food, it is absolutely necessary that the action of the gastric juices should not be paralyzed; and it is precisely the contrary effect which is produced by the use of saccharine. Although this substance is supposed to be thrown off almost in the same proportion as it is taken, in cases of organic derangement it is liable to accumulate and produce unhealthy symptoms, such as indigestion, cramp, and general discomfort. Admitting even that saccharine is absolutely inoffensive from a hygienic point of view, it must be borne in mind that it is at a disadvantage compared with the ordinary cane or beetroot sugar, inasmuch as it has no nourishing properties. A curious fact about saccharine is that insects seem to have a positive dislike to it. In a pastrycook's shop, where a number of tarts and cakes had been sprinkled with saccharine, it was observed that a wasp and the inevitable flies carefully avoided settling on them—the wasp especially, for on a cake sprinkled with saccharine being purposely put in its way, it displayed a great amount of irritation.

In a communication to the French Academy of Medicine, Dr. Worms states that of several patients who made use of saccharine by his advice, all but one were soon compelled to give it up, on account of the occurrence of dyspeptic symptoms, nausea, loss of appetite, &c. It is usually not until after the substance has been taken for from 10 to 15 days that it manifests its evil influence; and it then appears to accumulate in the system. It has been computed by Professor Salkowski that the quantity of saccharine which an ordinary man in a condition of sound health and of medium strength may take daily with impunity is certainly not more than 1½ grains.

As to the detection of saccharine when mixed with other matters, Mr. D. Lindo, writing in the *Chemical News*, says it would seldom be possible to detect it, unless it was first isolated in a state of at least tolerable purity. Chemical tests that can be easily applied for its identification in this condition are probably known, and may have been published; but he has not met with any, except the production of salicylic acid from the compound by fusing it with potash or soda. He has failed as yet to obtain a characteristic reaction for the substance in solution. The following test, which must be applied to the solid body, is believed to be original. It consists in evaporating to dryness on a water-bath, the saccharine mixed with an excess of nitric acid. A fragment of caustic potash (not too small) is then added, and a drop or two of water, without

removing the dish from the bath. Colour is at once developed, and if the dish is inclined, streaks of colour—blue, violet, purple, and red—flow into the caustic; the reaction is very fine, and is still more beautiful if 50 per cent. alcohol is added to the potash instead of pure water. The test, however, is not extremely delicate; and 0.5 milligramme of saccharine in the solid state is about the smallest quantity that will give definite results. Heat is necessary to develop the colours, and apparently a large excess of alkali. Soda does not appear to act as well as potash. Colour reactions obtained with coal-tar products must, Mr. Lindo adds, always be suspected of not being characteristic.

THE GLASGOW INTERNATIONAL EXHIBITION.

EIGHTH ARTICLE.

THROUGHOUT all the civilized world, the Saracen Foundry of Glasgow is well known as being the place where the famous "Macfarlane's castings" are produced, more especially sanitary and rainwater goods and art castings in almost endless variety. It was therefore but natural to suppose that Messrs. W. Macfarlane and Co., the proprietors of that great foundry establishment, should take a prominent place in the Glasgow Exhibition, by way of upholding the fame and reputation of the important industrial district of which Glasgow is the centre. The position given to the firm is a very decided acknowledgment of their eminence in the production of high-class foundry goods in a variety of classes or departments. It is not necessary that we should enlarge upon the beauty and general excellence of the constructive and decorative ironwork shown by them; but our reference to this extensive collection is more with the view of directing attention to the examples of lamp-pillars, brackets, pendants, &c., for lighting by gas in public thoroughfares, railway stations, halls, churches, warehouses, &c. Most of these productions of the art foundry are well worthy of study. One of the lamp pillars—a massive and very beautiful piece of ironwork—is surmounted by a group of five lanterns, all in frameworks of castings formed of elegant tracery and foliar details. Another combination consists of a handsome pillar, surmounted by a main central lantern and by two side-arm lanterns—similar to pillars which have been erected at many street crossings in London. Others are examples of pillars which have been fitted at various banks and other public buildings in Glasgow. Altogether, Messrs. Macfarlane and Co. have acquitted themselves well in their display of ornamental cast-iron manufactures; and for their lamp-pillars, &c., they deserve very great credit.

There are several stands in the Machinery Court proper which are specially deserving of some attention at our hands. One of these is the collection of instruments shown by Murrie's Engineering Company, of Glasgow. The instruments referred to are chiefly pyrometers and thermometers, which have a very extensive range of usefulness, as they are capable of indicating (continuously and accurately) any degree of temperature between 50° below to 2000° above zero Fahr. They are constructed throughout of specially prepared homogeneous steel, and are subjected to severe continued tests, so as to ensure accuracy in graduation; and they indicate the degree of heat with unvarying precision. The instruments here shown are coated with nickel, copper, or platinum, depending on the purpose to which they are to be applied. It may be mentioned that these instruments are made in groups suited for various classes of operations where the temperatures employed are within certain well-defined limits. For example, Nos. 10 and 11 are specially designed for ammonia-stills, &c.; the ranges of temperature being, respectively, from 150° to 250° Fahr., and from 220° to 350° Fahr. Another group are intended for indicating the temperatures employed in tar-distilling and similar operations. Nos. 24 to 28 are suitable for indicating temperatures ranging from 400° up to 2000° Fahr.—such temperatures as are reached in gas, shale, and other retorts. Then, lastly, there are instruments designed for testing the temperature of regenerator furnaces, &c. Gas managers, tar and ammonia distillers, &c., who have used these instruments speak very highly of them, as their indications are exceedingly trustworthy. There is also shown at this stand an improved duplex pump, such as may be used for pumping tar, oil, ammoniacal liquor, &c. In this piece of apparatus there are two slide-valve steam cylinders, and two double-acting pumps; each pump and its steam cylinder being so arranged by the side of, and connected with the other, that the steam-valve of each is operated by the steam-piston of the other. In each case the cylinder has a gun-metal liner. Gas managers, equally with other steam-users, are deeply interested in the correct working of the boilers under their charge; and consequently a perfect low-water alarm can scarcely fail to be of advantage to them. At the same stand an alarm is exhibited which is exceedingly simple in its construction, and which can be tested at any time without interfering with the working of the boiler. It consists of a chamber or hollow sphere, placed outside the boiler, above the highest water-level. A tube or channel leads from the chamber to the interior of the boiler; the nose of the tube terminating at the lowest water-level. The outside chamber is fitted with a float, which, as it rises and falls, operates a valve on the higher end of the chamber, to which a steam-whistle is fitted. When the nose of the dip-pipe is immersed in the water, the steam-pressure, acting on the surface of the water in the boiler, maintains the outside chamber full of water; and, in consequence, keeps the float in its highest position—thus closing the outlet-valve. On the nose of the dip-pipe being uncovered, the water falls into the boiler, and the float descends; thereby opening the valve and permitting the steam to escape and sound the whistle.

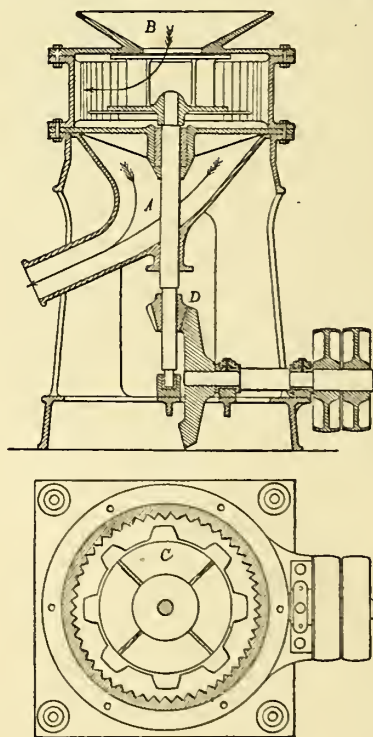
There are various stands in the Machinery Court at which pumps are shown of kinds suitable for use about gas-works, for pumping tar, ammoniacal liquor, &c., or for filling and emptying gasholder tanks, circulating water through condensers, &c. In this connection attention should be directed to the display of pumping machinery at the stand of the Pulsometer Engineering Company, and more especially to their "Deane" double-plunger, their "Cyclic," and their "Pulsometer" pumps.

At the stand occupied by Messrs. Fielding and Platt, of Gloucester, there are shown various examples of that firm's patent duplex pumping-engines, suitable for many purposes, including the pumping of gas tar, ammoniacal liquor, &c. The distinctive feature of these pumps lies in the fact that the steam cycles are controlled by means of a single-slide valve. By this arrangement it is said the parts required are greatly simplified and reduced in number, with a corresponding reduction in wear and tear, and in the amount of attention needed. It is also claimed that, as the valve is moved in two directions, one transverse to the other, its surfaces always remain in a perfectly steam-tight condition; and consequently they never require re-facing or renewal of any kind. An excellent display of pumping machinery is likewise made at the stand of Messrs. S. Owens and Co., of London, who are well known for their gas exhausters, gas-valves, &c. A prominent feature of the goods which they display is the collection of Blake's steam-pumps, such as are installed in and about many gas and water works, both at home and abroad. Similar apparatus to that which we have referred to in this article will also be found in other parts of the exhibition.

Notes.

ANOTHER COKE-BREAKER.

The accompanying illustrations, which are taken from a recent number of the *Journal des Usines à Gaz*, show a new form of coke-breaker devised by MM. Bréant Fils, in which centrifugal



force is directly applied to effect the desired object. The apparatus consists of a cast-iron framework supporting a hopper A, from which the broken coke is discharged, and a cylindrical body, furnished inside with angular projections, as shown. This cylinder bears the receptacle B, into which the large coke is thrown. In the centre of the cylinder there is fitted a "projector" C, which turns with a rapid horizontal movement—the speed depending upon the hardness of the material to be broken. This projector is fixed at the extremity of a vertical shaft, which receives its motion from a horizontal shaft (through the medium of the cog-wheels D, fixed at suitable angles) worked by the driving-wheel at the end. The action of the machine is extremely simple. The large coke, on being shot into the hopper B, falls into the space below, where it is attacked by the projector, thrown with considerable force against the serrated inner surface of the cylinder, and broken by the violence of the shock. The outlets of the hoppers are so arranged that, however large may be the coke, and however rapidly the machine may be fed, the lower hopper can never become obstructed. Consequently, friction of the pieces of coke one against another is avoided, with a resulting diminution in the production of breeze and dust. The constituent parts of the machine are of a simple character, strong, and durable. It has been tried in the presence of a number of gas engineers, with the result (according to our French contemporary) that a loss of only 5 to 6 per

cent. was shown, with an addition of 4 to 5 per cent. of dust. So that, after breaking and sifting the coke, a maximum loss of only 8 to 10 per cent. is sustained.

REDUCTION OF GAS VOLUMES TO NORMAL TEMPERATURE AND PRESSURE.

Herr Lunge has devised an apparatus for reducing gas volumes to normal temperature and pressure. It has been illustrated in the *Chemiker Zeitung*; and an abstract of the description was lately given in the *Journal of the Society of Chemical Industry*. Both Herr Lunge and Herr Winkler have already shown how a nitrometer may be used for bringing gas volumes to normal pressure and temperature. The volume of gas to be reduced is compared with the volume taken up by 100 c.c. of gas, which are permanently enclosed in a nitrometer at 0° C. and 760 mm. pressure. The quotient forms the factor by which the gas volume to be reduced has to be divided. Multiplication has been found more convenient in practice; and by substituting for this factor its reciprocal figure, multiplication takes the place of division. The author advocates engraving on the apparatus the reciprocal figures, and publishes a small table for the guidance of the manufacturer of such apparatus.

WATER POWER IN THE UNITED STATES.

The American Statistical Association has, says *Industries*, published a paper on the subject of the water power employed in the United States for manufacturing purposes. In 1880 there were in use 55,404 water-wheels and turbines, giving a total power of 1,225,379-horse power; this being 35·93 per cent. of the total power employed in the country for manufacturing purposes. Professor G. F. Swain, who has drawn up the paper, states that the value of water power, like that of any other commodity, is governed by the law of supply and demand, and depends upon a multitude of circumstances; but inasmuch as water power could not, in any part of the country, be replaced by steam power at a less annual expense than about £4 per net effective horse power, the annual value of the utilized water power would, on this basis, amount to nearly £5,000,000. As regards the distribution of water-power among the more important industries, the largest proportion—70·70 per cent.—is found in the case of paper-mills. Of the total power used in flour and grist mills, about 61 per cent. is water power. This finds its explanation in the fact that the majority of these mills are small, and for local use only. The raw material and the finished article are respectively produced and consumed in the immediate neighbourhood, and convenience of transport enters little into the question; so that water power, on account of its intrinsic cheapness, is preferred. In the manufacture of cotton and woollen goods, one-half the total power is water power; and in the case of worsted goods, the proportion of water power is still above the average for the entire country. On the other hand, the proportion of water power employed in the manufacture of boots and shoes, and of iron and steel, is very insignificant. In the former case this is explained by the small amount of power used per establishment, the limited use of water for purposes of manufacture, and the almost forced location in certain places; and in the case of iron and steel, questions of location and ease of transport explain the small proportion of water power.

SOUTH-WESTERN GAS ASSOCIATION OF THE UNITED STATES.—A short time ago several gas managers located in Texas discussed the subject of forming an Association of Gas Engineers in that State; and the project was so favourably received that a meeting was called, and the preliminaries arranged. The new organization is called the South-Western Association; and its object is to be the professional improvement of its members, and the advancement of gas engineering in its several branches. Colonel J. P. Smith (of Fort Worth) has been chosen as temporary Chairman; and Mr. C. P. Russell (of Houston) will discharge the secretarial duties. The last number of the *American Gaslight Journal* contains the articles of constitution of the new Association, which we trust may have a successful career.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.—The seventy-fifth quarterly meeting of this Institution, which will be held at Doncaster next Saturday, will be a specially interesting one. The Council Chamber at the Town Hall has been kindly placed at the disposal of the members by his Worship the Mayor (Alderman Wainwright); and there, after a luncheon at the Elephant Hotel, the business will be transacted, under the presidency of Mr. T. Duxbury, of Darwen. Two gentlemen—Mr. T. Settle, Manager of the New Mill Gas-Works, near Huddersfield, and Mr. W. Drewry, Manager of the Cleethorpes Gas-Works—will be proposed as members. The discussion of Mr. Dalglish's paper on "Oil and other Illuminants, and their Effect on the Consumption of Gas," read at the meeting of the Institution in December last, and given in the *JOURNAL* for the 20th of that month (p. 1091), will doubtless bring out some valuable facts; but the attention of the members will be chiefly directed to a paper to be read by Mr. T. Newbighing, C.E., on "Gasholders without Upper Guide-Framing." With the author's well-known thoroughness in all he undertakes, he has had a diagram and models of holders prepared to illustrate his remarks. At the close of the business the members will pay a visit to the ruins of Conisbro' Castle; and on their return take tea together. Although we are now in the holiday season, the programme issued for the meeting by Mr. Harrison Veevers, the Honorary Secretary, is by no means of this character.

Communicated Article.

MANAGEMENT OF GAS-WORKS EMPLOYEES. CONCLUDING ARTICLE.

We have last of all to consider the course to be adopted in cases of accident or sickness. Government has already taken the former in hand by means of the Employers Liability Act, by which the responsibility for accidents during working operations is chiefly thrown upon the employers of labour. Gas-works are fairly safe places, and enjoy a considerable amount of freedom from accidents or casualties. Several respectable Insurance Offices have, therefore, found it worth while to issue policies covering all liability under the Act at remarkably low premiums, which afford but an inconsiderable addition to the wages sheet. It is a very general custom to take advantage of this opportunity of avoiding risk of being "let in" for heavy expenses and damages. Government also offers some assistance to employers by sending round inspectors to see that exposed cog-wheels, cranks, or other moving parts are properly fenced in, and other precautions taken with a view of reducing risk of accident as low as possible. All men are, of course, liable to sickness, and at some gas-works considerable latitude is observed with regard to sick pay; but there are several reasons in favour of a rigid rule, enforcing the payment of each man only for the time actually worked. It is difficult, when once the practice of allowing sick pay at full wages (by continuing the wages during a man's absence on account of illness) is established, to know where to draw the line. Perhaps things have gone on quietly for some years, when suddenly a regular epidemic of "absent on account of sickness" sets in, which will have a marked effect upon the wages sheet. A coincidence between the sick times and the periods of local holidays or rejoicings will also be noticeable. If one man is allowed a week's absence on full pay on account of sickness, it is difficult to refuse ten days similar privilege to a second, or a fortnight to a third. Where this practice has obtained, the first opportunity that offers, such as a rise of wages, the introduction of Sunday stopping, or any other privilege, may be taken advantage of to put an end to it. And when this is done, the result may, as was once actually observed by a working man, prove that the stoppage of sick pay is "the best doctor that ever came into the place." It must also be remembered that there are several sick clubs in every town; and a member of one of these, if allowed sick leave on full pay, may draw his allowance from the club as well, and thus derive an actual profit of 50 per cent. or more on his ordinary day wages, for every day's absence.

If the number of men employed on the works is large enough, it is a good plan to establish a sick or provident fund for the employees, or, rather, to encourage and assist them in forming one. Whilst declining any actual responsibility in the establishment or management of the same, the manager may countenance it in every possible way, such as by allowing the use of a room on the works for the business meetings, taking the chair at the annual gathering, &c. Apart from the question of policy, it is simply a matter of duty that the employers of labour should take some interest in the well-being of those whom they employ; and therefore any scheme which renders the men more provident in their habits, or in any way tends to their welfare—physically, mentally, morally, or spiritually—should be heartily encouraged. Much can be done in the way of providing a comfortable room for meals, a bath room, and even a reading room for the men. If the works are small and employ only a few hands, the manager may be of service in getting information as to the safest and most reliable provident clubs in the neighbourhood, and in other ways.

What is to be done with the old servants, worn out in the company's service, is frequently a troublesome question. In many instances the Act of Parliament contains no provision for such cases—a striking contrast to the rules in many branches of the public service. The man who has devoted the best years of his life to the service of the Company certainly has a right to complain if he is cast off in his old age, when unable to take up any other remunerative occupation; for it is idle to pretend that the wages paid, either to the lowest or the highest, are such as to leave a margin for the accumulation of an independency, after paying the daily expenses of living, &c. Therefore, there can be no question as to the justice of establishing superannuation funds. In cases of amalgamation, the principle of awarding an adequate compensation for loss of office, even to men in the prime of life, has been recognized and sanctioned by Parliament; how much more is it just to award compensation when the loss of office is rendered imperative by the inexorable laws of nature? Particularly in regard to the retort-house and the lamp-lighting, does this apply, as these duties require a man to be in full possession of activity and energy. There is usually something to be done in the way of finding positions—such as store-keeper, gatekeeper, valvesman, &c.—for old and trusty servants who have lost the activity of youth, or they may be put on as general utility men, or employed in what, by a curious perversion of actual fact, is usually called "running" errands. But old servants ought not to be left to the tender mercies of chance; there should be a recognized scheme for meeting their case. The many advantages afforded to the manager by the general knowledge of the existence of such a scheme, are obvious. Once a man has remained a few years in the employ of the Company, there is the prospect of "losing his pension" by bad behaviour or dereliction, on his part. It is a great mistake to allow old men to remain on the works a day after they are really unable to discharge the duties they undertake, or to take their fair share with the rest of the gang.

They expect little indulgences in the way of unpunctuality, sitting down to have a smoke now and then, &c., which perhaps cannot be refused to them with a good grace, but which also can never be tolerated if good discipline and method are to be maintained amongst the men. The better plan, in the absence of a proper fund, is to meet such cases by means of an allowance, or gratuity, or any other form of compensation that will be allowed by the auditors. In some works a regular superannuation fund for the benefit of *employés* forms one of the features of the provident club; and it is scarcely necessary to add that such a fund should receive liberal support from the company.

Technical Record.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

OFFICIAL REPORT OF THE PROCEEDINGS AT THE ANNUAL MEETING IN GLASGOW.

The Twenty-Seventh Annual General Meeting of the members of the North British Association of Gas Managers was held on Thursday, July 26, 1888, in the Hall of the Philosophical Society, Bath Street, Glasgow—the PRESIDENT (Mr. David Terrace, of Dawsholm, Glasgow) in the chair. There was a large attendance.

REPORT OF THE COMMITTEE.

The SECRETARY (Mr. R. S. Carlow, of Arbroath) read the annual report of the Committee, as follows:—

The Committee now presents its fourth annual report in the form agreed on at the 1885 meeting; and the following statement gives a general outline of the business done, with some notes that may be interesting.

The property belonging to the Association—consisting of the business books, reports for past years, &c., as per list recorded in the minute-book, pp. 308–309—was handed over to the Secretary, Mr. Robert S. Carlow, who was appointed at the last annual meeting.

The remit "On the Best Standard Burner for Scotch Gas" has been under the consideration of the Committee; and it was resolved to place the results of testing of burners in the hands of Mr. George R. Hislop, the Convener of the Sub-Committee on this question. Mr. Hislop kindly undertook this work; and to-day we are to have a paper embracing this interesting subject. The Committee's work in this matter may now fairly be considered at an end; and it is now for you to relieve the said Committee, with thanks.

The Research Fund has been contributed to by 50 companies.

In reference to the remit to Mr. William Young, along with a Special Sub-Committee, to investigate into the question of purification in closed vessels, the Committee regret that arrangements could not be completed in time to allow of a report being presented to this meeting; and recommend that the same Special Sub-Committee be requested to continue in office for another year. Proposals or suggestions from the members would be considered by the Committee, and reported on in due time.

The Benevolent Fund has been drawn on to the extent of £20 during the year.

The "Statistical Report, 1887," was compiled and issued to all the members, as well as to those who gave the necessary information.

The "Annual Report of Proceedings, 1887," was published and sent to each member of the Association, according to the rules. It contained the President's address, papers and discussions thereon, a list of the Past-Presidents, new members admitted, names of members of Committee, rules, &c.

It has again been considered advisable to postpone taking definite action in reference to the Murdoch Memorial. The amount at the credit of the fund is now £287. The Sub-Committee are endeavouring to raise further subscriptions, and fully trust that by another year the present sum will be considerably augmented.

In reference to the generous offer of Mr. Robb, consisting of bound volumes of the JOURNAL OF GAS LIGHTING, &c., the Committee regret that, as one of the conditions of the gift cannot be complied with—viz., having a "home" for their reception in Glasgow or Edinburgh—they very unwillingly decline the proposed addition to its property.

It is very gratifying that the membership of the Association is still increasing; thus showing that it is accomplishing the end for which it was originated.

The report was unanimously adopted.

THE ROLL OF THE ASSOCIATION.

The SECRETARY next read extracts from the minutes of the Committee meeting held prior to the general meeting. They showed that the following gentlemen had ceased (by resignation or otherwise) to be connected with the Association:—Ordinary members—Messrs. J. Adamson, Anstruther; A. Dougall, Hull; J. Gibb, Armagh; J. Burden; J. Morton, Muirkirk; P. Blair; and J. Stiven. Extraordinary members—Messrs. R. Brown, Lanemark (deceased); and C. T. Grant, Glasgow. The members of the Association number 166 ordinary members, 57 extraordinary members, 12 associates, and 4 honorary members; but deducting those resigning, &c., the numbers respectively are 159, 55, 10, and 4—total, 228. Add to these 10 ordinary, 3 extraordinary, and 4 associate members applying for admission (as per following list), there is a total of 245 members, including 4 honorary members.

ADMISSION OF NEW MEMBERS.

The SECRETARY also submitted applications from the following gentlemen, who were admitted:—

ORDINARY MEMBERS.

Ballantyne, J.	Gas-Works, Rothesay.
* Bell, A.	" " Peebles.
Boyd, T.	" " Lennoxtown.
Chayne, D.	" " Mountain Ash.
Donaldson, J.	" " Lochwinnoch.
Laing, W.	" " Dysart.
* McDonald, J.	" " Denny.
* Mitchell, D.	" " Newbattle, Edinburgh.
Ross, G.	" " Stonehaven.
Walker, A. B.	" " Spittal, Berwick-on-Tweed.

* Transferred from Associate List.

EXTRAORDINARY MEMBERS.

Brown, T. M.	Gas-Works, Lanemark.
McCrae, A. B.	" " Monifieth.
Morrison, J.	" " Dalkeith.

ASSOCIATES.

Cameron, J., Jun.	Gas-Works, Tradeston, Glasgow.
Edwards, W. A.	" " Brechin.
Robertson, H.	" " Broughty Ferry.
Ruxton, W. M.	" " Arbroath.

AUDITOR'S REPORT.

Mr. D. B. PEEBLES (Edinburgh), the Auditor, in submitting the accounts, said, as there were a good many details which would appear in the annual report, he would confine himself to giving a general outline of the financial position of the Association. In the General Fund the charge amounted to £163 11s. 10d.; and there was a balance of £12 14s. 10d. due to the Treasurer. So that there was no bank account in connection with the fund. With regard to the Benevolent Fund, there was a balance of £150 at the bank. There had been several sums paid to different persons whose cases were brought under the notice of the Association. The charge there was £200 14s. 10d., which was balanced by the discharge; leaving, as he had said, a balance of £150 at the credit of the fund. Then there was the Research and Investigation Fund. The charge was £83 18s. 9d.; the cash in the Treasurer's hands, £3 1s. 5d.; and the balance in the bank, £46 10s. He concluded by congratulating the members on their choice of a Secretary, as the books were clearly kept, and all the accounts properly vouched.

The PRESIDENT: I presume these accounts meet your approval. It appears that our funds are in a healthy state; for, although there is a slight deficit in the General Fund, I am sure it will be more than made up this year. Mr. Peebles deserves our hearty thanks for the trouble he takes in auditing our accounts from year to year.

Mr. PEEBLES, in acknowledging the compliment, assured the members that the work was a "labour of love" to him.

PRESIDENT'S ADDRESS.

The PRESIDENT then delivered his Inaugural Address, which was given in the JOURNAL for the 31st ult. (p. 204).

Mr. A. MACPHERSON (Kirkcaldy) said he was sure the members had all listened with very great interest to the President, and they were deeply indebted to him for his instructive address, in which he has most completely refuted the assertion that gas engineering has made little or no progress during the past 20 or 30 years. Great benefit had been conferred on gas consumers by the improvement in burners, for instance; and if the general body of the consumers paid more attention to this matter, they would save their pockets to a large extent. He proposed a vote of thanks to the President for his excellent address.

Mr. W. KEY (Tradeston, Glasgow) seconded the proposition, which was unanimously adopted.

The PRESIDENT having expressed his thanks to the members for the compliment they had paid him, the reading of papers was proceeded with.

MR. HISLOP'S PAPER.

The first paper was on "Gas-Burners for Photometrical Purposes" (being the remit of the Committee on the best standard burner for Scotch gas), by Mr. G. R. Hislop, of Paisley. It was given in the JOURNAL for the 31st ult. (p. 205); and it led to the following

Discussion.

The PRESIDENT: I am sure we have all listened with great pleasure and profit to Mr. Hislop's paper. I should like him to tell us whether, when referring to the angles, the 30° meant off the vertical or off the horizontal.

Mr. HISLOP: Off the vertical line.

The PRESIDENT: It is important to know that, because you can read 45° either way; but you do not know whether the sharpness of 30° is one way or another.

Mr. W. FOULIS (Glasgow): I have been very much pleased with Mr. Hislop's paper. The experiments he has carried out are altogether novel—at all events, I have never seen any showing the effect of the different angles at which the holes are drilled in a burner. It could scarcely have been anticipated that, in burning the same quantity of gas at the same pressure, the results would have been so different as Mr. Hislop's tables indicate, according to the angles of the holes. The information is very important; and, amongst other things, it shows that when statements are made respecting the various qualities of gas, it is highly necessary to know the conditions under which the gas is being burned. It also shows how important it is that consumers should attend to getting proper burners, so as to obtain the fullest value from the gas. I have no doubt that some of the burners which Mr. Hislop used were consuming gas in a way which, under ordinary circumstances, would not be objected to. It shows that those who are in charge of gas-works should endeavour to arrange, as far as possible, that consumers should have supplied to them burners which are the proper ones to use for the quality of gas that is being manufactured.

Mr. D. B. PEEBLES (Edinburgh): I should like to have had an opportunity of reading Mr. Hislop's paper before coming to the meeting, because I consider that the author has brought before us an altogether novel element. I do not think the angle of the apertures in gas-burners has ever been thoroughly considered in connection with the development of the illuminating power of the

gas consumed. Long ago Mr. Stewart, of Greenock, called attention to the necessity for having burners of different sizes with certain pressures. Every burner, like every man, has its idiosyncrasy. With burners of the same size, and having the same holes, you will, by the alteration of pressure, so develop the illuminating power as to make the difference very perceptible, even with the same class of burner. I wish Mr. Hislop, while experimenting with the burners, had given the results at different pressures. This might have produced some slight difference in the flames. It is a clearly ascertained fact that every burner has a particular pressure which will bring out the greatest illuminating power of the gas being consumed. Mr. Hislop has opened up an excellent field of inquiry, which will doubtless lead to some practical result in the construction of burners. In showing off a burner, one man will hold his hand behind the flame, and say "See how beautiful." But it is the white hand that helps the flame. Another holds up a newspaper, and says "See how transparent and beautiful; you could read through it." We hear such statements made to consumers, and they are led astray by them. Anything emanating from such a body as this, and from such a man as Mr. Hislop, will carry great weight amongst consumers. This is one of the most important subjects the Association could take up, because there is no doubt of the enormous waste caused by bad burners.

Mr. W. KEY (Tradeston, Glasgow): I understood that Mr. Hislop used iron burners; and I have to ask whether he tried burners of a larger diameter at the same angles, because I think the internal diameter has a great deal to do with the development of the illuminating power of the gas at the point of combustion. The ordinary iron burner has only a small internal bore. Mr. Bray's burner has at least double or treble the area; and the "Special" burner is still larger. I think the fact of the gas having to travel through the tube before it reaches the orifice at different angles has something to do with preparing it to be ignited and consuming the hydrocarbons. It is quite true, as Mr. Hislop has said, that gas managers and the public have been slow to develop in burners the highest possible illuminating power of the gas. Our President has told us that, by our present method of testing, 7-candle gas can be increased by the "London" Argand to 14-candle, and by a regenerative lamp to 28-candle power. This proves to my mind that there is something wrong, and that Mr. Hislop is justified in saying we ought to test gas with the best burner that can be obtained. He well deserves the thanks of the members. It is a credit to the Association to have a gentleman coming forward and discussing the effect of different angles on illuminating power; and if he were to add to this the various diameters of the burners, it would be something still further for us to reflect upon.

Mr. D. M. NELSON (Glasgow): For scientific purposes, I think every one will admit that Mr. Hislop's paper is pre-eminently excellent. The difficulty I see about it is that all the tests have been made with iron burners, which are now almost out of existence for ordinary use.

Mr. A. MACPHERSON (Kirkcaldy): Mr. Hislop's paper is altogether of such a novel character, that one feels it to be necessary to have some time to study it in order to do it justice. I am sure Mr. Hislop will feel that if we do not discuss it in the way in which we deal with some other papers on matters with which we are more conversant, it is because the subject is rather beyond our reach until we have had some further time for consideration. What Mr. Hislop has shown us in these tables should set us all thinking; and I trust that burner makers and Mr. Peebles (who is so well qualified to deal with the subject) will set to work and produce burners suited for all the various qualities of gas, and bored at the proper angles. There is a great deal of truth in what Mr. Key has said about the size of the burner immediately below the point of consumption. I believe, from experiments, that a large chamber just below the point of combustion acts on the regenerative principle. The gas is heated, and the carbon is raised to a higher temperature before actual combustion takes place; and being thus brought to the highest state of incandescence, a greater amount of light is obtained than would otherwise be produced. If you send a stream of gas through a narrow orifice, you will not get the same amount of light as when you have a large space immediately below the point of combustion. The angles at which the burners are bored must be great factors in realizing the largest amount of light. The great thing is to have a proper orifice. If it is too small, the oxygen that passes through is given off as soot—lodging on the ceiling, and causing consumers to cry out about "bad gas," whereas it is the best gas being destroyed that causes this blackening effect. We cannot be too particular in regard to burners; and every gas manager ought to try to enlighten the public as to the best way of using gas. Many people earn a livelihood by hawking burners, which they sell at 4d. and 6d. each, and which they can buy at 4s. 6d. a gross. I am glad to notice that, in some places, Magistrates are punishing these people, who are victimizing the gas consumers. I trust that before long every gas manager will consider it to be his duty to instruct people; and I think that it would be a good thing if gas companies and corporations supplied burners free to all their consumers.

Mr. J. M'CRAE (Dundee): I did not hear the whole of Mr. Hislop's paper; but, judging from the criticism that has followed, I gather that the communication has been of a most unique character. We can therefore scarcely be expected, at a moment's notice, to freely criticize the figures, which have cost so much thought and research. I would endorse, with great earnestness the desirability of educating the gas consumer to use his gas, and not to abuse it.

One serious difficulty which presents itself is this—that if a gas manager suggests a certain burner, or an alteration of the existing gas-burning arrangements, it is always attributed to a desire on his part to increase the consumption of gas. I am sure I express the sentiments of every manager when I say there is no one more satisfied at seeing gas properly consumed than the manager. This, however, can only be accomplished by using the best and most improved appliances. In passing along the streets of the various towns, we have evidence of the way in which gas is destroyed; and it makes a gas manager shiver to see the result of his handiwork thrown away, and to feel that in place of a good light there are large gas bills and general dissatisfaction all round. I hope to see the day when gas-burners will be handed to the consumers free; and not only this, but gas-burners suited to the various elevations of the towns in which they are to be used, because a burner that will do for a consumer on a level with the gas-works will be most unsuitable if used hundreds of feet above that level. I cannot say we have done this in Dundee; but I hope some day to make a move in this direction. Every town should be divided into zones, and for each zone there should be used a certain size and description of burner for ordinary consumers. Of course, for extraordinary consumers, extraordinary arrangements will have to be made. Now that Mr. Hislop has introduced this method, I hope it will be supported by the makers of burners. Any labour spent in this direction will not be lost; for it must result in satisfaction both to the seller and the buyer of gas.

Mr. HISLOP: I am greatly obliged to the members for their favourable criticism of my paper; and am specially pleased at the general expression of opinion that proper burners should be supplied to consumers. I have given much attention to this subject for a long time. I am glad to hear that opinion is ripening on this question; and I hope the new plan will be generally adopted. First of all, I have to thank Mr. Foulis. I am gratified to know that he thinks there are some good points in the paper; and this may encourage further investigation by other members. I hope this will be the result. The matter has long been in my mind, though I have not had time to go into it; and I felt sure there was more in it than has hitherto been considered of any value. I have many times observed that the flame of a burner of a certain condition would go up with the vibration even of a passing vehicle; and the result was to nearly double the amount of light given. This was the first thing which led me to think over the subject, and to make out that there was something in the angle of the holes drilled in the burner. As to the burners being of cast iron, I have to explain that it is not very easy to make them with clay tips. When I learned that the Sub-Committee of the Association were engaged in a similar investigation as myself about three years ago, I gave it up, because we were both troubling Mr. Bray at the same time. However, I procured this extensive series of Nos. 4, 5, 6, and 7 sizes, in order that I might test the whole of the burners with the same gas at the same time; and this I did. Mr. Key made reference to the size of the barrel of the burner. I took care to avoid all forms of burners which might be considered as exclusive in the case of testing gas under Act of Parliament; and I took the plain burner. I did not attempt to test the gas at various pressures, as I found I could not do so without causing it to flare. About 5 cubic feet per hour was as much as I could get at 5-10ths pressure without flaring. Before we can go higher, we must have some controlling medium in the barrel of the burner; but I was careful to avoid anything that might be considered objectionable in the standard test-burner. I might have gone very much further with this matter, and said what was the best angle at which to consume the different qualities of gas at 3, 4, or 6 cubic feet per hour; but I contented myself with keeping strictly to my subject. Of course, I shall be glad if I have opened up a field for further investigation by any of the members; and I have not the slightest doubt that they will come to the same conclusion as I did—viz., that the angle of impingement of the jets has a great deal to do with the amount of luminosity afforded.

The PRESIDENT, in closing the discussion, said it only remained for him to ask the members to accord Mr. Hislop a hearty vote of thanks for his interesting paper, the elaborate tests in which must have cost him a great deal of trouble.

The proposition was carried by acclamation.

MR. COWIE'S PAPER.

Mr. R. Cowie (Tillicoultry) next read a paper entitled "A Year's Experience in the Manufacture of Sulphate of Ammonia." This was given in the JOURNAL for the 7th inst. (p. 245).

Discussion.

Mr. S. STEWART (Greenock): I have listened with pleasure to Mr. Cowie's paper; and, considering the size of his works, I have to congratulate him on his successful working. In large establishments we may get a few pounds more sulphate per ton of coal than he does; but I consider 23 lbs. very good. The clear manner in which he has described his plant, and the success of his operations, should encourage other managers to follow this method. We are very much indebted to Mr. Cowie for his paper.

Mr. G. R. HISLOP (Paisley): We are also indebted to Mr. Cowie for the example he has set to managers all over the country. How often do we find great hesitancy on the part of managers to adopt new processes, although these would certainly result in greater economy. In this respect, we have to compliment Mr. Cowie on the fortitude and courage he has shown in venturing on the experiments described, and on the results he has achieved with his apparatus.

Mr. A. BELL (Clippens Oil-Works): I think Mr. Cowie's failure with his first saturator was not due so much to the impurity in the lead as to the way in which the lead was cast. I had one of these cast saturators; and I found that the lead was being eaten away by the acid. After a careful examination, I discovered that in casting the lead the temperature had been raised too high, and it became oxidized on the surface, and then was mixed in the casting. It was on the oxidized spots that the acid immediately acted. I had the oxidized portions cut out; and the saturator has worked successfully for the past three years. The ordinary lead-lined saturator is more difficult to keep up, on account of the wear and tear. I consider Mr. Cowie's plan of making his sulphate with ordinary commercial sulphuric acid to be an expensive way. If he would use pyrites acid, and allow the sulphide of arsenic to settle out in a separate vessel, he would find that his sulphate would be of a good colour, and be produced more economically.

Mr. DONALDSON (Lochwinnoch): Is it any profit to manufacture sulphate, compared with the price obtained by selling the liquor? I wish to ask the specific gravity of the acid. Mr. Cowie speaks of using 9 tons of acid for 9 tons of sulphate, which I think is a very large proportion.

Mr. P. WATSON (Stirling): Mr. Cowie recently made a remark to me about the properties of sulphate of ammonia as compared with nitrate of soda; and I should like if he would narrate the incident to the meeting.

Mr. J. M'CRAE (Dundee): I have had considerable experience, under different conditions, in the manufacture of sulphate of ammonia. I am pleased to see the manager of a small gas-works giving his experience upon any subject; and his example should be encouraged in our Association, because it has long been felt as a drawback that only the managers of large works come forward with papers. In my experience, gas making is as important in small as in large works; the difference is only one of degree. I would say to Mr. Cowie that he is working on the right lines, and that he has obtained equally good results to those produced in larger works, where more improved appliances are used. Although he is going on in the right direction, he must not stop where he is. I think that by using pyrites acid, he could, by means of a settler, allow the sulphide of arsenic to fall to the bottom, and so the impurity which is so much objected to in pyrites acid will be easily got rid of. To use pure sulphuric acid is a decidedly extravagant plan; and this Mr. Cowie will discover in the course of his experiments. It is prescribed in the Alkali-Works Regulation (Scotland) Act that no pipe shall be connected with the waste gases produced from the manufacture of sulphate of ammonia; therefore it is necessary that the purifiers should be of such an area as to absorb all the foul gases from the production of the sulphate, and must not be connected to any chimney, but be left open. I do not agree with the remark that the consumption of acid is proportionately high, because you require 1.1 tons of sulphuric acid to 1 ton of sulphate of ammonia—just about the proportion used by Mr. Cowie. I manufacture about 400 tons of sulphate in the year, and that is my experience. Mr. Cowie is to be congratulated on coming forward and giving the results of his experience; and I hope other members will follow his example, and be incited to make similar experiments, and report to the Association the result of their investigations.

Mr. J. ROSIE (Wick): Have you, in your experience, ever had a case of a pipe leading to the saturator becoming clogged up, and necessitating a safety-valve? I know a place where a still exploded; and the only cause which could be assigned was the pipe in the saturator choking, and thereby causing increased pressure. I observe that a good many managers work without a safety-valve; and I wish to know whether, in their opinion, this is a safe practice. Managers in small works are apt to forget the corrosive action of ammonia on brass cocks.

Mr. T. D. HALL (Montrose): It seems to me that £60 is a good sum for Mr. Cowie to realize from his liquor alone, carbonizing only 800 tons of coal. I should like him to tell us what he does with his tar; and if he sells it, what he gets for it. If he produces 8 tons of sulphate from 800 tons of coal, it seems to me that that is very good.

Mr. S. STEWART (Greenock): Reference has been made to a safety-valve. I consider that any kind of safety-valve on a still is not a proper thing. What we have at Greenock is a continuation of the filling tube to within an inch or two of the bottom of the boiler; and the liquor, as pumped into the boiler, keeps the pipe clear. There is no evaporation from this sealed pipe; it is only 3 inches diameter. This does away with all risk arising from the choking up of the pipe between the still and the cracker-box.

Mr. COWIE: A gentleman asked what we were doing with our tar. We sell the tar; and I may first say, in answer to his question, that two years ago, when the Company decided to go on with this sulphate business, the whole of our residuals for the year fetched only 5½d. to 6d. per ton of coal carbonized. This year we have received something like 2s. 1d. per ton of coal. This shows the difference. With reference to a remark made by Mr. M'Crae, I may explain that unless the attendant allows the fire to get too strong, causing the gas to be thrown off too rapidly, there is no necessity to have a pipe to the purifier. I intend to increase the area of the purifier, and also to raise the condensing power and add to the number of pipes passing through cold water. We obtained from 836 tons of coal exactly 8 tons 17 cwt. of sulphate. We have no safety-valve on the pipe leading to the saturator; but we have one to the boiler. We do not experience any difficulty with the choking of the pipe to the saturator. I was speaking lately

with an acquaintance of mine in Tillicoultry, who had been visiting the gas-works, and I explained to him that we obtained upwards of 8 tons of sulphate in the year. He told me of a gentleman who bought a good deal of hay from a farmer who gave his grass land rather a heavy dose of nitrate of soda. When a quantity of hay was carried home, the gentleman's horse refused to eat it; and he brought two men to examine the animal's mouth, believing that there must be something wrong with it. Both men declared that there was nothing wrong; and they said the defect must be in the hay. One of them obtained a sample of the hay; and, after examining it, stated that the farmer had dosed his land with too much nitrate of soda. Perhaps this hint may be taken by farmers, so that they may use more sulphate and less nitrate.

A vote of thanks was accorded to Mr. Cowie for his paper.

MR. M'CRAE'S PAPER.

Mr. J. M'Crae (Dundee) read the next paper, on "Coal Tar as Fuel for Steam-Boilers," which appeared in the JOURNAL for the 7th inst. (p. 245).

Discussion.

Mr. R. M. SUTHERLAND (Falkirk): I am not prepared to say very much on this subject; but I have been greatly interested by Mr. M'Crae's paper. The question is one of some consequence to gas managers. At the time when residual products were so low in price, the burning of tar was a question which occupied much attention. Some advocated the burning of tar, and others thought it was a pity to destroy it, seeing that it contained so many fine products. My idea is that it is very much a matter of sentiment. If there was too large a supply of tar, it did not do any harm to burn a portion of it, provided sufficient was left for the market. In London a considerable quantity was burned in one of the large gas-works; and I have no doubt that this had a good effect on the market, and that gas companies generally benefited from it. In regard to the fuel value of tar, I am not prepared to say anything very definite. A few years ago I had some experience in the burning of pitch oil when that article was difficult of sale. Our tanks were full to overflowing; and as we had to do something with it, we turned our attention to burning it. We did so very successfully, and obtained any heat required, which was under perfect control. The experiments were made at a time of the year when we were very busy; and I could not keep such correct data as to warrant me in stating its fuel value. It proved to us that when coal was scarce or dear, we could burn this tar or oil, and get whatever heat was necessary. Mr. M'Crae referred to the use of liquid fuel in a more concentrated form, especially in connection with steamers. I believe that will be done more extensively in the future, more especially if the seemingly inexhaustible supply of petroleum in Russia continues, because there they have the material in a portable and convenient form, and in any quantity, at an almost nominal price. If they manage, by the completion of some of the pipe-lines they are intending to make, to deliver this oil at a seaport at a low price, it will be used as fuel very extensively. I beg to thank Mr. M'Crae for the able manner in which he has brought this subject before the Association.

Mr. G. R. HISLOP (Paisley): I do not rise to give any personal experience on the burning of tar; but it is due to Mr. M'Crae to say that some time ago I visited Dundee, and made a careful inspection of his arrangement for burning tar, and could not help expressing great satisfaction with the admirable apparatus, and the effective way in which the tar was consumed, as well as the results obtained by its combustion. Mr. M'Crae is quite correct in pointing out that what can be profitably done in Dundee may not be the same in other places, and that it will be for other managers to judge for themselves whether it would be economical to burn tar or not. As a rule, the heavy tar is always a drug on our hands; and in most cases it would be economical to burn it. In England our friends connected with The Gas Institute have advocated the desirability of burning a larger proportion of tar, in order to bring up the price of what remains to be sold. That is a matter of opinion. We are greatly obliged to Mr. M'Crae for explaining how we can get out of the difficulty, if we find the pure tar to be a drug on our hands in the ordinary outlets. I give my hearty approval of the system Mr. M'Crae has introduced in Dundee.

Mr. A. MACPHERSON (Kirkcaldy): Like the previous speaker, I cannot give any practical experience; but I have had the pleasure of seeing Mr. M'Crae's system in operation at the Dundee Gas-Works. The perfection to which Mr. M'Crae has brought his plan reflects the greatest credit on him; showing as it does that, with his usual ability, he is ready to seize on anything which, from the situation of the town, will prove of benefit and profit to the Gas Commissioners. I have no doubt that by burning his tar, which he has difficulty in disposing of profitably, he will be enabled to effect a considerable saving. Perhaps he has not had the system long enough in operation to say whether tar has a more destructive effect on the boilers than ordinary firing; and I shall be glad to hear any information on this point.

Mr. W. KEY (Tradeston): I wish that Mr. M'Crae had given a section showing the portion underneath the fire, in order to afford us some idea as to the quantity of air which accompanies the steam and tar into the furnace, and also whether he has any material resting on the bars through which heated air may pass up and strike the spray as it goes into the flue to help the combustion. A great deal depends on that. In one of the Glasgow works, where 300 tons of coal are consumed for steam, the engineer injects steam over the top of the fuel in the furnace; and he states that in this

way he is able to obtain highly augmented steam power. I thought that if he sent the steam in underneath, he would reap more benefit. Perhaps Mr. McCrae can show how the tar and steam are consumed. His arrangements I think are exceedingly simple, and must commend themselves to everyone.

Mr. McCRAE: The effect on the boiler plates of burning tar is a very proper question; and it was a neglect on my part not to mention it. We have been using the tar about a year; and the plates are unaffected. I had expected that the paper was sufficiently detailed in regard to Mr. Key's question; for I say: "In changing from the coal or coke fuel to the tar, little or no difficulty is experienced; and very rarely is a shovelful of any kind of solid material required. The furnace-bars have only to be kept covered to prevent the waste of tar and the too rapid ingress of air." That is really the state of matters. You shut down your coke fire, and turn on the tar without any alteration or rearrangement of the furnace. A little adaptation is required for the regulation of every furnace; but this does not apply to tar especially; our coke always fetches a good price. Of course, if it was of inferior quality, it would not bring so good a price. I have to thank the members for their tender criticism; it is a repetition of the kindness I have so often experienced at your hands.

Mr. STEWART: How many gallons of tar do you use to the ton of coal?

Mr. McCRAE: Against 10 tons 16 cwt. of coal, I use 9 tons 3 cwt. of tar, or 1460 gallons.

A vote of thanks was accorded to Mr. McCrae for his paper; and the meeting adjourned for luncheon.

[The report of the subsequent proceedings will be given in next week's JOURNAL.]

NORTH OF IRELAND ASSOCIATION OF GAS MANAGERS.

ANNUAL MEETING AT LISBURN.

The First Annual Meeting of the members of this Association was held in the School-Room, Railway Street, Lisburn, last Tuesday—Mr. E. STEARS (Lisburn), President of the Association, in the chair. There was a fair attendance of members.

The HONORARY SECRETARY (Mr. J. Whimster, of Armagh) read the report of the Committee for the past year and the statement of accounts. The report was as follows:—

REPORT OF THE COMMITTEE.

Your Committee, in presenting at the first regular business meeting of the Association, a report of their proceedings during the year, feel that they can congratulate the members on the vitality of this, the youngest of the Associations in connection with our industry.

Immediately after the preliminary meeting held in Armagh last year, when it was decided to form the Association, we had applications from four gentlemen to be admitted to membership with us—two as ordinary, and two as extra-ordinary members—whom we received and enrolled accordingly.

The Committee, however, regret exceedingly that in this, the first report, they are called upon to record the fact that Death has made an inroad upon us, and has removed one of our first members—the late Mr. David Orr, Manager of the Monaghan Gas-Works. We have also lost two of our first members, through their removal from the country. But the Committee are sanguine that, through their success in arranging such a satisfactory and attractive programme for the present meeting—a programme which has been posted, so far as possible, to all the gas managers in Ireland—there should be more recruits than fill up the vacancies thus caused.

The Committee desire to bring before the managers of small gas-works the advantage to themselves of co-operating in this work, as it will afford them opportunities of coming in contact, and exchanging experiences with their fellow-labourers, which hitherto they have not had, except at the expense of a journey across the Channel; and they would also wish to impress upon the few managers of large undertakings in Ireland the desirability of identifying themselves with the movement, so as to give it impetus, and encourage their weaker brethren in the work of mutual improvement.

It was remitted to your Committee to frame a set of rules for the government of the Association. This, was done; the rules being drawn on the basis of those of the North British Association of Gas Managers. They were printed, bound up with the report of the preliminary meeting, and a copy sent to each member. The Committee trust that this part of their work will meet with the approval of the general body of the members.

As will be seen from the financial statement, also presented, the balance is on the right side of the account; and though the sum in hand (18s. 8d.) may be small, the Committee have satisfaction in that the Association is able to begin its second year so well.

Signed on behalf of the Committee

EDWARD STEARS, *President.*

JAMES WHIMSTER, *Secretary.*

Lisburn, Aug. 14, 1888.

Mr. W. S. STORMONTH (Coleraine) formally proposed the adoption of the report and statement of accounts.

Mr. A. WADDELL (Newtownards) seconded the motion.

The PRESIDENT put the resolution to the meeting, and it was carried unanimously.

NEW MEMBERS.

The next business was the admission of new members. Three gentlemen were admitted—Mr. J. Gibb (Newry) as an ordinary member, and Messrs. Walter King (London) and Johnstone (Edinburgh) as extra-ordinary members—on the motion of Mr. R. Ross (Dungannon), seconded by Mr. R. MERRILEES (Castleblayney).

ELECTION OF OFFICE-BEARERS.

The next business was the election of Office-bearers and Committee for the ensuing year.

The SECRETARY remarked that the Committee had given this matter a great deal of careful attention, and had experienced some difficulty in proposing the names of gentlemen as office-bearers,

having regard to the fact that the membership of the Association was at present so small. However, the Committee had decided to name as President for the ensuing year Mr. Featherstone, of Dundalk; and in accordance with that decision, he (the Secretary) had great pleasure in proposing that Mr. Featherstone be elected President.

Mr. R. ROSS (Dungannon) seconded the motion.

No other candidate being proposed,

The PRESIDENT declared Mr. Featherstone unanimously elected.

The SECRETARY said he begged, on behalf of the Committee, to submit the names of the following gentlemen as members of the Committee for the ensuing year:—Messrs. R. Ross (Dungannon), J. Nisbett (Portadown), J. Mearns (Banbridge), A. Waddell (Newtownards), T. Frizelle (Holywood), and A. Gibb (Newry).

The PRESIDENT said those were the names suggested by the Committee; but it was open to the members to elect other gentlemen if they thought fit.

Mr. J. ROBB (Limavady) said he had great pleasure in proposing that the names recommended by the Committee be adopted, and that these gentlemen be the Committee for next year.

Mr. R. MERRILEES (Castleblayney) seconded the motion, which was carried unanimously.

The SECRETARY said the only remaining question was that of the election of a Vice-President. On this matter the Committee had not come to any decision, and were not prepared to make any recommendation. They thought that perhaps the Association could manage to do without a Vice-President until they got into working order. Then there was the question of a Secretary and Treasurer, and also of an Auditor. For the last-mentioned position the Committee suggested Mr. J. Todhunter (Ballymena).

Mr. A. WADDELL (Newtownards) proposed that Mr. Todhunter be elected as Auditor.

Mr. W. NISBETT (Aughnacloy) seconded the motion, which was unanimously carried.

Mr. R. ROSS (Dungannon) said the only office remaining to be filled up was that of Secretary and Treasurer; and it gave him great pleasure to propose that Mr. J. Whimster, who had rendered such valuable assistance in establishing the Association, and who had from the beginning discharged the onerous duties of Secretary and Treasurer in a manner that entitled him to their warmest thanks, be re-elected to the position for the ensuing year.

Mr. W. R. FEATHERSTONE (Dundalk) was pleased to be permitted to second the resolution. He thought they could not have a better gentleman for their Secretary than Mr. Whimster. He was always willing to look after the interests of the Association; and, in addition to that, he possessed the ability to do so.

The PRESIDENT, in putting the resolution, said he was sure every member would agree with him that in Mr. Whimster as their Secretary and Treasurer they had "the right man in the right place."

The resolution was unanimously adopted.

PLACE OF NEXT MEETING.

The SECRETARY then proposed that the next meeting of the Association be held at Dundalk, as a compliment to their new President.

Mr. R. ROSS seconded the proposition.

Mr. J. ROBB thought the meeting should be held at some place which would be more convenient for the southern and western members. He suggested they ought to meet them half way.

The PRESIDENT said that at some future time perhaps they would be able to consider Mr. Robb's suggestion; but at present he did not think they could see their way to do so.

The resolution was then passed unanimously.

Mr. R. MERRILEES suggested that the next meeting should be arranged for the last week in May, any time in June, or the first week in July.

The SECRETARY said he did not think the first week in July would be practicable. It would certainly not suit him; and he thought it would be very inconvenient for the majority of the members.

After some further remarks,

The PRESIDENT said the meeting did not seem to be of the same opinion as Mr. Merrilees; and for the present it would be better to allow the date of next meeting to remain unchanged.

The subject then dropped.

The PRESIDENT next proceeded to deliver the following

INAUGURAL ADDRESS.

Gentlemen,—In commencing this brief address, I must thank you for having chosen Lisburn as the first place of meeting of our newly-formed Association, although I am afraid I cannot show you here anything novel in the operations connected with the manufacture of gas. I find, as a rule, that directors do not like to try new schemes which are likely to cause any additional expenditure; but they prefer to continue working on the old lines. Perhaps, if their dividends were to fall below 10 per cent., they would be more speculative.

In the North of Ireland, gas companies have (like many others) found it necessary to their welfare, in face of the competition of electric light and petroleum, to reduce the price of gas. The best means of maintaining the value of our property is by keeping the price of the commodity we supply as low as will pay a fair dividend, as there is no question that the competition of petroleum and electricity with gas is very sharp. As far as Lisburn is concerned, we find that very few new customers are obtained from small private houses with a rental up to (say) £20 a year. They nearly all consume oil, although the price of gas is only 3s. 9d. per 1000

cubic feet. One thing which operates against my Company procuring the custom of the poorer class of residents, is that we require a deposit of 10s. as security. This no doubt reduces the amount of bad debts; but it is detrimental to an extension of our business. In regard to the electric light, we have one mill in our district partly illuminated by this means; and I must say that it seems to give satisfaction. The owners of another mill are also seriously contemplating its adoption in an extension of their premises; and the promoters of the light say that the cost will be much less than gas. There is no doubt that there is more danger of our mill customers going over to electricity than the general public, as they can supply motive power and supervision at low cost.

I intend making a few general remarks on gas manufacture from my own point of view, and hope that these will meet with approval. I may here incidentally remark, as some of our members may not be able to be present to-day, that we manufacture 26 million cubic feet of gas per annum; the maximum make being 160,000 cubic feet per 24 hours. As nearly half our make of gas is sold to mills, the heaviest output is in the winter months. Dealing first with the retort-house, our retort-benches consist of sixes, set on Cathels's system. The only alteration I have made is in the furnace. I use cast-iron bars 2 ft. 6 in. long, the furnace 12 inches wide, and double doors; thus giving a deep fire, and generally allowing some air to pass in through a sight-hole left partly open over the furnace. I take the opportunity here of suggesting to those members who may have had some experience with regenerative furnaces, that we shall be glad if they will give us some information on this important subject.

In regard to the question of tar burning, I have tried this both with and without steam, and must say that I prefer the latter plan, as it does not give such intense heat in the furnace, and also causes less trouble and noise in working. The tar-supply tank is fixed outside the retort-house, and is filled with tar from the well by an injector, at the same time permitting the tar from the pipe leading from the hydraulic main to flow into it—the overflow going back again to the same main lower down. I found some difficulty at first in getting this plan to work. This, however, I overcame by introducing a gas-burner in the wooden box where the tank is situated; and by keeping the temperature up to 70° Fahr. I have not had any trouble on this point, and do not find it necessary to use screens to keep out the dirt. My experience leads me to the conclusion that 2 gallons of tar are about equal to a bushel of coke. I may mention that the tar was used in the ordinary furnace. The fire was allowed to clinker up, and only a sufficient opening left to consume the tar and its products with a few bushels of coke daily. We clinkered the fire out perhaps once or twice a week. When burning tar, the upper furnace-door is substituted by one having four 1-inch holes drilled through it for the air supply.

As to the exhausters, we have three—one being a Laidlaw or rotary exhauster, and the others a Beale and a steam-jet. The latter is made of 1½-inch pipe, which is sometimes used for six retorts in the summer. For general use, I prefer Laidlaw's exhauster, as it costs less for lubrication and attention, although the amount of "slip" in it is very large. It answers well for all but the heavy work, when there is a strong back pressure, and then Beale's is more suitable. For Beale's exhauster we use creosote oil, which answers the purpose well, and is cheap. After leaving the exhauster, the gas passes through an ordinary scrubber, worked with ammoniacal liquor; and we are now fixing also one of Kirkham, Hulett, and Chandler's "Standard" washers to work with water. The gas is then purified with lime in the ordinary way.

It may be in your recollection that we had an explosion during last winter. It took place at 4 o'clock in the morning, just as the men had finished the 3 o'clock charge. It was caused by a seal-cup at the bottom of the centre-valve blowing; the lime in the purifiers being too dry, which caused more back-pressure than the seal-cup would stand. The flooring of the purifying-house being boarded over, the hollow space below became filled with gas; and it eventually caught fire from a lamp in the yard. Four men were taking water to fill a syphon which it was thought was unsealed, when the explosion took place blowing the men away and unslating the purifier-house, besides doing other damage to the works. Fortunately, the only injury to the apparatus was a crack across the bottom of one of the purifiers. The men were taken to the infirmary, where they were under care between two and three months; the Company paying them full wages during the whole time.

I have this summer fixed a hydraulic safety-valve to the inlet of the scrubber, consisting of a covered tank 3 feet deep by 14 in. by 12 in., with a division 2 inches from one side going down to within 3 inches of the bottom. The working pressure is regulated by a ¾-inch pipe for overflow at the water-line; the inside of it being carried 6 inches downwards, so as not to be affected by the ebullitions of the water when in action. There are also two rows of tiles laid partly across the inside of the chamber, 6 inches and 9 inches above the water-line, to check the ascent of the water, as it is thrown upwards by the gas. A 4-inch pipe conveys the gas to the top of the scrubber; so that in case it operates, the gas will be blown into the atmosphere out of danger. The gas-inlet is in the 2-inch chamber; and the outlet-chamber being larger, will prevent so much water being blown out of it through the overflow when put in action. I made 4-inch connections to this valve, which I considered large enough to take off the make of gas in case the inlet to the gasholders should be closed by accident; and

thus preventing the purifier lutes blowing, and not allowing too much gas to flow back from the gasholders in case the holder inlet-valve was open.

We have manufactured sulphate of ammonia at our works for about twelve years. I believe I may claim to be the first in this district to do so. The apparatus employed I may describe as "home made;" the capital outlay being under £100. All the tanks, including the saturating-tank, are lined with sheet lead 6 lbs. to the foot. The saturating-tank is lined with lead in one piece, what the plumbers call pig lugged—i.e., the ends are turned up. The joints of the other tanks are joined with coarse solder. The liquor is pumped into a tank supplying the boiler by the same pump that supplies the scrubber. The boiler is fired with breeze. There are then a saturating-tank, two settling-tanks, and two evaporating-tanks. The liquor is heated by the waste steam from the engine after it has passed through a water-heater for the boiler feed. The man who sells coke makes the sulphate of ammonia, with the aid of an assistant, in the winter months. When I commenced the manufacture, the salts were made in the saturating-box; but it was found more convenient to make it by working the saturating-box with half water and half acid at starting, and then removing the neutralized liquor to the settling-tank, and from thence letting it down to the evaporating tank below. This plan enables the man in charge to leave the boiler filled with ammoniacal liquor at night, having made up the saturating tank with sufficient acid and water to neutralize the steam from the boiler; so that all the night stokers have to do is to keep up the fire, and shut the damper and lift the safety-valve when the water gets to a certain level in the gauge. We generally make about a ton of salts to every 110 tons of coal carbonized. I have given these details, as there may be some manager who may be under the impression that it requires a large outlay to set up sulphate works, I may say there are no brick buildings connected with the apparatus, and the tanks are under wooden sheds.

With regard to the question of wet and dry meters, I may say that I am an advocate of the latter—in fact, for the last five years we have not bought any wet meters. The consumers always prefer the dry meters, as they give less trouble. As to our street lamps, they are all provided with governors. I should strongly advise those managers who have not adopted governors to do so; and I can assure them that the results will be not only a much more satisfactory light, but a saving of gas.

I have upon several occasions met with managers of small works who, upon my inquiring what pressure they supplied at during the night, could not tell me, as there was no pressure-gauge on the works. The general plan seems to be to put the gas on full at night. Those who have (say) a 4-inch valve which they open and shut, should have a 1-inch or ¾-inch governor acting as a bye-pass round the valve; and so work the night pressure after eleven o'clock and the day pressure with it. By having a pressure-gauge on the outlet, the pressure can be reduced from (say) 5-10ths inch in the daytime to 1 inch after 11 p.m., instead of allowing the gasholder pressure to remain on the town all night.

The question of Sunday labour in gas-works has recently received much attention. In our case we give the day stokers a half holiday—that is, half the men come to work at six o'clock, and go off after the twelve o'clock charge is finished; the other half remaining during the afternoon. The men receive full day's wages. The work is generally eased on Sundays by laying off a bed or two according to the state of the gasholders.

In conclusion, I may observe that in my opinion it is not unlikely in the future we may find large works adopting a system of manufacturing water gas on the plan advocated by Mr. A. Wilson of Stafford, which resembles a cupola used by ironfounders for melting iron, and that a method will be found of injecting gas tar into it, so that a gas of low illuminating power may be used for mixing with ordinary gas, and used for day supply (say) for eight months in the year. There are some gas companies who have a large demand for gas for cooking purposes, &c., and who perhaps are only compelled by their Act to supply 14-candle gas, whereas they generally give from 16 to 17 candle gas. The only difficulty I can foresee, is that at lighting time the consumers on the distant parts of the mains might complain of the low illuminating power of the gas during the early portion of the evening. There is, however, no doubt that a scheme of this nature would require more attention than the ordinary plan of coal gas making, and certainly would not be suitable for small works.

Mr. FEATHERSTONE said he had great pleasure in proposing that the best thanks of the Association be given to the President for his very admirable address. He (Mr. Featherstone) had listened with the greatest appreciation to the address, which was full of valuable information which he was sure would prove of great advantage to every member of the Association. They would have an opportunity later on of reading it; and he was sure they would obtain very useful hints from a perusal of it.

Mr. FRIZELLE seconded the motion, which was carried unanimously.

PAPERS AND DISCUSSIONS.

The SECRETARY said he was sorry to have to announce that Mr. T. Travers (Cork), who had promised to read a paper, entitled "How can we best Assist our Consumers?" had written to say that he would not be able to be present, as he had to attend the half-yearly meeting of his Company. Further than this, Mr. Travers had not sent his paper; and therefore the meeting would not have an opportunity of listening to what he (the Secretary)

was sure would have been an able and interesting communication. However, they had three other gentlemen present who had prepared papers on subjects of importance.

The other papers on the *agenda* were then read, as follows:—“The Utilization of Tar at Dundalk,” by Mr. W. R. Featherstone, of Dundalk; “Experience with Mr. G. R. Hislop’s Regenerative Furnace,” by Mr. A. Waddell, of Newtownards; and “Retort-Setting for Small Gas-Works,” by Mr. J. Robb, of Limavady. These, with the necessary illustrations and the discussions, will be given next week.

VOTES OF THANKS.

Mr. WADDELL proposed that the cordial and hearty thanks of the meeting be given to the President, for the ability with which he had presided over the proceedings.

Mr. GIBB said it gave him great pleasure to second the proposition; and in doing so he desired to add, on behalf of the members generally, that Mr. Stears’s conduct during his year of office, and his anxiety on all occasions to serve and forward the interests of the Association, which, under his presidency, had prospered very much, had earned for him their warm and cordial thanks.

The resolution was carried with applause.

Mr. GIBB asked to be permitted, in the name of the members of the Association, to thank their Secretary and Treasurer for the way in which he had during the past year discharged the duties of his position. Mr. Whimster had been most indefatigable in looking after the interests of the Association, and he deserved their thanks.

The proposition was cordially agreed to.

The PRESIDENT thanked the proposer and seconder of the vote for the kind expressions they had made use of with regard to himself, and also the meeting for the equally kind manner in which they had received the vote, for which he was very much obliged to them. He hoped—and he was sure—the Association had a prosperous year’s work before them; and he trusted that their next meeting in Dundalk would be even more interesting than the present one had been.

The SECRETARY also desired to avail himself of the opportunity of thanking Mr. Gibb for his kind remarks with regard to himself, and the meeting for their vote of thanks. He could assure them that it was a pleasure to him to be able to do anything in his power for the success of the Association and the furtherance of the work in which they were all engaged. He thought that their work was a good one; and he hoped it would be successful in bringing them and their brethren more closely together, to their profit and advantage. He urged the members to cordially combine to forward the interests of the Association, which he was sure would go on and prosper.

The proceedings then terminated.

The members subsequently dined together at the Railway Hotel, under the presidency of Mr. Stears.

GAS LIGHTING BY HIGH-POWER BURNERS.

In the course of a communication presented to the Société Industrielle du Nord de la France by the Manager of the Wazemmes Gas Company, he made the following remarks on gas lighting with high-power burners:—

For gas of a standard illuminating value, the lighting power increases with the temperature of the flame. It also increases, under favourable conditions, if the quantity of gas consumed by the burner in a certain period is augmented. Thus, two burners consuming 60 litres (rather more than 2 cubic feet) of gas, placed in juxtaposition, produce less light than one burner consuming 120 litres. As it is impossible to indefinitely increase the supply to ordinary burners, multiple-flame burners have been invented, in which two or more ordinary flames are united so that they may impinge upon each other. By an ingenious arrangement for bringing the air into contact with the multiple flames, two excellent types of lamps are obtained, consuming respectively 700 and 1400 litres per hour, which meet with a rapid demand in Paris, and in many other towns, for lighting wide public thoroughfares, squares, and large open spaces. If, however, it is desired to obtain a flame with a much higher temperature, it is necessary to resort to a special arrangement for heating the air intended for combustion with the gas. The principle of heating the air by means of the waste heat escaping with the products of the waste gas—the regenerative principle—was adopted by Mr. F. Siemens, and applied not only to gas-burners, but to high-temperature stoves. With the Siemens burner on the regenerative principle the following results are obtained:—With a consumption of 150 litres per hour, the light of from 1 to 3 Carcels; 250 to 300 litres, 6 to 7 Carcels; 600 litres, 15 Carcels; 800 litres, 20 to 22 Carcels; 1600 litres, 46 to 48 Carcels; 2200 litres, 72 Carcels. Unfortunately, the construction of the Siemens Argand lamps is very delicate, and, moreover, they have the disadvantage of being heavy, and rather unsightly. In Germany they have been widely adopted; but in France they have met with but little success. The Schülke lamp is made on the same principle; and this appears to be too delicate to come into general use. One of the latest burners of the regenerative class is the Wenham, which has been before the public for some time in England, and is now being adopted in France. In point of fact it is merely a very effective improvement on Breittmayer’s burner, from which it differs only in its construction; being produced in some elegant styles, which lend themselves perfectly to the

decorations of private houses. The No. 2 lamp of this type, with a consumption of 283 litres (10 cubic feet) per hour, has given 126 candles, in a vertical direction without reflectors; horizontally, 50 candles. But the gas employed in the tests had an illuminating power about 20 per cent. higher than that usual in Paris. When experimenting in Paris with a No. 3 lamp in a vertical direction, it showed a consumption of 34.6 litres (1.2 cubic feet) per Carcel obtained. The Wenham lamp is constructed to give light in a vertical direction; and by adopting a large reflector, the illuminating power is increased 18 per cent. in a vertical line, and 55 per cent. at 80°, which is a highly satisfactory result. There are at present five sizes of these lamps. There is also the Delmas hot-air burner, in which the batwing flame is completely enclosed in a glass, mounted with a sheet-iron casing, heated by the products of combustion, through which the air passes on its passage downwards to feed the flame; and it thus increases the temperature, improves the illuminating power, and produces a beautiful steady light. Mention also may be made of the Siemens radiated heat-burner, by means of which the heating of the air is effected simply by the radiation of the metallic parts of the appliance which are in contact with the flame. These burners produce the light of 1 Carcel (9.5 candles) with a gas consumption of 70 litres (about 2½ cubic feet), and are therefore, from an economical point of view, intermediary between the high-power and regenerative burners. This degree of economy can be ascertained by an ingenious arrangement of the air supply in a burner with holes, which has been made in the laboratory of the Wazemmes Gas Company by M. Verl , the Engineer, who has invented a very simple burner called the “Lillois,” with which the light of 1 Carcel is obtained with a consumption of 70 litres. This produces a tulip-shaped flame, and it has a specially constructed glass arrangement on the outside for regulating the combustion. Comparing the above-mentioned burners with each other, we arrive at the following results:—The “Lillois” burner consumes 70 litres of gas per Carcel; the Siemens ordinary, 70 litres; the Siemens-Breittmayer, 35 to 39 litres; the Wenham, about 35 litres. Taking this into account, and considering that a Carcel corresponds with 105 litres of gas consumed in the Bengel form of burner, we see that the economy in gas might, by employing these burners, reach from 33 to 71 per cent. If this is compared with the batwing burner, which produces the light of 1 Carcel with a consumption of 120 litres of gas, the economy is greater—varying, according to the type of lamp, from 41 to 85 per cent.

THE GENOA WATER COMPANY’S CASE.—In the course of a letter recently addressed by Colonel Hughes-Hallett, one of the Directors of the City of Genoa Water-Works Company, Limited, to Mr. Webb Hayward, of Rochester, he states that the Board intend to appeal against the judgment of Mr. Justice Kekewich in the case reported in the JOURNAL last week (p. 293). The word “subscribed,” which was used in the prospectus in reference to the £200,000, and which was alleged to have misled the plaintiffs, was inserted under the advice of Counsel; and when the Directors found that a mistake had been made, they sent out a circular explaining the matter, and offering any debenture-holders the chance of having back the money they had subscribed, if they wished. Colonel Hughes-Hallett says the people who brought the action “not only took no advantage of the offer, but accepted the dividend each year.” The case will, if necessary, be carried to the House of Lords; and the Board appears to be confident of eventual success. At any rate, they ask for a suspension of judgment on the part of the public until the higher tribunals have been consulted.

THE EDINBURGH GAS-WORKS ARBITRATION.—Mr. George Livesey was in Edinburgh on Thursday and Friday last in connection with the arbitration between the Edinburgh and Leith Corporations’ Gas Commissioners and the two Gas Companies, to which reference has already been made in our columns. The two chief points in dispute were: (1) What were the implements which had to be specially paid for under the Purchase Act; and (2) what was the sum to be paid for the stock of coals which the Companies respectively had to hand over. The proceedings occupied the whole of Thursday; and on Friday morning Mr. Livesey made his award. He has decided that “no item or article is to be valued and paid for which was used or required for the efficient working of the respective undertakings at their maximum production of last winter,” and also that “only those stores of materials referred to in section 90 of the Act, and all implements, meters, and pipes in store or in hand—whether new, or unused, or not—which are in excess of the quantities of materials, implements, meters, and pipes which were required at the aforesaid period of maximum working, are to be valued and paid for, as provided in the said Act.” The effect of this decision, says the *Scotsman*, will practically be a reduction of the claims of the Companies by upwards of £5000. In carrying out the decision, the lists of both Companies were gone through, and the various articles disallowed were withdrawn. The Arbitrator and the parties’ representatives thereafter proceeded to the works to value the stores to be paid for. He then proceeded to adjust the various claims agreeably with his award, and visited the works for the purpose of examining the implements and stocks which have to be paid for by the Commissioners, in order to attach a value to the same. He fixed the price of the unused gas in the gasholders and pipes as on the 1st of August at 2s. 6d. per 1000 cubic feet. The valuation of the coal in store or in hand is to be made at the contract price.

Register of Patents

SELF-GENERATING GAS-BURNERS AND APPARATUS CONNECTED THEREWITH.—Norman, J. J., of Southwark Bridge Road, London. No. 9665; July 9, 1887. [8d.]

This invention has for its object improvements in patent No. 1828 of 1884, whereby it was proposed to increase the utility and convenience of the apparatus described therein, and render it more easily applicable to a variety of uses, where the generation and ready control of a great volume of heat and a high degree of temperature, as well as perfect combustion and absence of smoke, are desired—thus rendering it peculiarly suitable for use in inflating balloons for war and other purposes, whereby "greater convenience and economy in aerial navigation are obtained, and at the same time greater facility of, and safety in their employment."

GAS MOTOR ENGINES.—Lindley, H., and Browett, T., of Salford. No. 11,345; Aug. 19, 1887. [11d.]

This invention relates to gas motor engines of the kind wherein a charge of explosive gas or vapour or spray mixed with air is drawn into a cylinder, then compressed, then ignited, and afterwards expelled during four successive strokes of a piston corresponding to two revolutions of the engine; and the object of it is to simplify the construction of such engines, and to enable the power produced to be governed in proportion to the load.

To this end the waste products resulting from the explosion are expelled from the cylinder by providing at or near the end of the cylinder lying towards the crank-shaft of the engine, holes or ports in such a position that they are uncovered by the piston on the completion of its out-stroke—that is, its stroke towards the shaft. These ports, which may be of small diameter so as not to open too early, serve to get rid of any excess of pressure over atmospheric pressure that may remain in the cylinder at the end of a working stroke. After the crank has passed the dead centre, the piston begins to return; and it then expels a small portion of the contents of the cylinder through the holes already mentioned, continuing to expel until it has again covered such holes. If, however, it be deemed advisable to prevent such displacement by a loaded check-valve or other means, the piston during the remainder of its in-stroke deals with the bulk of the products in the cylinder in one of two other ways, premising that, in addition to the holes already mentioned, the engine is fitted with a separate exhaust-valve at the other end of the cylinder (the farther end from the shaft). This valve is capable of being mechanically moved by a lever, cam, or other means, and worked from the engine itself; the actuating mechanism being so arranged as to operate or not under the control of the governor. A valve is also provided whereby the charge of air and inflammable vapour or spray can be admitted into the cylinder. This may advantageously be of the lift type, and self-acting—that is, adapted to lift when there is a partial vacuum or reduction of pressure in the cylinder; or means may be provided to operate it mechanically by a slide such as is frequently used in gas-engines for this purpose.

GAS MOTOR ENGINES.—Embleton, D., of Hunslet, near Leeds. No. 11,717; Aug. 26, 1887. [8d.]

This invention has reference to an improved construction of gas-engine of the type described in patent No. 2447 of 1886, in which there is an explosion at every revolution or alternate stroke, and in which there is admitted to the cylinder through a hole or radial holes (uncovered by the piston as it approaches the termination of its outward stroke) a scavenging charge of air, and afterwards a combustible mixture of gas or vapour and air, and the contents of the cylinder are compressed on the inward stroke, during which also products of combustion and air are expelled through the inner end of the cylinder. In this way, on the conclusion of the inward stroke, there is enclosed within a chamber at the inner end of the cylinder—and which may advantageously be of larger diameter than the working cylinder—a practically homogeneous compressed charge of combustible mixture, which is ignited and expanded so as to propel the piston outward until it uncovers the holes. Air is thus admitted first; and afterwards a further charge of combustible mixture (as before), which is compressed on the return stroke, during which the products of combustion from the explosion, as also air admitted, are expelled; and so on at each revolution or double stroke of the engine. In this engine the chamber into which the combustible mixture is compressed preparatory to ignition is not made long, and of a gradually diminishing diameter; but is made short in proportion to the stroke of the piston, and of uniform diameter, whether such diameter be the same as that of the working cylinder or not. Satisfactory results may be obtained, says the patentee, by the use of an ignition chamber having a cubical capacity of from about one-fifth to one-fourth that of the working cylinder. Means may also be provided to ensure a thorough admixture of air and gas or vapour prior to entering the working cylinder.

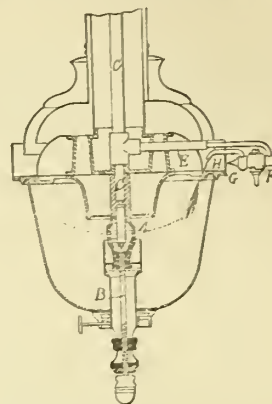
LAMP AND GAS COOKING-STOVES.—Bowen, E., of Perry Barr, near Birmingham. No. 12,508; Sept. 15, 1887. [8d.]

This invention is designed to increase the superficial heating surfaces of gas-stoves; so that the maximum amount of heat is obtained for a minimum expenditure of gas. The stove consists of a series of rectangular shaped plates, connected together so as to form an enclosure, with horizontal divisional spaces to constitute heating chambers, which are situated between vortical flues or passages, leading respectively from the burner chamber at the base of the stove, and from the horizontal heating chamber leading to a crown space at the summit of the stove.

LIGHTING REGENERATIVE GAS-LAMPS.—Fournoss, H., of Manchester. No. 12,554; Sept. 16, 1887. [8d.]

This invention relates to means for lighting regenerative gas-lamps—more especially of the now well-known Fourness type; but is applicable for use with any lamp the burner of which is enclosed in a glass shield. The proposal is to ignite and shoot a tongue of flame into the interior of the shield and towards the burner; so that when the gas is turned on, the lamp is immediately lit without disturbing the shield, and without

providing any ports or openings therein for the introduction of tapers or other lighting media.



In the illustration given of a Fourness lamp, the supply of gas to the burner A is controlled by a valve B operated from beneath the lamp; while the supply to the lighting apparatus is taken from the pipe C by a T-piece and a branch E, by which a constant supply of gas is led to the tap F. This tap has two outlets—one at G, and one at H; the latter being directed downward towards the interior of the lamp. When the tap is turned on, gas issues from both outlets. Just opposite to the outlet G an opening is formed in the surrounding shield of the lamp; and immediately opposite to the outlet H another opening is made in the upper part of the lamp. When the lamp is to be lit, the tap is turned and the gas issuing from G is ignited. This flame strikes and ignites the gas issuing from H; and the flame is shot downward into the interior of the glass. The valve B is then turned, and this allows gas to issue from the burner A; and it is immediately ignited by the flame from H, and the lamp is lit. The tap F is then turned off until again required.

PRESSURE INDICATOR FOR FOUL GASES.—Thomas, A., of West Cowes, and Thomas, P., of Buckingham. No. 1366; Jan. 30, 1888. [8d.]

In reference to this invention, the patentees say: We make the indicator of two glass tubes—one inside the other. The outer one has a solid bottom, while the inner one is open at both ends, and is slightly the longest. At the lower end of the back-plate (of wood or metal), we fix a small shelf, which has a hole sunk part of the way in to receive the solid end of the outer tube, or a ferrule may be fixed upon the shelf which answers the same purpose. At the top of the back-plate we fix a ring, through which the outer tube is passed. We make a metal guide to stand in the bottom of the outer tube, and one to clip the top of the tube. Each of these guides has a hole in the centre through which the inner tube is passed, so as to keep the inner tube in the centre of the outer one; or the solid end of the outer tube can be made dome-shaped, and the open end brought into a smaller diameter. This dispenses with the two last-named guides, as the alteration to the outer tube will keep the inner one in the centre. To admit of the water passing freely from the inner to the outer tube, the lower end is bevelled. To use the indicator, the gas is passed (by means of a portable pipe) into the inner tube; and coming in contact with the water, displaces part of it, driving it into the outer one—the difference between the two water-levels showing the amount of pressure upon the apparatus.

IMPROVEMENTS IN STARTING GEAR FOR GAS-ENGINES.—Deboutteville, E. D., and Malandin, L. C. P., of Fontaine-le-Bourg, France. No. 8300; June 6, 1888. [6d.]

This invention relates to improvements in starting gear of the class described in patent No. 2305 of 1888. By means of the present invention, the starting of the engine can be effected without working the piston by hand in order to draw in the gaseous mixture during a fraction of the stroke, and to compress the charge thus drawn in as described in the former patent. With this object, the cylinder is provided with a cock or valve, by means of which the inert gas in the cylinder can be discharged.

GAS-LAMPS.—Thompson, W. P.; communicated from Herzfeld, J., of Berlin. No. 8532; June 11, 1888. [8d.]

The object of the present invention is to prevent the decomposition of the gas in the supply-pipes of regenerative gas-burners, or at least to reduce it to a minimum, and also to provide an arrangement of the pipes which will enable anyone to clean them easily, by simply brushing their inside surface, without having to remove the lamp at all. By this arrangement, the gas which flows through the pipes at a great velocity gets heated to a certain extent, but not enough to cause the separation of the carbon. The gas then enters a special distributing chamber, in which it is further heated, so that the separation and deposition of the carbon take place in the chamber, which is thus not liable to be stopped.

APPLICATIONS FOR LETTERS PATENT.

- 11,242.—BARKER, T. B., "Improvements in gas-engines." Aug. 3.
- 11,392.—PRICE, W., and WEBB, E., "Improvements in apparatus for gas lighting, warming, and ventilating." Aug. 7.
- 11,396.—CUTLER, S., and CLOUDSLEY, J. L., "Improvements in gas-meter indices, whereby they may be adjusted so as to prevent more than a limited quantity of gas being passed without readjustment." Aug. 7.
- 11,431.—MAIN, R. B., & A. P., "Improvements in gas fires or stoves." Aug. 8.
- 11,444.—NORRIS, F. G., "An improved method of and apparatus for silencing or rendering practically noiseless the exhaust from gas or petroleum engines." Aug. 8.
- 11,471.—BUTZKE, F., "Improvements in gas-lamps." Aug. 9.
- 11,561.—EUREN-WALTEN, E. R. K., and FABRICIUS, C., "Improvements in gas incandescent lamps." Aug. 10.
- 11,692.—HUNT, R. J., and HARRISON, T. H., "The better governing of gas-motors, entitled 'Hero' gas-meter governor." Aug. 14.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

WIND PRESSURES ON GASHOLDERS

[The correspondent whose letter we give herewith has good and sufficient reasons for withholding his name from publication; but, in order that due weight may attach to the position he takes up on this subject, it may be mentioned that "Theory and Practice" is the *nom de plume* assumed by the gentleman who is contributing the interesting series of articles in the JOURNAL (commenced in Vol. L.), under the title of "The Guide-Framing of Gasholders."—Ed. J. G. L.]

SIR,—There seems to be a great deal of mystery in the minds of some people as to the manner in which wind pressure acts upon a gasholder, and the effect it produces. Perhaps the following remarks may help to clear up the misunderstanding, which has evidently taken possession of the writer of the leading article in the JOURNAL for the 31st. ult. He remarks: "Up to last year it was generally accepted that the overturning force of the wind, exerted against a gasholder from one direction, tended to push the holder along a horizontal plane, and could be equally divided among the number of guide-rollers brought into play." Mr. Corbet Woodall and Mr. Foulis are both quoted as holding this view; and Mr. Hunt is looked upon as a waverer. The writer calls this the "fundamental assumption of the old theory," and "the old theory of gasholder stability;" and he states that it is now contradicted by the experiment at Rotherhithe. This is due to a confusion of ideas on the subject—viz., confounding the loading of a beam with the manner in which the beam resists the load.

A gasholder may be looked upon as a beam fixed at one end; or a cantilever, as it is generally called for brevity. It is "uniformly loaded" from top to bottom (wind), as stated by Mr. Woodall. No one can reasonably contend that the wind pressure is not, to all intents and purposes, a uniform load that is distributed equally from top to bottom over the sides of the holder.* This pressure is transmitted to the guide-framing, through the roller carriages, uniformly from top to bottom. The force (or load) is horizontal in direction, as stated, and tends to sheer off the guide-framing at the base in a horizontal plane.

This is all perfectly correct, as far as it goes; but we are asked to believe that these elementary principles in mechanics, which have been proved up to the hilt, are upset by the experiment at Rotherhithe. The most elementary text-book in Applied Mechanics shows that uniform load on a cantilever induces a shearing force at the fixed end equal to the total load, and at right angles to its length. The gasholder which is subject to precisely the same conditions of loading cannot claim exemption from this law or principle in mechanics.

A cantilever, like all other beams, is not only subject to shearing strains due to the load tending to push it along a plane at right angles to its length—i.e., in the same direction as the load acts, and which is horizontal in the case of a gasholder cantilever—but, as is well known by every engineer, it is likewise subject to compression and tension along its fibres, on opposite sides of the neutral axis, due to the bending moment. It is likewise subject to buckling, crippling, and wrinkling strains.

In the old style of gasholders, the bell or floating part of the holder pushed against several cantilevers in the shape of a number of massive columns or standards, lightly tied together by girders, but practically acting like so many independent cantilevers. But in the new style, the bell pushes against one cantilever only—viz., the whole guide-framing in which it is enclosed. Mr. George Livesey, much more than a "year ago," clearly recognized and advocated this latter method of construction—viz., making the whole structure into one complete braced-frame cantilever, instead of the old mode of several cantilevers. There is no "reconstruction of theory" or "new theory" demanded. The theory remains the same; it only becomes a matter for deciding which is the better plan for meeting the demands of theory—to put up one Livesey braced-frame or several independent cantilevers, to resist the horizontal push of the wind. This is a wide question into which space forbids me to enter.

The writer of the article also infers that, because the top lift does not blow over when the top part of the guide-framing is done away with (as at Rotherhithe), it does not push at the top guides when the framing is carried to the full height, as usual; or, in other words, that the top roller-carriages never have any work to do. This clearly shows what false conclusions may be drawn from an "experiment" improperly understood. In the Rotherhithe gasholder, the total horizontal push of the wind is the same as if the guide-framing reached the full height. The resultant horizontal shear at the foot is the same. The bending strain at the foot of the guide-framing is the same. The crippling or buckling strains are increased, because the cups are not so well suited to resist distortion as the strutted top curb is, and therefore render but little assistance to the guide-framing. The great difference in the conditions is this: The bell of the gasholder itself is now called upon to act as a cantilever in its upper lift, which it is not required to do in the ordinary construction. It would undoubtedly push against the top of the guide-framing if there were any to push against; but as there is not, it has to take all the bending strains in itself, caused and created by abolishing the top framing. This is all fully explained, and the nature of the strains pointed out, in the "Communicated Articles" on this subject which appeared in the JOURNAL last, and early in the present year. The push which would in the ordinary way be given out by the top rollers is given out lower down by the dip rollers on the middle lift. The following illustration may make my meaning clearer:—Bed a plank evenly on the ground. It may fairly be said to press the ground equally along its entire length—i.e., the ground is "uniformly loaded." Now remove the supporting earth from under one end—say, for one-third of its length. Are we to infer, because the end of the plank does not break off after the

earth is removed, that it did not exert any pressure against the ground at that end before the earth was removed? We know such an inference to be absurd; and yet that is exactly what we are asked to believe about the gasholder—viz., that because the inner lift does not break off or bend over, it could not have exerted any pressure against the guide-framing if the frame had been carried to the full height.

Another extraordinary statement needs comment. It is this: "If a gasholder will stand in fair weather, it will stand in a storm." This is equivalent to saying that a chain which will not break with a load of 10 tons will, of course, not break with a load of 20 tons—an absurdity.

The writer of the article further states that the best way to solve the problem, and determine the "new theory" is by "direct experiment." On this subject I would only remark that experiments, in order to be understood, must be accompanied by a capacity for drawing correct conclusions, or they are valueless, if not positively dangerous, for experiment (anything which appeals to the outward senses) always carries with it a certain amount of conviction which may be false altogether, of which we now have a case in point. The same experiment may prove opposite things to different individuals. It seems strange that you only have to call anything "practical," and you may have any number of followers; but brand it as "theory," and doubt is at once cast upon it, although experiment unaccompanied by sound "theoretical" knowledge in the subject is very little good. It is useless to resort to experiment for determining the nature of the strains on a gasholder, unless the greatest care is exercised in not drawing hasty and erroneous conclusions.

With regard to making experiments on this question, it is quite unnecessary to work with expensive models. All that need be done is to take (say) an existing three-lift holder, and remove the top rollers, or, for safety, set them back a few inches all round. You then have the inner lift free. Do the same with the rollers on as many lifts as you wish to run up and down independently of the guide-framing; and if the folly of "6 feet of guide-framing only" must be proved "practically," fix rollers on the side of the outer lift 6 feet above the bottom curb, and remove all those working in the guides above that level. Then inflate the holder, and note the result!

In conclusion, I cannot do better than quote Mr. George Livesey's gentle rebuke, when writing on this "6 feet of guide-framing" suggestion (see JOURNAL for April 26, 1887): "It is all very well for a writer to sit at his desk and formulate theories; but to put them in practice would incur a responsibility from which he would probably shrink."

Aug. 10, 1888.

THEORY AND PRACTICE.

MR. CARPENTER ON GASEOUS FIRING.

SIR,—After Mr. Hunt's recent remarks (*ante* pp. 28, 166) upon Mr. Carpenter's paper, on "The Principles of Gaseous Firing," read at the meeting of The Gas Institute in June last, I thought we were on the way towards ascertaining what we are very anxious to know—viz., the amount of fuel consumed for producing gas where the simple generator is employed, and the amount where the complete regenerator is used. After reading Mr. Carpenter's two papers—one at the Southern District Association, the other at the Institute—on this subject, together with the discussions on them, I have to confess that I have not been able to get from them one atom of reliable information as to the quantity of fuel actually used at the Vauxhall Gas-Works. The basis on which he founds his calculation is erroneous, starting, as it does, upon a loose and inaccurate assumption, and ending in a result even wider of the truth than the original assumption itself.

Your correspondent "A. B." evidently writes with only an imperfect understanding on the subject, or he would not try to make out that much more coke can be produced in the retort from a ton of coals in London than in Birmingham. Why does he endeavour to confuse us by writing about so many speculative level or heaped bushels of coke from a ton of coal? Surely he must be aware of the increase in bulk between the coal put into, and the coke drawn out of a retort, when the coal used comes from the Newcastle district, like that used by the South Metropolitan Company. This coal swells and increases materially in bulk during distillation; and the resulting coke is very porous, and capable of holding a great deal of absorbed moisture; whereas the coke yielded by the inland coal used in Birmingham is much more dense, and scarcely more bulky, than the coal from which it was produced. While the bulk of coke from a ton of coal in London may be greater than that from a ton as used in Birmingham, there cannot be much difference in the weight of this residual when drawn from the retort. It is the after manipulation that makes the difference in weight. It might be well if "A. B." would look into "Field's Analysis" for 1887, and say, if he can, how it is that The Gaslight and Coke Company make 43·7 bushels of coke from a ton of the same kind of coal as is used by the South Metropolitan Company, while the latter Company can produce 49·8 bushels. The Gaslight and Coke Company also use 8·8 bushels of their make for fuel, while the South Metropolitan Company use 9·9 bushels for the same purpose.

Mr. Carpenter, in his letter in the JOURNAL for the 31st ult. (p. 208), says: "After deducting the fuel value of the tar burnt, I sell 10·3 cwt. of coke for every ton of coal carbonized." There is nothing exceptional in this sale of Newcastle coke; and no doubt the same amount is being disposed of at other works where neither generator nor regenerator furnaces are employed. In fact, Mr. Frank Livesey informed the members of the Southern District Association of Gas Managers, before whom Mr. Carpenter read his first paper, that he had made a series of experiments to discover the average weight of coke produced from a ton of the coal they used, with the result that 15 cwt. of coke was, on the average, obtained in the condition in which it was sold to the public; and in one case it reached as high as 16 cwt. At the same meeting Mr. Livesey said that with a good setting of retorts he was selling 10½ cwt. of coke per ton of coal carbonized. According to this, 4½ cwt. would be used in the furnaces as fuel for heating the retorts. From Mr. Carpenter's own showing, he has only produced 10,250 cubic feet of gas per ton of coal, or 6000 cubic feet per mouthpiece, and has sold 10½ cwt. of coke. Taking Mr. Livesey's own figure for the make of coke, this leaves 4½ cwt. for fuel, or 21 lbs. of coke for every 100 lbs. of coal carbonized, which is practically the same the quantity used by Mr. Hack at Salfrey before the introduction of furnaces of the regenerative type. If Mr. Carpenter will look again at "Field's Analysis," from which he quotes, he will see that several works in his district are doing much

* As remarked in the first article on "Gasholder Guide-Framing," the wind pressure increases as you rise from the ground (see "Graham's Graphical Statics"); but this does not affect the question at issue. It would be impossible to treat of gasholders under every possible condition of wind pressure—local gusts, protection by surrounding buildings, &c. The only reasonable course is to adopt a sufficiently high maximum pressure per square foot to cover all these little irregularities, and take it as uniformly loaded.

better than he is, without either generators or regenerators. By handling the "Analysis," Mr. Carpenter shows that he sells 2 cwt. of coke per ton more than they do in Birmingham; but by a further calculation he might just as easily have shown that the South Metropolitan Company are actually credited with selling more coke per ton of coal than they make from the same weight in Birmingham. Mr. Field assumes a chaldron of coke to weigh $9\frac{1}{2}$ cwt., or 32½ lbs. per bushel. In another place he states that the South Metropolitan Company make 49·8 bushels, and use 9·9 bushels, or sell 39·9—say 40 bushels per ton of coal; therefore they sell 1300 lbs. per ton of coal. The make of coke at Birmingham is recorded as being 1230 lbs. per ton of coal carbonized, or 70 lbs. less than the sale in London. Surely it is time that practical men gave up their unreliable and intrinsically inaccurate basis of assumption for a method by which the data in these elaborate analyses may be made valuable and consistent, so that the simple, but important, matter of fuel used for heating purposes could be arrived at with a reasonable degree of certainty for any works.

So far as I can gather, Mr. Carpenter has not on any occasion, in print, given any data of value upon the fuel account, although he has been asked by Mr. Hack and others to do so. Why does he not take up the commendable position assumed by every truly scientific investigator, and give that easily obtained and indisputably accurate information about his furnace for which Mr. Hack asked at The Gas Institute meeting? Mr. Hack said (and his words commend themselves to everybody): "It is no use to say you sold so many chaldrons of coke, when you only sold so many before, and to claim the difference as the economy effected. There should be careful tests of the fuel used, weighed into the furnace; the coal put into the retorts being also weighed. In this way they could tell clearly and positively what the advantages were, in the matter of fuel of one kind of furnace over another."

There is no doubt that the furnaces at the Vauxhall works are simple in construction; but there is nothing new or novel about them. They are very similar, especially in the settings, to Herr Oechelhäuser's generator settings (illustrated in "King's Treatise," Vol. I., pp. 233-4); but since the furnaces there shown were designed, very great progress has been made with regenerator furnaces, which, when properly handled, produce a larger yield of gas per ton of coal and per retort, with a consumption of about 10 lbs. of coke per 100 lbs. of coal carbonized.

In conclusion, it appears to me that we shall require different proof than that which can be obtained by manipulating any sale account, based upon an assumed make of coke, before we decide to leave the indisputably more scientific regenerative furnace to go back on our footsteps for a whole decade, under Mr. Carpenter's leadership, to find a model upon which to found the only perfect retort-heating apparatus.

Aug. 13, 1888.

"JOCELYN CRUIKSHANK."

LAYING MAINS OVER RAILWAY BRIDGES.

SIR.—This is a matter of very common occurrence. Public roads are in no cases vested in railway companies, but in some local authority; and no gas or water company need be told that, on giving proper notice to the authorities, they can lay mains without their consent. It is absurd, then, to suppose that they cannot lay mains therein without the sanction of any railway company who may happen to have a bridge under the road.

Section 18 of the Railways Clauses Consolidation Act, 1845, to which you refer, begins as you put it: "It shall be lawful for the company, for the purpose of constructing their railway, to raise, sink, &c." These and many other powers, very arbitrary in themselves, but very necessary, are given to railway companies for the purpose of construction, but for that only. There is, however, this to be considered: Under the Railways Clauses Consolidation Act, section 45, it is provided "that such bridge, with the immediate approaches, and all other necessary works connected therewith, shall be executed and at all times thereafter maintained at the expense of the company." And in every railway Special Act where such powers are given, the steepest gradients of the road on each side of the bridge, and the minimum depth of soil over the bridge, are strictly prescribed; and it may be that the depth of soil is not sufficient for laying a large main. It is therefore expedient for the gas or water company's own protection, even though it may not be absolutely necessary, to arrange matters with the railway company before interfering with that part of the road which they are required to "maintain."

Gas Companies' Association,

76, Palace Chambers, S.W., Aug. 20, 1888.

W. LIVESEY.

EXTENSION OF THE BRIGHOUSE GAS-WORKS.—At the last meeting of the Brighthouse Local Board, the Clerk reported that the Local Government Board have acceded to the Board's application to borrow £1500 for the purposes of their gas undertaking.

MUNICIPAL CORPORATIONS (LOCAL BILLS), IRELAND, BILL.—This Bill, which is to enable Municipal Corporations in Ireland to apply municipal funds in the promotion of Local Bills in Parliament, was read the third time in the House of Lords on the 11th inst., and received the Royal Assent on the following Monday.

SCARBOROUGH GAS COMPANY.—The half-yearly meeting of this Company was held on Saturday, the 11th inst. Alderman Fowler presided; and, in moving the adoption of the report (a summary of which has already appeared), said that the Directors were able to pay the maximum dividend and to carry forward a balance of £834 18s. 2d. They had been enabled to reduce the price of gas to 2s. 9d. per 1000 cubic feet to private consumers, and to 2s. 8d. to the Corporation, which meant a loss of nearly £1800 upon the revenue. Mr. R. H. Butterworth seconded the motion. The report was adopted without dissent; and the maximum dividends were declared. Mr. G. Gascoigne (Chairman of the Derby Gas-Works) proposed a resolution that, in view of the decisive progress of the Company in recent years, its greatly improved position and efficiency, entailing as it had done greatly increased demands upon the time and attention of the management, the amount of remuneration to be paid to the Directors for the current half year should be £150, and a similar sum for each succeeding half year in which the maximum dividend should be paid to the shareholders. Mr. Robson seconded the motion; but the Chairman stated that the Directors did not wish such extra acknowledgment of their services. Ultimately it was resolved that £200 be placed at the disposal of the Directors as remuneration for their services in the current year. A vote of thanks having been accorded to the Chairman and other Directors, the proceedings closed.

Legal Intelligence.

GLAMORGANSHIRE ASSIZES.—FRIDAY, AUG. 10.

(Before Mr. Justice FIELD.)

THE SWANSEA CORPORATION AND THE SUPPLY OF COMPENSATION WATER.

An action was commenced to-day by Mr. E. Chrimes and others, trading as the Groesnant Tin-Plate Company, against the Corporation of Swansea, for the recovery of £2410, made up as follows:—£755 for penalties for the stoppage of compensation water from the River Lliw, 151 days at £5 per day; £755 for the like with respect to the Blaenant Ddn Brook; and £900 damages. The plaintiffs are riparian owners on the Lliw and the Blaenant Ddn Brook, and, as such, are interested in their waters.

Mr. M'INTYRE, Q.C., and Mr. VILLIERS MEAGER appeared for the plaintiffs; Mr. BOWEN ROWLANDS, Q.C., M.P., and Mr. DAVID LEWIS defended.

It was admitted, on behalf of the defendants, that the water was not sent down on the dates named by the plaintiffs, and that such stoppage did not occur in consequence of "inevitable accident" or the "act of God." For the plaintiffs it was argued that the omission of the Corporation to send down water was to suit their own purposes only, and was contrary to their Act of Parliament.

The arguments had not concluded when the Court rose.

SATURDAY, AUG. 11.

On the resumption of the proceedings to-day,

His LORDSHIP threw out a suggestion that the case might be settled by the parties.

After some consultation, the leading Counsel on each side retired. On returning, they said the agreement came to was that the claim for penalties in the action should be withdrawn—the defendants withdrawing the plea of the Public Health Act of 1875 for the purposes of that action only; the damages to be assessed by an arbitrator, if the parties were unable to agree upon them, and plaintiffs to have their costs.

Justice FIELD said this was a very reasonable agreement, and met the whole of the case. On the one hand, the mill-owners got no more than they were fairly entitled to, and the Corporation, on the other hand, were not made liable for more than they ought to pay. It was an honest and reasonable agreement; and he was glad his intervention had succeeded in bringing it about.

WESTMINSTER POLICE COURT.—WEDNESDAY, AUG. 15.

(Before Mr. BIRON.)

GAS CONSUMERS AND THEIR CONTRACTS.

To-day Mr. R. Darbyshire, of Oxford Terrace, Teddington, appeared to an adjourned summons, taken out at the instance of Mr. Arthur Dove, who claimed on behalf of The Gaslight and Coke Company a sum of £2 8s. 6d. for gas consumed at a house in Charlwood Street, Pimlico, from March, 1887, to January, 1888.

Mr. Dove said that, although the defendant had not himself consumed the gas, he was the person with whom the Company entered into an agreement, and therefore he was liable.

Defendant stated that in December, 1885, he went to the office of the Company, and gave notice that he was leaving the house, and that the supply of gas could be discontinued. The tenant who came after him apparently was not required to sign a fresh contract; and, after paying for two years, he got into difficulties, and left in debt. The Company accepted him as their customer, received money from him, and now he had gone away in their debt, and they would not take the trouble to find him.

Mr. Dove: We never recognized him, and the accounts have always been sent in in your name.

Defendant: And I have never been in the place since January, 1885.

Mrs. Darbyshire deposed that, in consequence of the verbal notice given by her husband, an official was sent two days afterwards to take away the meter and to disconnect the supply. She suggested the advisability of leaving it for the incoming tenant, as an act of kindness, and with a view of saving him expense. The man, on learning that the gas would be required, did not cut it off or take the meter away.

Mr. Dove denied that notice of any kind had been given by defendant, and urged that the contract Mr. Darbyshire entered into had never been terminated.

Mr. BIRON told the defendant that the contract he signed required him to give written notice to terminate it. Until such notice in writing was given, he was liable for all gas consumed.

Defendant said he thought the contract note he signed was only a matter of form. Certainly, he had no idea of liability for years after he left the house.

Mr. BIRON: When you sign a document again which imposes a liability, you will perhaps recollect the terms of it.

An order was made on the defendant to pay the money.

EXTENSION OF THE ILKESTON GAS-WORKS.—At the quarterly meeting of the Ilkeston Town Council last Tuesday, the Town Clerk read a letter from the Local Government Board with respect to the report made by Major-General Carey, after the inquiry held by him with reference to the application of the Council for sanction to borrow £6000 for works of gas supply. It appeared from the report that, although the scheme included six additional purifiers, it was intended to provide only two at present; and the omission reduced the amount to £4080, the loan of which the Board sanctioned for a term of 20 years. He added that, in compliance with the request of the Committee, he had written to the Local Government Board, asking for an extension of the time allowed for repayment to 50 years; and read a reply to the effect that such request could not be granted.

THE CARDIFF WATER-WORKS.—On Friday, the 10th inst., the members of the Water Committee of the Cardiff Corporation, accompanied by several of the Council, visited the water-works. The party first proceeded to Bly, where the machinery which has been erected for the purpose of pumping the water from the wells or springs in the district, and which it was explained by the Water Engineer (Mr. J. A. B. Williams, M. Inst. C.E.) was capable of raising 2 million gallons per day. Last summer these wells were of great value; yielding as much as 500,000 gallons of water per day in the driest part of the season—thus saving Cardiff from a water famine. The new works at Rhubina, where a balancing reservoir has been constructed, in which the water from the Taff Fawr is received, filtered, and then diverted to Llanishen, were inspected. The reservoir is situated at an altitude which will enable the Corporation, whenever they deem the time opportune, to supply Whitechapel, Llandaff, Penarth, and the higher parts of Penylan by a system of gravitation. Only one filter-bed has been constructed; but it is intended eventually to lay down four beds, with the accompanying pure water reservoirs. These will be capable of dealing with 1 million gallons of water per day. From Rhubina the party drove to the Llanishen reservoirs, where luncheon was served.

Parliamentary Intelligence.

PRIVATE BILLS (SESSION 1888) RELATING TO GAS, WATER, ETC.—PROGRESS MADE DURING THE SESSION.

Title of Bill.		Petition for Bill Presented.	Bill Read the First Time.	Bill Read a Second Time.	Bill Reported.	Bill Read the Third Time.	Bill Received Royal Assent.
Airdrie and Coatbridge Water	Lords . .	Feb. 14	Feb. 14	Feb. 28	Preamble	not proved	—
Barnstaple Water "	Commons.	—	—	—	—	—	—
Bristol Water	Lords . .	Commons Bill	April 13	April 23	May 7	May 15	} June 28
Brymbo Water	Commons.	Feb. 13	Feb. 14	Feb. 27	March 20	April 6	
Draycott Gas	Lords . .	Commons Bill	May 8	June 4	July 3	July 20	} Aug. 7
Drighlington Gas	Commons.	Feb. 13	Feb. 14	March 6	April 26	May 7	
Edinburgh and Leith Corporations' Gas	Lords . .	Commons Bill	April 13	April 23	April 26	May 4	} May 16
Edinburgh and Leith Gas	Commons.	Feb. 13	Feb. 14	Feb. 27	March 26	April 9	
Falkirk and District Water	Lords . .	Commons Bill	April 13	April 23	May 4	May 11	} May 16
Folkestone Water "	Commons.	Feb. 13	Feb. 14	Feb. 27	March 19	April 6	
Frodsham Gas and Water	Lords . .	Commons Bill	May 11	June 5	June 26	June 29	} July 24
Fylde Water "	Commons.	Feb. 13	Feb. 14	March 13	April 27	May 10	
Glasgow Corporation	Lords . .	Lords Bill	March 12	March 21	March 6	March 9	} April 27
Grand Junction Water	Commons.	Feb. 14	Feb. 14	March 21	April 12	April 16	
Halifax Corporation Water	Lords . .	Lords Bill	April 16	April 25	March 20	April 13	} June 28
Hamilton Water "	Commons.	Feb. 13	Feb. 14	Bill rejected	May 7	May 17	
Helston and Porthleven Water	Lords . .	Commons Bill	April 13	April 23	May 11	June 7	} June 28
Henley-on-Thames Gas "	Commons.	Feb. 13	Feb. 14	Feb. 20	March 19	April 9	
Hexham Local Board	Lords . .	Lords Bill	May 3	May 14	April 26	May 1	} June 28
Hinckley Local Board Water	Commons.	Commons Bill	April 30	May 7	June 21	June 25	
Kent Water	Lords . .	Commons Bill	Feb. 13	Feb. 14	June 19	June 22	} June 28
Keswick Gas	Commons.	Feb. 13	Feb. 14	Feb. 20	March 27	April 27	
Lancaster Corporation	Lords . .	Lords Bill	Feb. 14	Feb. 23	March 22	April 13	} July 5
Limpfield and Oxted Water	Commons.	Commons Bill	April 16	May 15	June 14	June 26	
Lincoln Corporation	Lords . .	Commons Bill	April 24	May 8	June 25	July 20	} Aug. 7
Llanelly Local Board	Commons.	Feb. 13	Feb. 14	Feb. 20	April 12	April 23	
London Sea Water Supply	Lords . .	Lords Bill	Feb. 14	Feb. 20	March 15	March 20	} July 5
Nelson Local Board	Commons.	Commons Bill	March 22	April 5	June 15	June 26	
Newport (Mon.) Corporation Water	Lords . .	Commons Bill	April 13	April 23	April 24	April 27	} April 30
North Staffordshire Water "	Commons.	Feb. 13	Feb. 14	Feb. 27	March 20	April 5	
Perth Water and Gas	Lords . .	Commons Bill	April 24	May 3	May 11	May 15	} June 28
Riddings District Gas	Commons.	Feb. 13	Feb. 14	March 12	April 12	April 23	
South Lincolnshire Fen Water	Lords . .	Commons Bill	June 11	June 19	July 17	July 20	} Aug. 7
South Staffordshire Water	Commons.	Feb. 13	Feb. 14	Feb. 20	May 17	June 8	
Staffordshire Potteries Water	Lords . .	Commons Bill	May 4	June 7	June 28	July 2	} July 24
Stockton and Middlesbrough Corporations Water	Commons.	Feb. 13	Feb. 14	Feb. 27	April 24	May 3	
Uckfield Water	Lords . .	Lords Bill	June 12	June 25	June 7	June 11	} July 24
West Surrey Water	Commons.	Commons Bill	June 26	July 5	July 2	July 5	
"	Lords . .	Commons Bill	Feb. 14	Feb. 20	July 23	July 30	} Aug. 7
"	Commons.	Feb. 13	Feb. 14	Feb. 20	June 19	June 25	
"	Lords . .	Commons Bill	May 15	June 14	May 3	May 11	} July 24
"	Commons.	Commons Bill	June 15	June 22	July 13	July 18	
"	Lords . .	Commons Bill	Feb. 14	Feb. 21	July 10	July 16	} Aug. 7
"	Commons.	Commons Bill	April 13	April 23	June 8	June 15	
"	Lords . .	Commons Bill	Feb. 14	Feb. 29	June 15	June 22	} July 5
"	Commons.	Commons Bill	Feb. 14	Feb. 20	March 21	April 9	
"	Lords . .	Commons Bill	Feb. 14	Feb. 20	Preamble	not proved	—
"	Commons.	Commons Bill	Feb. 14	Feb. 20	March 19	March 22	} May 16
"	Lords . .	Lords Bill	April 10	April 10	April 30	May 10	
"	Commons.	Commons Bill	June 7	June 11	June 11	June 14	} June 28
"	Lords . .	Commons Bill	Feb. 20	Feb. 20	March 23	April 10	
"	Commons.	Commons Bill	Feb. 24	Feb. 24	April 23	April 27	} July 5
"	Lords . .	Lords Bill	May 9	May 9	June 18	June 28	
"	Commons.	Lords Bill	Feb. 16	Feb. 24	May 14	May 15	—
"	Lords . .	Lords Bill	May 16	June 5	Bill withdrawn	—	—
"	Commons.	Lords Bill	Feb. 14	Feb. 24	April 27	May 8	} Aug. 7
"	Lords . .	Lords Bill	May 15	June 6	July 6	July 26	
"	Commons.	Commons Bill	April 13	April 23	May 14	June 21	} July 5
"	Lords . .	Commons Bill	Feb. 14	Feb. 20	March 22	April 12	
"	Commons.	Commons Bill	May 1	June 12	June 14	June 22	} July 5
"	Lords . .	Commons Bill	Feb. 14	Feb. 20	March 19	April 30	
"	Commons.	Commons Bill	April 13	April 24	May 14	June 21	} July 24
"	Lords . .	Commons Bill	Feb. 14	Feb. 28	March 14	March 26	

THE ARTESIAN WELL AT GAINSBOROUGH.—Last Wednesday, the members of the Gainsborough Local Board attended at the water-works for the purpose of testing the yield of the artesian well they have been sinking during the past two years. The boring has reached 1200 feet, 476 of which pass beyond the base of the marls, and into the Bunter sandstone. During last September the well was tested, when the yield was 5000 gallons per hour; and the quality was variously reported upon by several analysts. Since then an extension of 100 feet has been carried out; and the pumping has been going on for 16 days and nights continuously. It ceased on Wednesday, when a test was taken by means of a 1000-gallon tank. The yield showed a trifling increase; 8 min. 50 sec. being the time taken by the pump to lift 1000 gallons. The actual yield of water, making every possible allowance, is 6765 gallons per hour, or one-fourth of the actual quantity now pumped for the town's use from the River Trent. Several samples were taken for purposes of analysis, as, although the quantity is so much below what was anticipated, the quality of what has been obtained is very questionable; being of a high degree of hardness, caused, the analysts say, by the presence of sulphate of lime. Great disappointment is felt throughout the town, as already a sum of £5000 has been spent, apparently to no purpose. The boring—the only one of the kind in the district—has been watched with much interest by geologists and engineers from all parts of the country. The Local Government Board, acting upon the advice of Sir R. Rawlinson, refused some time ago to sanction any further loans for the purpose; and the latter portion of the cost has been met directly out of the district rates.

THE PRICE OF GAS AT BIRKENSHAW.—At the meeting of the Birkenshaw Local Board last Thursday, a letter was read from the Gomersal Gas Company, stating that the Directors had decided to meet the request of the deputation which recently waited upon them, and to make a reduction in the price of gas to the smallest consumers of a further 3d. per 1000 cubic feet, or 3s. 3d. net; a reduction of 3d. per 1000 cubic feet to consumers of quantities between 100,000 and 500,000 cubic feet, or 3s. net; and for quantities ranging from 500,000 to 1,000,000 cubic feet the price would be 2s. 9d. net. A letter from the Drighlington and Gildersome Gas Company stated that their price was 2s. 6d. per 1000 cubic feet, with discount according to consumption. The Board decided to discuss the question in Committee.

EASTBOURNE GAS COMPANY.—The report of the Directors of this Company, to be presented at the half-yearly meeting on the 27th inst., states that there is a net profit for the six months ending in June last of £4556 12s. 8d.; and deducting therefrom the sum of £18 17s. 6d. paid for interest, there remains £4537 15s. 2d., which, added to £2403 18s. 3d. (the balance brought forward, after payment of the interim dividend in March last), will give a total of £6941 13s. 5d. available for division. The Directors recommend that a dividend for the past six months be declared, at the rate of 12½ per cent. per annum on the £20,000 original capital of the Company, and also on the £12,490 (the amount raised on the "C" shares), and at the rate of 9½ per cent. upon the £55,000 paid-up capital raised on the "B" shares. This will absorb £4517 7s. 6d., and leave a balance of £2424 6s. 11d. to be carried forward.

Miscellaneous News.

SOUTH METROPOLITAN GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held last Wednesday, at the Bridge House Hotel, London Bridge—Mr. GEORGE LIVESLEY in the chair.

The SECRETARY (Mr. Frank Bnsh) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read (see *ante*, pp. 252, 296, 298).

The CHAIRMAN: Ladies and Gentlemen,—I always begin with the intention of making a short speech; and to-day I think that that intention will be carried out, for I have very little indeed to say. But in moving the adoption of the report, it is necessary that I should make a few remarks. The first observation I will make is as to the increase in the Company's business, which you are told amounts to 4·7 per cent. in the half year. Well, now, this increase depends to a considerable extent on the character of the weather, or rather on the thermometer. Taking last half year, the month of January was a mild one; and we actually sent out considerably less gas than we did in January in the previous year. The same may also be said of the month of May. In the other four months, however, there was an increase, particularly in June; and to give you some idea of the effect of the thermometer on the consumption of gas, I may state that in the nine weeks, beginning on the 2nd of June, and ending on the 4th of August, the increased consumption amounted to 14 per cent. over what it was in the corresponding nine weeks of last year. It is therefore not satisfactory to take a single half year, and base conclusions upon it. We have often said—and our experience justifies it—that reductions in price tend to increased consumption. Taking the last three corresponding half years, we find that in the June half of 1886, there was an increase of 9 per cent., which was a very heavy increase; in the June half of 1887, there was an increase of a little more than 5 per cent.—5½ per cent.; and then in the half year we are now dealing with, there was an increase of 4½ per cent. I think, therefore, that this at any rate is satisfactory, and is a justification for the policy the Directors have pursued in reducing the price of gas, because our strength is in obtaining an increase of business. It would not be a good day for gas companies if we were to find our business standing still. With reference to the accounts, there is very little indeed to say about them. Coals have been slightly cheaper than in the corresponding period of last year. In 1887 coals cost us 11s. 2½d. per ton; and in 1888 they cost us 10s. 10½d.—a difference of 4d. per ton. The products have yielded rather better. Whereas in 1887 they yielded 6s. 3d. per ton of coal, in 1888 they have produced 7s. 4½d. per ton. There has been an improvement all round. Tar was at its lowest in 1887. It is rather better this year. Coke was also at its lowest last year; and it has been better. The same may be said of ammonia. While I am on the subject of tar, I may say that we have, as stated in the report, burned a considerable quantity as fuel, because we held in the first place that its fuel value was greater than its selling value; and in the next place that the market was glutted—that the supply exceeded the demand—and that the only way to produce a balance was to remove what was in excess, and use a proportion of it for our furnaces. I may state here that it has been found that tar is worth 1½d. a gallon to burn, and that people are ready to buy it in quantities for this purpose at that price. It may also be used very advantageously under steam-boilers (on the plan devised by Mr. J. L. Chapman, the Engineer of the Harrow Gas-Works); and if gas companies generally do not like to use it for heating their retorts, and would use it under their steam-boilers, they would do a great deal to remove the glut on the market. However, things are improving undoubtedly. The next paragraph in the report informs you that exhibitions have been held in our district, which is a very large one. In the case of a provincial gas company, it is sufficient to hire the Town Hall, and hold a single exhibition of gas apparatus; and this serves for the whole town and for the company. But it will give you an idea of the extent of our district, when I tell you that we have had as many as 24 of these exhibitions in various parts. We have hired public halls in different places; obtained a talented lecturer on cookery from Kensington; and have given free lectures on four consecutive days in the week—in the afternoon and evening. We have had gas-stoves exhibited; and the result has been that, whereas in the June half of last year we increased the number of our stoves in use by rather more than 400, this half year we increased the number by more than 1400. There is therefore apparently a clear gain of 1000 stoves as the result of these exhibitions. I am bound to say also, in connection with these exhibitions, that the officers of the Company have taken up the matter in the right spirit, and have shown the utmost zeal and ability in conducting them, and have thus contributed very largely to their success. The next paragraph deals with the coal dues; and in this connection, I think it is only right to tell you what action I took—in the first instance, on my own responsibility. I was on the Committee of manufacturers for opposing the renewal of the coal dues; and these gentlemen repeatedly said to me: "Whenever we urge that the coal duties should be abolished, we are met with the remark, 'If you abolish the duties, the £150,000 a year paid by the gas companies towards those duties will simply go into the pockets of the gas shareholders.'" They also said to me "If you can show that this will not be the case, and that the benefit will go to the consumers, a very strong reason will be given for abolishing the coal dues." Well, there were considerable efforts made to induce the Government to take up the matter, and support the Bill that was promoted by the City Corporation and the Metropolitan Board of Works for the renewal of the dues next year. A deputation from them went to the First Lord of the Treasury, who promised to consider what they had stated, and to give them an answer in a few days. Seeing that it was a critical moment, I addressed a letter to the Right Hon. W. H. Smith, giving details showing the quantity of coal this Company used, what amount of coke we sold, and what would be the effect on the coke trade, and, moreover, that there would be a certain balance in hand when the coal dues were abolished. I then went on to say what we would do with this balance. I stated that there would be a saving of £15,000 a year, after allowing for an increase of the rates. Some people make a great deal of this point. They seem to think that if the money is not raised in one way, it must be raised in another; but I am not so sure about that. However, we pay £27,000 a year for the coal dues, which means a rate of 5s. in the pound; and no one says, or can prove, that the abolition of these dues will necessitate an increase in the rating of more than 2½d. in the pound. I said in my letter to Mr. Smith: "The saving of £15,000, coupled with the profit on the increase of business that will result from the reduction, justifies the announcement I made at the general meeting of the Company on the 22nd of February last, 'If the coal dues were not renewed, we should at once reduce the price of gas by 1d. per 1000 cubic feet.' Consequently, the consumers of gas and coke will obtain the full benefit of the non-renewal of the tax. But the reduction of 1d. in the price of gas will entitle the shareholders, under the

sliding scale, to ½ per cent. more dividend, or £5000 a year." Then I go on: "In my opinion, it will not be fair to the consumers to take this extra dividend, if earned, because the question of the abolition of the coal dues was not an element of consideration before Parliament when the initial price was fixed in 1876." This is my individual opinion. I know that, at the time the initial price was fixed in 1876, no one thought anything about the coal dues, which were then fixed up to 1889, or for thirteen years; and the matter was not considered at all. Therefore, if the coal dues are to be abolished, I feel it would be an act of justice to the public to let them have the full benefit; and moreover it would be an act of wisdom on our part to adopt this course, because I am quite sure it is detrimental to gas companies to appear too grasping in the matter of dividend. I do not know that I have anything more to say to you. I was going to finish with two or three remarks about the advantages of gas. Gas is unfashionable. We are constantly hearing people abusing gas; saying this, that, and the other about it. Though, however, they abuse it so strongly and object to it, still they use it; and they use it because there is nothing equal to it—there is nothing like it. I am not going to say that other lights may not for certain purposes be used with advantage. You may have a lamp on the table; and for reading purposes that, no doubt, is very fine indeed. But for general purposes of illumination, or for lighting rooms generally, a lamp on the table does not answer. Nothing will do it so well and effectively as gas; and moreover, the objection raised to the heat produced by gas is all in its favour. If there were no heat there could be no ventilation. That is the principle of Nature. The air which is so essential to us is kept in motion by the heat of the sun, and nothing else. It is the heat of the sun which is the prime mover; and the heat generated by gas in dwelling and other rooms may be used as the most effective means of ventilation—not merely to carry off its own products, but to carry off all the vitiated air of the room too. I have, therefore, the greatest confidence in saying that for general lighting purposes there is nothing like gas; and with the great improvements which have been made in burners of late years, whereby double the amount of light may be obtained for the same quantity of gas consumed, the advantages of gas are still further enhanced, because its price is practically reduced by improvement of the burners to about one-half what it otherwise would be. And then this enormous increase in the consumption which we find on the fall of the thermometer, is a very striking illustration of the use to which gas is put. We can only conclude that it arises partly from people lighting the gas to warm their rooms. In dull and cold weather, the days are shorter; but I believe a very large quantity of the increased consumption that we see is owing to the use of gas for heating. At the low price (2s. 5d.) at which this Company supplies it, gas is used I know very extensively for this object; and it is also employed for manufacturing purposes. To give you one illustration—for such a purpose as enamelling glass or iron, where a certain heat is required to fuse the material on the surface. In the case of stained glass, for instance, the operation used to be done in a furnace heated with coal or solid fuel; and it required 24 hours to work off a single charge. The oven had to be heated, then the material was put in, and left in till it was cool. Now, with a gas-heated furnace, the fire can always be kept up to the exact temperature required. The glass is put in on a small traveller; and instead of taking 24 hours to do the work, it is done in an hour. I was told by one manufacturer only a week ago, that he is making arrangements by which he will be able to burn off a tray of glass in seven minutes, instead of an hour, by simply providing another chamber for cooling it, and letting the fusing be done in this one. This is only an illustration of what is going on in numbers of other cases. Gas is being used for a multiplicity of purposes, of which you and I have no conception. All sorts of manufacturing work is now being accomplished by gas, instead of solid fuel; and when we look at all these sources from which our profits are derived, we need, I feel sure, have no fear in regard to the future. We may believe that the future is likely to be as prosperous as the past; we may expect an increase of business in the future; and this increase will enable us to reduce our price, which would still further consolidate our position, so that we, or our successors, will be able to render as good accounts to our shareholders in the future as we submit to day. I now move—"That the report and accounts now presented be received and adopted, and the report entered on the minutes."

Mr. ROBERT MORTON seconded the motion.

The CHAIRMAN, in answer to Mr. Bradfield, stated that the duty on coal was 1s. 1d. a ton, of which 9d. went to the Metropolitan Board of Works, and 4d. to the City Corporation.

Mr. RIDGE said he did not clearly understand how the dividend of 13 per cent. would be distributed.

The CHAIRMAN: It will be divided just as it was last half year between the "A," "B," and "C" stock.

Mr. G. BRAY said he was sorry he could not quite agree with the terms in the report in regard to the half year being "uneventful" and "satisfactory." There had been rumours during the last twelve months as to the unsatisfactory condition of the works at East Greenwich. The last half-yearly report stated that everything was in a satisfactory condition there. The Chairman also in his speech made the same announcement; and he would give the terms in order that there might be no mistake. First as to what was said by the Directors. Last half-year's report stated that "the Directors are pleased to be able to report that from the starting in August to the present time the working has gone on satisfactorily." Again it said: "The whole of these extensive works have been satisfactorily carried out under the supervision of the Company's Engineer, whose services the Directors fully appreciate and have suitably acknowledged." Then the Chairman, in his speech at the half-yearly meeting, referring to these works, said: "They are working very satisfactorily . . . and we are quite satisfied with the manner in which they have been carried out." Further on in his speech, he said: "When I was on the question of the new works, I might have said that there have been reports that we were in difficulties. Well, you may take it from me that we were not in any difficulties, and have been in no difficulties whatever with regard to these works." These were emphatic statements; but since they were made, a report had been presented by a Bolton Corporation Committee on the question of gas machinery stoking, and a deputation of the Corporation asked to be shown round the works at Greenwich, and permission was given to them. The report they gave of what they saw said—

Mr. G. HOWLETT rose to a point of order. He failed to see anything in the report as to the Greenwich works; and he asked if the honourable proprietor was in order in bringing forward anything that members of a provincial Corporation might have seen at these works.

The CHAIRMAN: You are not absolutely in order in alluding to the report of the Bolton Corporation; but if you have any remarks to make about the works, Mr. Bray, I have no objection to listen to them, and to give the best answer in my power; but the honourable proprietor is certainly right in suggesting that you are not in order.

Mr. BRAY said he was perfectly satisfied that, under the terms of the notice convening the meeting, he was in order. It stated that certain specified business would be transacted, and the meeting was called "for

other purposes." The "other" business was not in the hands of the Directors. The Bolton Corporation stated that they saw—

The CHAIRMAN: I cannot allow you to read that report. You may make a speech if you like; but you must not read that report, which has nothing to do with us.

Mr. BRAY (continuing) said that the report from the Bolton Corporation was to the effect that the works at Greenwich were sinking into the ground. (Ironical laughter.) He submitted that there was nothing to laugh at in connection with the condition in which the gentlemen to whom he was referring stated that they had found the works. The works, they said, were sinking into the ground; and an expensive machine stoker which they had gone to see was not, in consequence of the state of the works, in working order, and that stokers were doing the business by hand firing. If this statement was not true, it could be contradicted; and he would be glad to hear that the statement of the Bolton Corporation was not correct. He held, seeing that so much had been stated with respect to the efficiency of the Greenwich works, that sound and true information regarding them ought to have been submitted to the proprietors. He had an objection to take to the refusal of correct information by the Directors on another point. The proprietors were aware that a good deal had been said recently regarding the Amalgamation Schemes; and although nothing had been said in the present report as to amalgamation, it was freely discussed at the last meeting. He had information, which was not available at that time, which he thought it was necessary that the proprietors should be in possession of with respect to that matter. They might be aware that the last proposal was with regard to the amalgamation with The Gaslight and Coke Company. That proposal was made by the Chairman himself; and he was prepared to state that he was suspicious of those proposals, and he looked into the sum which the Directors had received in connection with the question of amalgamation. He found the amount; and he asked questions as to the sums certain Directors had received in connection with previous amalgamations. He found that there were sums amounting to £26,229 put down in the balance-sheet for December, 1882, and June to December, 1883, under the heading "Commutations under the Schemes;" but the Directors had refused to inform him to whom the £26,229 had been paid.

Mr. HOWLETT rose again to a point of order. The whole question of amalgamation had been settled for years past; and he objected to Mr. BRAY reiterating an old question of amalgamation, and wasting the time of the meeting in doing so. What Mr. BRAY's purpose was he could not say. He took it that at their half-yearly meetings they had to deal with business before them.

The CHAIRMAN: I am obliged to rule, much to my regret, as I should like to hear Mr. BRAY out, that he is entirely out of order in referring to an amalgamation which took place eight years ago.

Mr. BRAY observed that if the matter was not discussed at the meeting, it would not be allowed to remain where it was. He submitted that he was in order; and he now asked whether the Chairman—loud cries of "Chair, chair!"—whether the Chairman had received the sum in question, or any of it; and if so what for. Also if the proprietors voted upon it, and were allowed to know what the sums were for? Did the Chairman refuse to reply now?

Mr. HOWLETT said his remarks would be entirely confined to the half-yearly report. He thought, however—

Mr. BRAY (interrupting, and addressing the Chairman): I ask if you will refuse to give the information.

The CHAIRMAN: I will give my reply at the close of the discussion.

Mr. BRAY: It would be more convenient if you gave it now.

The CHAIRMAN: I shall not do that. I shall give my reply at the close.

Mr. HOWLETT assumed that the Chairman would conduct the meeting in the ordinary way; he was not aware that Mr. BRAY held any patent yet for conducting public meetings. For his own part, he had to compliment the Directors on the report they had brought forward. He was in a very different spirit from the last speaker, who seemed to have attended the meeting to air certain grievances that he might have with particular members of the Company. The proprietors as a body, however, were there as business men; and they had not come to listen to any private grievances. He had been to the Greenwich works, and had seen no part sinking. However, the Bolton Corporation might be very clever, and might have seen a good deal that other people did not see. It was the business of the proprietors to increase the prosperity of the Company rather than to be complaining and carping about what was being done at Greenwich. In his own case he illuminated his house with gas; he burnt it as fuel in every stove in his house; and he cut his chaff with a gas-engine; and last half year he tried to distribute a large quantity of coke among people who had not burnt it before. If every shareholder would take this view of the concern in which he was a partner, they would soon have a state of things even more pleasant than had been submitted to them that day. He was very pleased with the report. The Company had gone on with a series of uninterrupted successes; and he believed that if the business continued to be conducted in the same straightforward and honourable manner as in the past, further successes would come to the Company.

Mr. SUGG observed, with regard to the complaint of Mr. BRAY as to the East Greenwich works sinking, that he happened to be able to give the proprietors a different piece of information. Mr. BRAY stated that the Bolton Corporation had been to the works, and had seen them sinking into the ground. He (the speaker) had, however, been to the works with a company of the most distinguished French engineers and European engineers of the day. They went over all the works; and he could assure the meeting that their inspection was a very careful one. He heard no one say anything about the sinking into the ground. On the contrary, the French engineers said that it was the simplest and finest piece of construction they had ever seen anywhere; and their encomiums upon the works were very great indeed.

A SHAREHOLDER asked whether they got as many feet out of a ton of coal by using tar as they did by coke.

The CHAIRMAN: I will answer the last question first. There is more difficulty in keeping the heats regular by burning tar than there is by burning coke; and if the men do not look to them and give that constant attention to the tar fires which they require, you will not get quite so many feet per ton of coal as you do when burning coke. I do not know that there is any other question I have to answer. I have replied to the inquiry as to the dividend—that the dividend of 13 per cent. spoken of in the report means 13 per cent. dividend on the whole of the capital, which will be divided in accordance with the terms of the Scheme of Amalgamation of 1880; and the dividend will be exactly the same as it was last half year to all classes of shareholders. Now, as to the works at East Greenwich, Mr. BRAY, I think, said that "sound and true" information should have been given. I tell you, gentlemen, that true information has been given. I am not going to tell you that the Directors of this Company are such an incompetent body that they would proclaim aloud to the world everything connected with the management and working of the Company. There may be things not detrimental to the Company—I may say that most decidedly—but things not advantageous

to state in a public meeting, with reporters present; and we reserve our discretion as to what we tell you. But I repeat that sound and true information has been given to you, and I tell you that these works are in a good state; and that if any of the shareholders would like to see them, nothing would please me better than to take them over the works. They are working now as satisfactorily, if not more satisfactorily than any of our stations; and as to this unofficial and unauthorized report from which Mr. BRAY has quoted, that report has in his own paper been shown to be erroneous in many particulars by gentlemen who have written about it. I have also had a letter from the Chairman of the Bolton Gas Committee, expressing the very greatest regret that anything was said about the works. The other question which Mr. BRAY has asked has nothing to do with this meeting; but I feel bound to say a few words. Mr. BRAY was not a shareholder when the amalgamation took place. In fact, he became a shareholder on the 1st of April, 1886, and I tell you, gentlemen, that his object—which I know—in becoming a shareholder was solely, or mainly, for the purpose of attacking me.

Mr. BRAY, amid loud cries of "Order," said he denied the imputation.

Mr. REDFERN: The truth is unpalatable, Mr. Chairman.

Mr. BRAY said he absolutely denied the imputation. The Chairman could know nothing about his motives, in becoming a shareholder; and he asked him to withdraw what he had said.

The CHAIRMAN: I will withdraw, then, all imputations on your motives; and I will say that your acts and deeds performed since you became a shareholder have been conclusive to my mind, and to every reasonable mind, that that was your object. It is in connection with the Crystal Palace Exhibition. Mr. BRAY says an injury was done to him; but I am not going into this. I am perfectly prepared to answer every question shareholders may put when asked in the interests of the Company, and when it will be to the interests of the Company to answer it. As far as regards the personal question which Mr. BRAY has asked, I should like to answer it, because whatever I may have received has been with the sanction of the Board of Trade, the Public Auditor, and the shareholders too; and I am not ashamed of anything that I have received. That, however, is not a question that is before the meeting.

The resolution was then carried unanimously.

The DEPUTY-CHAIRMAN (Mr. J. Mews): I have to propose the resolution as to the dividend; and the motion is as follows:—"That a dividend at the rate of 13 per cent. per annum be now declared, and that such dividend (with the exception of the sum of £500) be apportioned among the three classes of stock as prescribed by the Scheme of Amalgamation, 1880, and that the warrants be transmitted to the registered addresses of the proprietors by post." There is nothing I need say in addition to what I have just read, as I think the affairs of the Company have been very fully considered, and explanations have been given by the Chairman on every possible point.

Mr. T. ROWLAND HILL seconded the motion, which was agreed to.

Mr. MACE then proposed a vote of thanks to the Chairman and Directors, for the able way in which they had conducted the business of the Company. He said he considered they had shown great ability in bringing the concern to the position it now occupied.

Mr. FRANKLIN, in seconding the motion, expressed regret at the attack which had been made on the Chairman. Every attention ought to be given to remarks of proprietors, if they wanted to make a statement as to anything that might be dark in the affairs of the Company; but the position taken by Mr. BRAY was evidently one which ought not to be countenanced by the meeting.

The motion having been carried,

The CHAIRMAN said: It is peculiarly gratifying to me, and I have no doubt it is to my brother Directors, to find this unanimous and hearty vote of thanks passed to us. I can assure you, on behalf of my colleagues as well as on my own behalf, that we really have the interests of the Company at heart; and you may rest assured that in every possible way we will endeavour to protect those interests, and to promote the prosperity of the Company. We have a good record to show in the past; and I do not think you have any reason to suppose that this record will show signs of being broken in the future. I am sure that you have in the Board a body of gentlemen who have a single-minded object in doing their duty to the Company and to the shareholders. And now I must say a few words as to the officers. We are indebted to them for very good work; and not merely good work. They do not simply do their duty, but they do it with earnestness, as if they loved the work. I can assure you that we are constantly finding that the various officers of the Company are endeavouring, by all the means in their power, to promote its prosperity, to economize in the working, and to increase the business; and I therefore think that a vote of thanks should be passed to them. I move—"That the best thanks of this meeting be given to the Engineer and the officers under him, and to the Secretary and officers under him, for their attention to their duties, and for the earnestness with which those duties were performed."

Mr. CHAMPTON seconded the motion, which was carried unanimously.

The CHIEF ENGINEER (Mr. Frank Livesey): Mr. Chairman, ladies, and gentlemen—I thank you very heartily for myself and all those included in the vote of thanks which you have so kindly passed in our favour. We are quite aware that we have not arrived at perfection; so that whatever merits there may be in the working results of the half year, we are still trying to do something better. In reference to our works at East Greenwich, I may say that they are now working at least as economically as any other station of the Company, and in the future we shall still go on improving there. We are building a second section there; and the work is being largely done by our own men.

The SECRETARY having briefly acknowledged the vote on behalf of himself and the staff working under him, the proceedings terminated.

WAKEFIELD GAS COMPANY.—The 83rd half-yearly meeting of this Company was held on Monday last week. Mr. W. Statter, Chairman of the Directors, presided, and moved the adoption of the report and statement of accounts, both of which were of a most satisfactory character. It was stated that the works are in first-rate order; and everything is going on as well as the Directors could expect or wish. The quantity of gas made during the past half year was 106,422,000 cubic feet—an increase on the corresponding half year of 3,119,000 cubic feet. The leakage was only 12½ per cent., as against 15 per cent. in previous half years; and although the Company are only bound to supply gas of 16-candle power, they have furnished it of 17½-candle power. The Company made upwards of 3,000,000 cubic feet more gas; but the extra cost was only about £41, and the cost of distribution is £53 less than a year ago. Their income is £816 more; for, besides the increase in the consumption of gas, they have received £582 more for residual products. The Chairman moved that a dividend of 11 per cent. should be paid on the original shares, and £8 5s. and £7 14s. on the new shares, all free of income-tax; that £1500 should be added to the reserve, so as to increase it to £9500; and that £414 17s. 2d. should be carried to the current half-year's account. This disposed of the profit for the half year, which amounted to £6772 14s. 8d. The report was adopted.

BARNET DISTRICT GAS AND WATER COMPANY.

The Half-Yearly General Meeting of this Company was held last Thursday, at the Guildhall Tavern, Gresham Street, E.C.—Mr. JAMES GLAISHER, F.R.S., in the chair.

The SECRETARY (Mr. Alfred Lass, F.C.A.) having read the notice convening the meeting,

The CHAIRMAN said that he met the shareholders that day under very painful circumstances indeed. As long as he (the Chairman) had been connected with the Company, Mr. Bontems had presided at every half-yearly meeting. He found his health failing him, and he had just resigned when that sad street accident happened. He was knocked down by a milk-cart, which caused concussion of the brain; and under these painful circumstances they were parted. Little did they think, the last time they were there (although some of them thought he looked very ill), that they were soon to part, and under such painful circumstances. Their late Chairman was faithful. He told them at their last half-yearly meeting that in the preceding six months he had never omitted a single meeting of the Board, nor a single Committee meeting; and it was a fact. Then, with such extreme attention, to be removed, was something for which he (the Chairman) found it difficult to find words to express himself. He was certain that their deceased friend's wife and family had the deepest sympathy of the shareholders; and that the meeting would pass a vote of condolence with them. He would propose that a letter of condolence to the widow should be written by the Secretary, expressing their deep sorrow and pain at the circumstances under which their late Chairman was taken from them.

Mr. C. HORSLEY, J.P., seconded the proposal, which was at once acquiesced in by the shareholders.

It was agreed to take as read the Directors' report and the accounts for the past half year, an epitome of which was given in the JOURNAL last week (p. 306).

The CHAIRMAN said the first sentence in the report stated that, "in accordance with the agreement with the Barnet Rural Sanitary Authority, mains have been laid for the supply of water to South Mims village." He had been over this district; and when he saw the ponds from which a good deal of the domestic water had been taken by the villagers, and also the two pumps—requiring great labour (for the water was deep) to raise and then to carry it—he could not help thinking that, independent of anything else, it was a philanthropic piece of work to go there at all. He was also pleased with the manner in which the pipes had been laid. The next paragraph in the report spoke of the sinking of the new well. This was proceeding. It had been a long time about; but it was a heavy piece of work, and was imperatively necessary. They were now down 230 feet. The pumps had been fixed in position; and he hoped, in the present state of the work, that at the next half-yearly meeting the Board would be able to tell the shareholders that it was finished, and then this account would be closed. The business of the Company, the report stated, continued to increase. He would make a few remarks upon both the gas and the water undertakings with respect to this increase. Taking gas first, in the year 1878 they made 30,989,000 cubic feet of gas; and in 1887 they made 50,770,000 cubic feet—being an increase of 19,781,000 cubic feet in the nine years. In 1878 the revenue received was £8339; and last year £11,492—showing an increase of £3153 in nine years. Now, the price charged for gas in 1880 was 6s.; on the 3rd of April in that year they reduced it to 5s. 9d.; then on the 6th of June following they lowered it to 5s. 6d.; on the 5th of October of the same year they reduced it to 5s. 3d.; on the 5th of April, 1882, the price was brought down to 5s.; two years passed, and they reduced it to 4s. 9d.; on the 5th of January, 1885, they lowered it to 4s. 6d.; and on the 5th of April this year to 4s. 3d. Their experience was that they gained by every reduction they made. They had increased this year, with the price at 4s. 3d.; and the Board had determined that day to reduce the price to 4s. throughout the whole district as from Jan. 1 next. The Board hoped that this would give them an impetus. They wanted a fillip of some kind to improve the gas portion of the undertaking, for in the nine years the increase had been little more than 60 per cent.; and in ten years they ought to have doubled, as the price of gas was then 6s. Now that there was to be a greater reduction, he hoped they would have to speak in a few years of a greatly increased business. The capital employed in 1880 was £71,385; and in that year they only carbonized a ton of coal for £19 of capital. This was very bad. This year their capital was £83,338—being an increase of £11,953 in the eight years; but they had carbonized a ton of coal for £15 4s. of capital. In some of the largest works a ton of coal was carbonized for £5 of capital; but he could scarcely persuade himself that he should live to see it come down so low as this in their Company. However, the gas consumption was steadily increasing; and they hoped that it would increase at a more rapid rate in the future. There was one thing to be said. Last Thursday he went with their Engineer (Mr. Martin) over the pipes; and for two miles of pipes he found they had only three customers. They had only, on an average, 33 customers to a mile of piping; while the London Companies had more than 100 customers, and the Suburban Companies 57. Many of their (the Barnet Company's) customers were only small ones—not large ones like they were in London; so that the shareholders would see the difficulty they had to contend with. Their make per mile of main was only 1,238,000 cubic feet; in the Metropolitan districts the make was 8,442,000 cubic feet; and in the Suburban districts the average was 3,388,000 cubic feet. The shareholders would see what a great deal the Company had to do to pull up; but the greater the difficulty, the greater must be their perseverance. Turning to the water portion of the undertaking, in 1878 their rental was £1715; and last year it was £11,564. In the nine years, therefore, they had increased in their rental £6849, or 145 per cent. This was very satisfactory; and they had every reason to believe, from the steadiness of their progress during those years, that it would continue. The quantity of water pumped in June, 1880, was 101,600,000 gallons; in June, 1888, it had risen to 255,173,000 gallons. Thus in eight years it had increased by 153,573,000 gallons, or 151 per cent.—something more than the rental. The capital employed in 1880 was £73,603; in 1888, £119,441. The capital, therefore, in the eight years, had increased by £45,838; but when he went a little further, and asked himself what was the capital for every million gallons of water, he found that in 1880 it was £724; and the average of the London Water Companies was £240. In June last this £724 was reduced to £468 per million gallons. So that in these eight years they had made a very solid step downwards in this respect. Their consumers were their best friends; and ever since he had been on the Board, his constant object had been to consider the interests of their customers. Some of the water consumers were totally misled by the Company's Act of Parliament as to the meaning of "rateable value." There were residing in the Company's district some few consumers who were withholding payment for their water because they considered the charge to be based upon the poor-rate assessment. In the action recently brought against the Company by Mr. Stevens, it was decided in the Court of Queen's Bench that the poor-rate assessment was not the basis upon which this Company's charge for water should be made. He should like to say that if those consumers who considered that they had a grievance, because the Company declined to adopt the poor-rate assess-

ment as the basis of charge, would adopt the decision of the Judges upon this point, they would save themselves both trouble and expense. When the Company's Bill was passed, it was mentioned to be rack-rent; and considering that rack-rent was the basis, the charge was very low in proportion to what it would have been upon the poor-rate assessment. The Bill was considerably criticized in passing through both Houses of Parliament, and it was very evident that the consumers suffered loss and inconvenience by not attending to what the law is upon the subject. They were prospering very rapidly in both branches of their business; and he did hope that, as they were now supplying 250 cubic feet of gas for 1s., many more people would use it in the future than had done in the past. It was the best, and he thought the most healthful illuminant. At all events, they would look forward hopefully. He begged to move—"That the report of the Directors, together with the balance-sheet as signed by the Auditors be received, adopted, and entered upon the minutes."

Mr. HORSLEY seconded the motion.

Mr. F. WAKEFIELD, referring to the demise of Mr. Bontems, said he did not think this gentleman could have had a single enemy in the world, because any one more courteous or pleasing to talk to he had never met; and the shareholders could, he thought, all bear witness that no one could act better or more honestly in the chair than did their late friend. As representing one of the largest consumers, and in his private capacity, he could find no fault with the charges the Company made for gas. The Board had set a very good example to the other Gas Companies who supplied Finchley. In regard to the fight which Mr. Stevens had had with the Company, personally he was very glad he had not succeeded, and that the verdict had gone the other way—especially considering the position of the Company. As the Chairman had shown, they could not be compared with the London Water Companies, as in their own case they extended their mains into districts where they obtained very little revenue. Alluding to the dividend proposed, he said he thought it was about time they had a little more return for their money. They had now had 7 per cent. for a long time. Many gas companies he knew would consider 7 per cent. rather a poor thing; in fact, there were few of the Suburban Companies which were paying so little as the Barnet. Perhaps he might suggest to the Directors that they should now turn their attention to getting a little more dividend, and not do any more "philanthropic" work at present. Referring to the proposal to light the streets at Barnet with the electric light, he said they were also going to inquire into the matter at Finchley; but in his opinion the electric light could not touch gas in point of price, either for ordinary house or public lighting.

Mr. LONDON inquired whether the letting out of stoves was progressing. He referred to the lectures in cookery which had been delivered in the South Metropolitan Gas Company's district, and he thought that if something of the same kind was carried out in the Barnet district, it would conduce to a more general adoption of cooking-stoves.

The CHAIRMAN, replying to Mr. Wakefield, said the Directors were with him as to what he had said with respect to an increase of dividend. As soon as they possibly could, they would raise it. They must, however, bear in mind that a few thousand pounds of undivided balance was all they had for a reserve fund; and they had no emergency fund. They had besides only 33 customers per mile of main. With respect to the adoption of the electric light in Barnet, he had no fear of it, as a great deal more money would have to be paid for it. As to the remarks of Mr. London, he said the Board looked forward to the 4s. price developing the use of gas for heating and cooking purposes. Mr. Magnus Ohren said that a price of 6s. per 1000 feet would pay in cooking; so the 4s. was well within the mark.

The motion was then unanimously carried.

On the motion of the CHAIRMAN, seconded by Mr. WAKEFIELD, dividends were declared at the rates of 7 per cent. per annum on the "A" and "C" stocks; 6 per cent. per annum on the "B" stock; and £4 18s. per cent. per annum on the "D" capital (water), all less income-tax, and payable on the 15th of September.

The CHAIRMAN, in proposing a vote of thanks to the officers of the Company, specially eulogized the services of the Secretary (Mr. Lass), the Engineer (Mr. Martin), the Chief Cashier (Mr. Wright), and the Auditors (Messrs. F. Lennard and A. G. Hounsham).

Mr. HORSLEY seconded the motion, which was unanimously approved.

A vote of thanks to the Chairman and Directors concluded the business of the meeting.

TOTTENHAM AND EDMONTON GAS COMPANY.

The report and statement of accounts for the six months ending June 30 last, which the Directors of the above-named Company will present to the shareholders next Saturday, are of a satisfactory character. There was an increase to the extent of 8 per cent. in the sale of gas, as compared with the corresponding period of last year. This continued increase has enabled the Directors to reduce the price of gas, as from the 1st ult., 2d. per 1000 cubic feet to private consumers, and lower the charge to the Local Authorities for the public lighting by 2s. 6d. per lamp per annum. The sale of residuals shows an improved value, with the exception of tar, which continues very low. The Directors have made a considerable outlay in improving the supply of gas at Winchmore Hill and in the western part of the Company's district, to meet a continually increasing demand. The Engineer (Mr. W. H. H. Broadberry) reports the works to be in excellent condition, and the quality of the gas satisfactory. The profit and loss account, inclusive of £3542 1s. 2d. brought forward, gives an available balance of £9235 7s. 6d., from which the Directors recommend the payment of the following dividends (less income-tax):—On the original capital at the rate of 11 per cent. per annum; and on the new ordinary capital at the rate of 8 per cent. per annum—amounting together to £5545 15s. 9d., and leaving a balance of £3689 11s. 9d. to be carried forward. The quantity of coal and cannel carbonized in the past half year was 12,525 tons; and 123,441,100 cubic feet of gas were sold. The residuals produced were as follows:—Coke, 7760 tons; breeze, 1213 chaldrons; tar, 125,245 gallons; ammoniacal liquor, 3062 butts of 108 gallons each, which was worked up into 103½ tons of sulphate. The total amount of paid-up capital on June 30 last was £150,000; but as the expenditure has been £153,661, this account has been overdrawn to the extent of £3661.

THE GAS SUPPLY OF THE CITY OF LONDON.—Professor A. W. Williamson, F.R.S., the Chief Gas Examiner for the Metropolis, has reported to the Corporation the results of the daily testings of the gas supplied by The Gaslight and Coke Company to the City of London testing-stations during the past quarter. He states that the average illuminating power in standard sperm candles was 16.5 at Jewry Street, 16.7 at Cloth Fair, and 16.8 at Salisbury Square; the parliamentary standard being 16 candles. At two of the stations the minimum lighting power of the gas was also higher than the requirements; but at Jewry Street it fell below the standard on four occasions during the quarter. As regards purity, sulphuretted hydrogen was not present in the gas last quarter. The proportions of sulphur in other forms than this per 100 cubic feet of gas averaged 11.5 grains at Jewry Street, 9.5 grains at Cloth Fair, and 9.6 grains at Salisbury Square. All these results were below the prescribed limit.

CROYDON COMMERCIAL GAS COMPANY.

The report of the Directors of this Company, to be presented to the shareholders at their half-yearly meeting to-morrow, states that the quantity of gas sold in the six months ending June 30 last showed an increase of 10,039,400 cubic feet, or 5·84 per cent., as compared with the corresponding period of 1887. The revenue from the sale of gas is, however, less by £593 17s. 8d., in consequence of the large reduction of 3d. per 1000 cubic feet made in the price. Increased amounts have been obtained for the coke and other residuals, with the exception of tar. A large number of gas cooking and heating stoves were supplied during the half year. The illuminating power and purity of the gas supplied by the Company have been reported as satisfactory by the gas examiner for the Corporation of Croydon. The unappropriated balance amounts to £16,570 6s. 9d., out of which the Directors recommend the payment of the standard dividends at the rate of 10 per cent. per annum on the capital of £51,600, and of 7 per cent. per annum on the capital of £137,500; and an additional dividend (under the sliding scale) at the rate of 3 per cent. per annum on the several classes of shares—all less income-tax—for the half year. The full dividends will absorb £10,229, and enable the Directors to carry to the credit of the next half-year's accounts the sum of £6341 6s. 9d. With regard to the works (which are under the supervision of Mr. J. W. Helps), there were 17,867 tons of coal and 262 tons of cannel carbonized during the half year; the quantity of gas made being 188,195,000 cubic feet. The residuals produced were: Coke, 217,560 cwt.; breeze, 1630 dozen 4-bushel sacks; tar, 179,929 gallons; ammoniacal liquor, 430,014 gallons; sulphate of ammonia, 175 tons.

BROMLEY GAS COMPANY.

The report of the Directors of this Company for the half year ending June 30 last, which, with the accounts, will be presented at the ordinary meeting of shareholders to be held on the 30th inst., states that the increase in the consumption of gas during the six months was somewhat disappointing, in view of the reduction in price (equal to about 7½ per cent.) which took effect from the 1st of January last; the amount of increase being only about 1½ million cubic feet, or 2½ per cent. Nevertheless, the half-yearly revenue account cannot, the Directors think, be deemed unsatisfactory; for, with the aid of the £458 1s. brought from the last account, it shows a balance of £5118 18s. 6d., available for division among the proprietors; of which sum the Directors recommend that £4573 should be applied in payment of dividends at the rate of 11 per cent. on the old capital and 8 per cent. on the new respectively, and that the balance—viz., £545 18s. 6d.—be carried to the next account. Owing to the reduction in the price of gas, which has lowered the half-year's gas-rental by nearly £800, the Company have barely earned the dividend recommended. The Directors, however, have confidence in the elasticity of the revenue, and believe that an increased consumption will, as on former occasions, result from the policy of liberality pursued towards the consumers; and that by the exercise of economy and careful management, they will be enabled to exhibit a still more satisfactory account at the end of the current half year. Since the last meeting the Directors have disposed of 315 shares by public tender, which realized £4921, representing an average price of £15 12s. 5d. per £10 share. These shares will participate, as from the 31st of March last, in the dividend to be declared at the forthcoming meeting. With regard to the works, the new gasholder is expected to be completed within a few weeks, and ready for use in the ensuing winter season. Thus ample storage for the Company's requirements for several years to come will have been provided. The Company's called-up capital amounted on June 30 last to £126,547, of which £117,048 had been expended.

MAIDSTONE GAS COMPANY.

The Annual General Meeting of this Company was held on Thursday, the 9th inst.—Mr. AMBROSE WARDE in the chair.

The report presented by the Directors showed that the profit for the year amounted to £8781, out of which they recommended the declaration of a dividend at the rate of 10½ per cent. per annum, free of income-tax. An interim dividend of 5 per cent. having been paid on the 1st of March last, the balance of 5½ per cent. would, if the recommendation were accepted, be payable on the 1st prox. The business of the Company continues to increase; and the works, plant, and mains have been kept in good condition by the Engineer and Manager (Mr. H. Smythe).

The CHAIRMAN, in moving the adoption of the report, said it was very short; but he wished to add to it, for the information of the proprietors, the fact that during the past year, for every ton of 20 cwt. of coal carbonized, they had sold 10,298 cubic feet of gas, and that its average illuminating power for the year had been 15·69 candles, and the sulphur compounds only 10·86 grains per 100 cubic feet, as testified by the Borough Analyst (Mr. Adams). The retort-house, where a Company must look to make their profit, was filled throughout with West's hand-power charging and drawing machines; and by the use of these and all modern appliances, the Company were again enabled to declare a dividend of 10½ per cent. per annum on the whole of the capital. At the same time they were supplying the consumers (whose interests were identical with their own) at 2s. 6d. per 1000 cubic feet. These results, he could assure the meeting, could not be obtained in the South of England, in an inland town like theirs, unless they employed the best apparatus, and conducted their business upon the most sound and economical principles; and he felt sure that they might safely anticipate a larger profit at the end of next year.

Mr. J. H. HILLS, seconded the motion, and it was carried.

The dividend recommended having been formally declared, the retiring Directors and Auditor were re-elected, and the proceedings closed with a vote of thanks to the Chairman and Directors.

THE WATER SUPPLY OF KIRKBY AND SKEGBY.—Last Thursday, Mr. Arnold Taylor held inquiries relative to applications made to the Local Government Board by the Local Authorities of Basford and Mansfield—by the former for sanction to borrow £6000 for the laying of mains, &c., for the supply of water from Sutton-in-Ashfield to East Kirkby, Kirkby-in-Ashfield, Todd's Row, Nuncargate, Annesley, and Annesley Woodhouse; and by the latter for permission to borrow £2700 for the purpose of supplying with water the contributory parish of Skegby, which includes Stanton Hill and Meden Bank. Objection was offered to the first-named scheme by Captain Salmond, a large colliery-owner in the parish; but his representative was not prepared to admit that the works were not needed. The scheme proposed by the Mansfield Sanitary Authority, which would cost £2700, was next considered; an alternative scheme, which could be carried out for £1028, being submitted by a private individual. The Inspector expressed his preference for the former. On the same occasion, the Inspector inquired into an application from the Sutton-in-Ashfield Local Board for sanction to borrow £1500 for the extension of the Sutton-in-Ashfield Water-Works system to Skegby and Kirkby-in-Ashfield. The various applications are now awaiting the decision of the Local Government Board.

NEWPORT (MON.) GAS COMPANY.

The Half-Yearly Meeting of this Company was held on Monday last week—Mr. E. J. PHILLIPS in the chair.

The SECRETARY (Mr. E. F. Marfleet) having read the notice convening the meeting, the Directors' report, with the accounts for the six months ending June 30 last, was presented. The latter showed the total share and loan capital to be £124,442 9s. 9d. The gross revenue for the past half year was £14,434 17s. 4d.; and the expenditure, £10,346 11s. 10d.—leaving a balance of £4088 5s. 6d. The amount of the dividend is £3800; so that there is nearly £300 more than is required for this purpose, but not more than is necessary to pay interest on debentures. In connection with the expenditure, it may be stated that a sum of £700 extra was paid in rates. The working was, however, a success on the whole.

The CHAIRMAN, in moving the adoption of the report, remarked, in regard to the increase in the item of rates and taxes—£982, as against £248 for the first half of last year—that it arose through a difference between the existing rating by the Assessment Committee and what the Company thought it should be. Had it not been for this, the half-year's earnings would have been sufficient to pay the dividend and interest. With regard to the extensions to Maindee, the Chairman stated that the supply had hitherto been divided as coming from the new and the old works. Henceforth, however, it would be from the new works. There was an application for an extension to Tydu. There was reason to think that Tredegar would light Lord Tredegar's house with gas; and this would be an encouragement. The engineering report as to the works showed that they were in good order. On the whole, much credit was due to the officials—to the Engineer (Mr. T. Canning, Assoc. M. Inst. C.E.), for the careful attention he had bestowed on the works and management generally, and also to the Secretary and other officers.

Mr. LAYBOURNE seconded the motion, and it was carried.

Dividends at the rates of 5, 3½, and 3½ per cent. on the various classes of stock were then declared, and the proceedings closed.

BRADFORD CORPORATION GAS SUPPLY.

At the Meeting of the Bradford Town Council last Tuesday, Alderman F. Priestman presented to the Council an account of the receipts and expenditure in connection with the gas supply of the borough for the six months ending June 30, 1888. He said there was a net profit of £5530 on the half year, as against £9070 in the corresponding period of 1887. It would be remembered that the period covered by the account was the one in which the reduction of 3d. per 1000 cubic feet in the price of gas was made, which reduction amounted in the aggregate to £6500. They had regained half of the loss which it was expected would be sustained by the reduction. The repairs to retorts had been much more extensive than in the corresponding half of 1887; the amount of expenditure being well on to £2000 more than in that period. There was, therefore, every reason to believe that the shortcoming would be made up in the current half year. The residuals had contributed very considerably to this result; and there was every prospect of its continuing to do so. In the statement he presented, almost everything spent on capital account had been placed to the revenue department, with the exception of £1800 for mains and services, £289 for stoves (on which the Corporation were receiving interest), and £150 laid out on works. The total sum expended by the Corporation up to the present time was £569,504; and the balance still unexpended was £20,306. The items of expenditure were so exactly similar to those of the first half of 1887, that he need not comment upon them. The bad debts were less than they had ever been in any other half year. At present they amounted to the extremely low sum of £155. In answer to a question, Alderman Priestman further stated that the price of coal was the same as last year, and that all the contracts made by the Corporation were placed with the proprietors of collieries, and not with coal merchants. The increased consumption of gas in the past six months was as nearly as possible 5 per cent. The amount received for gas was £58,136, as compared with £60,976 in the corresponding period of last year. The difference, it would be seen, was only £2800, in spite of the reduction in price.

EDINBURGH AND LEITH GAS COMMISSION.

A Meeting of the Edinburgh and Leith Gas Commission took place on Monday last week—the Lord Provost (Sir T. Clark) in the chair. After a discussion on the position of the Managers of the two gas-works in the possession of the Commission, the Clerk (Mr. J. M. Jack) read the following report by a Sub-Committee of the Works Committee on the transfer of the undertakings:—"The Clerk reported that he had had a meeting as to the Leith Company's inventory of stores, &c., with Mr. Beveridge (the Parliamentary Agent), who had advised that some items therein formed part of the going concern already bought and paid for by the Commissioners." He further read a telegram from Mr. Beveridge, stating that Mr. Ferguson, C.E., was of the same opinion; and he submitted a draft of a letter which he advised should be sent to Mr. Duncan. The Committee instructed the Clerk to despatch it, and also a similar one to Mr. Blair, if the Edinburgh Company's inventory appeared open to the same objection. The Committee remitted to Councillor Charles Robertson to check the inventories as far as possible; he getting the assistance of Mr. Blaikie and any further help he might find necessary." The report was adopted. The report of the Finance Committee was then considered; and the appointments therein recommended, of Mr. J. S. Gibb as Treasurer and Mr. Cockburn as Collector, were made. Mr. Colston, in order to get the business of the Commission "under weigh" as soon as possible, moved that it be remitted to the Works Committee to consider and report to the next meeting upon the proposed duties of Mr. Dewar, late Statutory Clerk of the Edinburgh and Leith Gas Company; that the Commissioners proceed at their next meeting to elect an Auditor; and that the next meeting of Commissioners be held on the 20th inst. Bailie Archibald urged that the Finance Committee should consider as to the reorganization of the whole staff. In future, he said, there would be one concern; and every official, with the exception of surveyors, &c., would require to have a certain district assigned to him. Mr. Colston said the regulations, &c., could be framed after these appointments had been made. It was likely that the Commission would obtain some information on the subject from the persons they had already appointed. Mr. Smith Clark suggested that Bailie Archibald should make a motion remitting the question to the Finance Committee for consideration and report. He said it appeared to him, having regard to the transactions which they had carried through, that it would be of vital importance that the accounts of the two systems should be kept as separate as was practicable. He thought it was also clear that the Commission must, as far as possible, use the officials as if they were conducting one system. At first this would give rise to some little difficulty as a mere matter of bookkeeping. They might, however, manage to apportion the cost of the officials common to both concerns—say, in proportion to the output of each concern. In whatever way the thing was to be managed, he apprehended that the time, if it had not already come, might arise when they would make a remit to the Finance Committee to consider the whole question, and to report to the Commission. The motion was agreed to.

DUMFRIES CORPORATION GAS SUPPLY.
ANNUAL REPORT.

From the report and statement of accounts issued by the Dumfries Gas Commissioners for the year ended May 15 last, we find that the gas undertaking has been in their charge for ten years; indeed, if we mistake not, Dumfries was the first town to take advantage of the provisions of the Burghs Gas Supply (Scotland) Act, 1876. This being so, a somewhat detailed notice of the undertaking in question, as it now presents itself in the annual report and financial statement, may have some interest for our readers, more especially those in the northern part of the kingdom.

During the year 5134 tons of coal were carbonized; being an increase of 55 tons over the amount consumed in the preceding year. The average cost was 14s. 11½d. per ton—a slightly lower average than that estimated at the beginning of the year by the Engineer (Mr. G. Malam). The quantity of gas manufactured was 51,442,700 cubic feet; the average yield per ton of coal being 10,020 feet. Including what was used at the works, the amount of gas sold was 44,531,100 feet; being an addition of 776,600 feet on the preceding year's sales, and an average of 8673 feet per ton of coal carbonized. The leakage or unaccounted-for gas was 13·43 per cent.—certainly a high rate; but considerably under what it was even less than ten years ago. New and larger street mains were laid during the year in certain portions of the area of supply, which, together with the ordinary renewals, involved an outlay of £424 12s. 9d., of which about one-third was charged against capital and the remainder against revenue. Where necessary renewals of meters were made at a cost of £28 7s. 8d.; and for new meters (not in place of old ones) an outlay of £67 14s. 6d. was incurred. A fresh contract for the sale of all the tar and liquor, at an increased price, was entered into for one year, as from the 15th of May last. The condensers erected last year have proved to be quite satisfactory as regards efficiency. Towards redemption of the new loan of £4000, the first payment of £231 6s. 5d., including interest, has been charged in the past year's accounts. Out of the said loan there were paid during the year various sums amounting in all to £2991 14s.—the largest items being £1822 8s. 5d. for land acquired, including law charges; £640 11s. 5d. for new condensers fitted up complete; and £290 as payments on account for new buildings and new boundary wall. After payment of £432 6s. 2d. on completion of the buildings and boundary wall, there will still be available for future extensions on capital account, a balance of £575 19s. 10d.

When the works passed into the hands of the Town Council in 1878, they had to be purchased by a loan, for which interest at the rate of 4½ per cent. had to be paid. On the 15th of May last, there was still owing on this loan the sum of £18,750. Another loan was contracted in 1885 at the same rate of interest; and on this the sum still owing is £3516 6s. 3d. Including the amount due on the loan of £4000 contracted during the past year, the total balance due on mortgages on May 15 was £26,194 19s. 10d. Up to May 15, 1887, the expenditure of the Gas Commissioners in the shape of loan capital (purchasing, improving, and extending works, &c.) amounted to £29,000; and as already mentioned, the expenditure during the past year was £2991 14s.—thus making a total outlay of £31,991 14s., with a balance on capital account of £1003 6s.

Coming to the revenue account, we find that the total cost for the manufacture of gas was £5625 12s. 9d., of which the chief item was £3832 6s. 11d. for the coal delivered on the works. Wages at works, including Engineer's salary, rank for £859 11s. 8d.; and repairs and maintenance of works and plant involved an outlay of £683 15s. For distribution of gas there was spent £326 11s. 5d. Rates, taxes, and insurance, management, law charges, &c., brought up the total expenditure to £6626 5s. 6d. From sales of gas, at 3s. 9d. per 1000 cubic feet, there was obtained a revenue of £8238 5s. 7d. For coke, tar, ammoniacal liquor, and refuse lime, there was obtained £624 4s. 10d. Rental from gas-cookers and other miscellaneous items brought up the total receipts to £8918 13s. 2d.; so that there was a gross balance on the year's operations of £2292 7s. 8d. carried to profit and loss account, the total amount of which on May 15 was £2305 13s. 5d. At the same date the reserve fund account stood at £398 16s. 6d., of which the sum of £150 was brought from profit and loss account. The sinking fund applied to the redemption of mortgages now stands at £943 3s. 11d. The balance of net profit to be carried forward is £17 2s. 11d.

In making out his estimates for the current year, the Engineer assumes that there will be an outlay of £3791 13s. 4d. for cannel coal and shale (5000 tons, at 15s. 2d. per ton); and in all, under the head of manufacture of gas, an outlay of £5516 13s. 4d. For distribution of gas the estimate is £323; for rates, taxes, and insurance, £146 0s. 6d.; management, £336 5s. These and other items are calculated to amount to £6496 18s. 10d. in the shape of total expenditure. It is estimated that the gas sales will amount to 43 million cubic feet; realizing (at 3s. 9d. per 1000 cubic feet) a sum of £8062 10s. The revenue from residual products is put down at £778 15s.; and the rental from gas-cookers and other miscellaneous items is calculated at £55. The total estimated revenue, therefore, is £8896 5s.; giving a prospective balance of £2399 6s. 2d. carried to profit and loss account, and a balance of net profit, on May 15, 1889, of £126 18s. 11d. This is after making full allowance for interest on mortgages, sinking and reserve funds, and working expenses, and crediting balance profit on the past year's working.

When the accounts were under the consideration of the Gas Commissioners at their last meeting, Provost Scott, in moving their adoption, said that they showed a profit in favour of the gas-works; but it did not warrant the Commissioners in interfering with the price of the gas. The charge was now 3s. 9d. per 1000 cubic feet, which he thought was a very moderate price. The estimates for next year showed a still larger balance in their favour. Mr. Currie, in seconding the motion, said that the improvements recently carried out at the gas-works had been fully justified. The motion was unanimously agreed to.

SKIPTON WATER SUPPLY.—Last Friday, a meeting of the Skipton Local Board was held—Mr. J. B. Dowhurst presiding—when a letter was read from Mr. Hill, C.E., of Manchester, giving particulars of the cost of bringing water from Cawder Gill into the existing reservoir, in iron pipes 15 inches in diameter (including contingencies); estimating it at about £2500. The laying of the pipes, he said, would no doubt give the town some relief for a few years to come; but he could not recommend the scheme except as an extension for tiding over the present deficiency. After a long discussion, a Committee was appointed to consult with various landowners as to other proposed schemes.

THE NORTHERN COAL TRADE.—There has been an improvement in the demand for both steam and gas coal in the North of England, and prices have advanced in some instances. Steam coal is now quoted at 7s. 9d. per ton for best qualities; and most of the collieries raising this class of coal have full employment, with, in some instances, pressing demand. Second-class coals are not in such full demand, and the larger output of small coals makes them weaker in price. Gas coals are generally in better demand; and there have been advances in price in the case of a few contracts which have just been renewed, whilst one or two local contracts are also in the market, and are expected to be closed at rather higher prices than the low rates which have ruled for a year. The demand for manufacturing coal is strong.

ARBROATH CORPORATION GAS SUPPLY.

THE PROPOSED EXTENSION OF THE GAS-WORKS.

At a Meeting of the Arbroath Gas Commission held on Monday last week, they had under consideration the question of the extension of the gas-works. A report on the subject by Mr. R. Mitchell, Engineer of the Edinburgh works of the Edinburgh and Leith Corporations' gas undertaking, was recently published in the JOURNAL (see ante, p. 132). The attention of the Commissioners was first directed to a letter which had been sent to the Clerk (Mr. D. Chapel) by Mr. G. Milne, a resident at Arbroath, drawing attention to the fact that a new illuminant, known as water gas, was being manufactured in several places in England, and enclosing for the information of the Corporation a copy of a report on the subject by the Leeds Forge Company, in whose premises the new system of lighting is being extensively used. According to the report, the gas possessed the virtue of being as powerful an illuminant as the electric light, and was producible at 4½d. per 1000 cubic feet.

Mr. DICKSON, referring to the subject of the extension of the gas-works, said he objected to the scheme on account of the enormous expense, considering the difficulty that would be experienced in satisfactorily supplying the lower parts of the town from the present site of the works. Even though the Commissioners might be satisfied that gas was the illuminant of the future, he for one should not go upon the principle of making improvements on a site which had been condemned by all the experts they had consulted. He thought they should consult gentlemen who were scientifically acquainted with other illuminants. He accordingly moved that the final decision of the Corporation should be delayed for six months.

Mr. SANDEMAN seconded the motion.

Provost ANDERSON said the Committee of Management had been quite unanimous regarding the necessity of the extensions; and he thought the Commissioners at their last meeting were unanimous that they should at once be proceeded with. (No, no.) He at any rate was so satisfied that they were doing the right thing, and saving money to the town, that there would be no increase of taxation, and that the price would not be advanced, that he moved as an amendment to Mr. Dickson's motion that the works should be proceeded with, and that it should be remitted to the Committee of Management to take in contracts in the terms of Mr. Mitchell's report, as qualified by the subsequent minute of the Committee of Management.

Mr. CARGILL seconded the amendment. It must be acknowledged, he said, that greater pressure was required throughout the town, and that this could not be obtained without increased storage accommodation. It had also to be borne in mind that gas might yet be improved as an illuminant; and that if any great step forward in its use were made, the community would be able to secure the benefit probably without great expense.

Provost ANDERSON remarked that the feasibility of changing the site of the works had been before the Committee of Management; but they had found that, from a financial standpoint, a removal of the works would be altogether impossible. To remove them would cost at least £20,000; and the only saving that would be effected would be some £300 per annum on cartage. The new works, therefore, would never recoup themselves; and, besides, they considered it too late in the day to talk of removing the works, after they had planted all their valuable machinery on the present site.

Mr. DICKSON said, with reference to the "valuable machinery on the present site" to which the Provost had alluded, they were just proposing to put down £8000 worth of new plant there. He pointed out, with respect to the other remarks of the Provost regarding the proposed alteration of the site of the works, that the £300 which they would save annually on cartage if the works were transferred represented £9000 of capital, which sum, with the £8000 they proposed spending under the scheme now being discussed, represented an amount almost equivalent to the estimated cost of removing the works.

The amendment was adopted by 8 to 6 votes.

Mr. MICHIE gave notice that at the next meeting he would move that they rescind the resolution, on the ground that several members of the Corporation were absent, and that it was arrived at by a narrow majority.

DENTON AND HAUGHTON LOCAL BOARD GAS SUPPLY.

The Manager of the Gas Department of the Denton and Haughton Local Board (Mr. James M. Veevers) has favoured us with a copy of the statement of accounts of the department for the year ending March 25 last, as passed by Messrs. Nairne, Son, and Pollitt, of Manchester. It is summarized in the following table; the figures for the previous financial year being given for comparison:—

	1887.	1888.
Cost of coal and cannel	£2476 8 4	£2289 0 0
Quantity used, in tons	4508	4475
Average price per ton	£0 11 0½	£0 10 2½
Total make of gas, in cubic feet	48,257,480	48,788,700
Total sale of gas, in cubic feet	42,527,344	42,810,023
Loss, in cubic feet	5,730,136	5,978,678
Loss per cent.	11·87	12·25
Gas made per ton, in cubic feet	10,700	10,927
Gas sold per ton, in cubic feet	9,493	9,566
Average illuminating power, candles	19·30	19·28
Income from gas	£6988 7 8	£6908 8 4
" meter hire	83 1 7	83 18 6
" tar and liquor	368 8 0	479 9 4
" coke	499 1 6	476 2 10
" sundries	140 17 2	23 19 1
Average cost of gas made per 1000 cubic feet	0 1 6½	0 1 5
Do. sold per 1000 cubic feet	0 1 9	0 1 7½
Average price of gas sold per 1000 cubic feet	0 3 3¼	0 3 2¼
Profit on gas sold per 1000 cubic feet	0 1 6½	0 1 7½
Annuities per 1000 feet of gas sold	0 0 8½	0 0 8½
Interest on loans, do.	0 0 9 5-7ths	0 0 8 1-5th

REDUCTIONS IN PRICE.—The Directors of the *Bilston Gas Company* have decided to reduce the price of gas by 3d. per 1000 cubic feet at the close of the present quarter.—The *Brighton and Hove General Gas Company* purpose reducing the price of gas by 2d. per 1000 cubic feet as from the 1st of January next.—The *British Gaslight Company* have given notice to their consumers at Hull that the price of gas will be reduced from 2s. to 1s. 11d. per 1000 cubic feet as from the 1st ult.—The Directors of the *Crystal Palace District Gas Company* have given notice that the price of gas will be reduced to 2s. 8d. per 1000 cubic feet from and after the date of the present Michaelmas quarter's accounts.—The Directors of the *Gloucester Gas Company* have decided to make a further reduction in the price of gas as from the end of last half year. The reduction will be 2d. per 1000 cubic feet. This will make the price 2s. 7d. per 1000, equal to 2s. 5½d. after the usual 5 per cent. discount is allowed. The price will even be lower than this to the Corporation for street lighting, as the 2s. 7d. is, under the contract, subject to a deduction of 10 per cent. and then to 5 per cent. off that. Large consumers are on the same terms as the Corporation.

THE PRICE OF GAS FOR PUBLIC LIGHTING AT SWANSEA.

At the Meeting of the Swansea Town Council last Wednesday, the Streets Committee reported that a letter from the Gas Company had been received stating that the Directors were prepared to continue the supply of gas to the public lamps, on the same conditions as the previous contract, at 2s. 10d. per 1000 cubic feet, such price to take effect on and from the 1st of October next. The Town Clerk was directed to inquire whether the "2s. 10d." was not a clerical error; the present cost of lighting being based on the price of 2s. 6d. per 1000 cubic feet. Mr. Richards, in moving the adoption of the minutes, said "the same conditions" seemed to mean an increase of 4d. per 1000 cubic feet. The Company wanted 2s. 10d. instead of 2s. 6d. This was, he supposed, whipping the Corporation because they had recently opposed the Company; for he was unable to see any other reason for such action. The matter had been referred to the Gas Committee; and he hoped something would be done in a short time to teach the Company that the Corporation would be able to do without them. The amount spent on public lighting was £3770. Mr. Martin said the Manager of the Company (Mr. Thornton Andrews, M. Inst. C.E.) had assured him that the increase was due to no ill-feeling; for though the price of gas to the Corporation had been raised to 2s. 10d., private consumers were charged 3s. Mr. Burnie said it was time the Corporation should look round determinedly with the object of seeing if a new method of lighting—electricity, for instance—could not now be introduced. There were electric lighting companies who would guarantee the street lighting for a less sum than that now paid. There was ample margin in £3770 a year to make it worth their while to consider the question of electricity. At a later stage in the proceedings, Mr. Martin stated that an offer had been made to the Council by a Company to light the town free, if the population was shown to be upwards of 80,000; the only condition being the use of a certain lamp.

THE MALVERN LINK LOCAL BOARD AND THE GAS COMPANY.

OIL TO BE ADOPTED FOR THE PUBLIC LIGHTING.

The question which has long been under discussion between the Malvern Link Gas Company and the Local Board, and which was thought to have been amicably settled a fortnight ago (see *ante*, p. 251), has been revived. It was further considered at a meeting of the Local Board on Monday last week. After the whole of the correspondence between the Board and the Company had been read, the Chairman (Mr. W. W. A. Tree) said he had taken into consideration the dates, the various letters written, and the meetings held by the Board, and the effect which they had upon his mind was that the Board had met the Company half way, and had tried to bring about an amicable settlement of this question. The Company made three alternative proposals—to supply the gas at 4s. 6d. per 1000 cubic feet, refer the matter to arbitration, or sell their works to the Board. The letter containing these proposals was considered at as early a date as possible; and the Board suggested certain conditions, which he thought might have been fairly accepted. For a month they did not receive any answer from the Company; and the Clerk to the Board was instructed to write them asking for a reply. To this they received a letter ignoring the conditions the Board had previously proposed. No attempt to discuss them in any way was made; but the Directors could not see the way to alter their conditions. Then the Secretary of the Company wrote on Aug. 1, stating that the Board had misconstrued his letter of April 7; the intention being that 4s. 6d. per 1000 feet should include the cost of lighting and extinguishing. Upon this the Board agreed to accept the Company's offer. A few days afterwards the shareholders of the Company held a meeting; and then the Secretary wrote to him to say that his letter of Aug. 1 was only a private suggestion, and that it had been rejected by the Directors and shareholders. If the Secretary erred in the construction of his own letter, it followed that the Directors wished to charge the Board £32 per season more than their official thought they intended to charge, and it might be reasonably inferred £32 more than he, the Secretary, considered they ought to charge. The Chairman moved the following resolution—"That the Clerk write to the Company, saying that as their letter of Aug. 1 is simply a repetition of proposals made on Aug. 7, which the Board have already rejected, they cannot entertain further negotiations with the Company." Mr. Webb seconded the motion, which was carried unanimously. A tender, in reply to the Board's advertisement for lighting the district with oil, had been received; and after a short discussion it was accepted—the Board stating that a saving of something like £109 per annum would be effected by the use of oil.

THE ELECTRIC LIGHTING EXPERIMENT AT LEAMINGTON.

At the Meeting of the Leamington Town Council on Monday last week, the Mayor (Mr. J. Fell) in the chair—the following letter, dated the 31st ult., addressed to the Town Clerk by Mr. Arthur Chamberlain, on behalf of the Midland Electric Light and Power Company, Limited, on the subject of the electric lighting of the town, was read:—"We beg to acknowledge receipt of your favour of the 10th inst. (July), informing us that our letter of June 21 was considered by the Council, and that they have given permission for the erection of four arc lights, by way of an experiment, provided no charge be made on the Corporation, on some spot to be agreed upon, at a height not exceeding 50 feet, but that the Council object to the lights being placed on the Town Hall tower, as they considered the access undesirable, and the height (100 feet) far too great, and believe that a position facing the Parade would be more suitable. [See *ante*, p. 133.] The essence of our offer was that the arcs should be placed on the tower, and therefore in a position not absolutely facing the Parade, should be at least 100 feet high, and, though lent and fixed by us free of charge, should be connected to the present mains, and the current, therefore, paid for by the Corporation. We may take it, then, that the Council have given us permission to do as nearly as possible the exact opposite of what we offered to do. We do not call in question the wisdom of the Council in wishing to try the effect of four arc lamps of 2000-candle power each, placed not more than 50 feet high, and facing the Parade, which at its narrowest point is only 50 feet wide. We only say that we do not wish to try this particular effect a second time at our own expense. We have already, at our own expense, and on our own property, tried the effect of arcs between 30 feet and 50 feet high for street lighting. There is no mistake about the light. Used as we have shown in Wise Street, it would take the place of the ten street lamps. If the Council have not given attention to this particular illustration of the power of electricity as an illuminant, they can see it any night from nine till eleven. But this is an illustration of street lighting by arcs. What we last offered to do was to give the town an opportunity of seeing street lighting by incandescent lamps in combination with arc lighting of open spaces. The two are quite different problems. We think it extraordinary that so substantial and extensive a building as the Town Hall tower should only be available for the purpose of housing a clock; and we cannot understand how the man who attends to the arcs can do more damage to it than he who attends to the clock. But we accept the decision of the Council, and now withdraw our offer;

and we take the opportunity to withdraw also, at all events for the present, our former offer made some three months ago, to bear half the cost of removing the arms that now suspend the 16-candle power lamps from the posts, and to exchange them for upright lanterns and 32-candle power lamps. Our reasons are these: We find that our motives are not appreciated. We are supposed to be madly desirous for a continuance, at any cost, of our present contract for lighting the Parade; whereas, as a matter of business, we do not care about lighting the Parade at all. As far as the Parade is concerned, our chief desire was to assist the more public-spirited members of the Council in bringing Leamington abreast of the times. The system of lighting recommended by us, we admit—as discussed in full conclave, and adopted unanimously—does not appear, when in practice, to please the Council. This is a matter of taste, and not of electrical engineering. Still, we were willing to assist the Council in any change they desired; but every offer we made is used by our opponents as the excuse for some attack on our reputation, and some fresh outpourings of local spite and local prejudice. When we have been personally present, we have had no reason to complain of the result of the discussion; but behind our backs the matter is different. There, statements are made to our disadvantage that are unsupported by any evidence that would be received in a Court of Justice, and that are untrue in fact; and no effort is made to distinguish between legitimate criticism of matters of taste and opinion, such as the method of distributing the light and the appliances by which it is distributed, and for which matters the Council are now alone responsible, and the other matter for which only we are responsible—the candle power of the lamps. We ask—and surely it is not an unreasonable request—as a condition precedent of any fresh offer on our part, that the candle power of our lamps should be regularly tested and published at the same time and in the same way as the candle power of the gas-lamps is tested and published."

The Mayor said he thought it was a pity Mr. Chamberlain had not a wise man at his elbow when he sat down to write that letter.

Mr. CROWTHER DAVIES proposed that the letter be referred to the Watch Committee. He said it was such that, as a matter of taste, it was to be regretted that it had been written.

The motion was carried.

Mr. CROWTHER DAVIES had a motion on the *agenda* paper that notice be given to the Electric Light and Power Company to terminate the present contract in twelve months' time; but when this was reached, he asked permission to withdraw it. In doing so, he explained that it was his desire that no means should be left untried by way of arriving at a satisfactory settlement with Mr. Chamberlain. The desire of those with whom he was acting—and it was a feeling he shared—was that the Electric Lighting Company should not feel that any hasty steps had been taken by the Council to put an end to the contract, but, on the contrary, that every means had been used to bring about a satisfactory settlement. It was undoubtedly a most unfortunate letter they had heard read—unfortunate for the writer rather than the recipients. [A VOICE: "It's a very rude one."] He had formed a most unjust and unworthy conception of the Council as a whole, as well as of some of its individual members. The resolution he asked to withdraw was one he could carry; but as it was to be withdrawn, he hoped Mr. Chamberlain would come to the conclusion that it would be well to treat the Council as reasonable, just, and honourable men. There was no desire to "throw cold water" upon his Company; but to secure an arrangement which would be just to the rate-payers and fair to the Company.

Mr. BRIGHT said he thought Mr. Davies had acted most generously in withdrawing the motion. As one who advocated the introduction of the electric light, he certainly was not satisfied with it, but thought the defect was due, not to the light itself, but to the lanterns used. The letter sent by Mr. Chamberlain was extremely unwise.

Mr. DAVIES said he did not retract anything he had said about the light; and if it was not made satisfactory, he would revive the subject at some future time.

Leave to withdraw the motion was then given, and the subject referred to the General Purposes Committee.

METROPOLIS WATER SUPPLY.

According to the returns furnished to the Registrar-General by the London Water Companies, the average quantity of water supplied daily to the Metropolis in the past month was 169,387,002 gallons, as against 188,951,202 gallons in the corresponding month of 1887. The number of houses served last month was 740,236, or at the rate of 229 gallons per house, and 29.3 gallons per head of the population. In July, 1887, the number of houses was 727,543; and the quantity of water allowed for each person 33.3 gallons. Of the entire bulk of water supplied last month, 83,853,966 gallons were drawn from the Thames, and 85,533,036 gallons from the Lea and other sources.

Dr. E. Frankland, in the course of his report to the Registrar-General on the quality of the Metropolitan water supply last month, makes the following remarks:—"The Thames water sent out by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies contained in every case a markedly increased proportion of organic matter as compared with the previous month's samples. This increase is due to the heavy rainfall and swollen state of the river, although the samples were collected prior to the severest floods which occurred at the latter end of the month. All the samples were clear and bright. The water principally derived from the River Lea, and supplied by the New River and East London Companies, exhibited no material alteration as regards organic matter; the proportion present in the New River Company's supply being but little in excess of that in the deep-well waters, whilst that in the East London Company's water was less than in any of the Thames supplies. Both samples were clear and bright. The deep-well water of the Kent and Colne Valley Companies and of the Tottenham Local Board of Health contained, as usual, only a very small proportion of organic matter; and the Colne Valley Company by softening their supply with lime thereby rendered it also of excellent quality for washing and all other domestic purposes."

POOLE GAS AND COKE COMPANY.—At the twenty-fifth half-yearly general meeting of this Company, held on Monday last week, the Directors, in their report, alluded to the death of the Secretary (Mr. John Budden), who had conducted the works, both practically and financially, to their satisfaction for so many years, and to the appointment of Mr. W. Davis as his successor, as well as Engineer of the works. The accounts presented showed a profit of £576. This allowed of the payment of dividends of 5 and 4 per cent. on the two classes of stock; which was agreed to. The Chairman (Mr. W. Pearce), in acknowledging a vote of thanks passed to himself and the Directors, said the Company had been most fortunate in securing the services of Mr. Davis, who had given the greatest satisfaction to all since he had been Manager. He added that during the seven years he had been Chairman, the Company had reduced the price of gas from 5s. 11d. to 4s. per 1000 to private consumers. They hoped with increased consumption and good management to return to the maximum dividend.

THE WAKEFIELD WATER-WORKS ARBITRATIONS.

The arbitrations between the Wakefield Corporation and the Wakefield Union Rural Sanitary Authority and the Local Board of Sandal Magna occupied the attention of the Arbitrator (Mr. E. Cousins, C.E.) at the Surveyors' Institution for three days last week.

Mr. Balfour Browne, Q.C., and Mr. J. Beverley appeared for the Corporation; Mr. Cripps and Mr. C. M. Atkinson for the Wakefield Union; and Mr. Mattinson, M.P., for the Local Board of Sandal Magna. The case, shortly stated, so far as regards the Wakefield Union, is that they gave notice to the Corporation of their intention to purchase the pipes and apparatus within their district, under the provisions of section 61 of the Wakefield Water-Works Act of 1880. The arbitration was for the purpose of assessing the price which they are to pay, and the terms and conditions of the transfer. The offer made by the Wakefield Union was upwards of £1100; but the sum required by the Corporation for the same thing was £52,000—the difference between them turning on the construction of the Act. The contention of the Wakefield Union was that they ought to pay only the value of the pipes and apparatus *in situ*; whereas for the Corporation it was argued that they must pay not only for the pipes and laying them, but also for them as a portion of the undertaking. In other words, the Union would take away a certain amount of revenue from the Corporation; and they must have the capital to compensate them. The case for the Corporation having been concluded, Mr. G. W. Stevenson, C.E., gave evidence for the Wakefield Union. He said that he had had large experience in advising corporations and water companies as to transfers of the latter undertakings. He had valued at £1127 the pipes, fittings, and other apparatus connected with the distribution of water belonging to the Corporation laid in the district of the Wakefield Union. He would not allow anything for compulsory purchase or prospective value, because the Wakefield Union simply exercised their option to purchase. Mr. Anthony Barr, of Liverpool, gave corroborative evidence. Mr. Cripps then summed up for the Wakefield Union, and contended that as the value of the property to his clients was only £1200, it was absurd to have to pay £52,000 for it. These figures were based on the assumption that the Wakefield Union would cease to take the water from the Corporation; but they were willing to enter into an agreement to be customers of the Corporation. Mr. Balfour Browne replied upon the whole case, arguing that the Corporation were entitled to the prospective revenue of the undertaking they were selling; and this amounted to £52,000, and not the £1127 for the pipes, as if the Corporation had nothing but old iron to sell.

The case between the Wakefield Corporation and the Sandal Magna Local Board was next gone into. Mr. Balfour Browne, Q.C., and Mr. Beverley appeared for the Corporation; and Mr. Mattinson, M.P., for the Board. The Corporation by their witnesses put the value, on the same basis as in the last case, at £39,000. Sir F. Bramwell, Mr. Rofe, C.E., and Mr. Coxon, borough accountant, were called for the Corporation. On behalf of the Local Board the offer made was £1010; and their case was supported by Mr. H. Mason, Solicitor to the Board; Mr. B. Shaw, of Doncaster, and Mr. A. Davey, of Sheffield. Mr. Mattinson, M.P., and Mr. Balfour Browne, Q.C., having been heard for their respective clients, the arbitrations concluded, and the Arbitrator will make his award in due course.

THE WALSALL CORPORATION AND THE SOUTH STAFFORDSHIRE WATER BILL.

At the Meeting of the Walsall Town Council on Monday last week, a report was presented by the Sub-Committee appointed to take charge of the opposition to the South Staffordshire Water Company's Bill, which, it may be remembered, after passing the Committee of the House of Lords, was withdrawn in the Commons. It set forth that the measure proposed to repeal certain provisions in the Company's existing Acts which had from time to time been inserted therein for the benefit and protection of the Corporation—such as, for instance, the clauses as to the breaking up and restoring of streets, the protection of gas-mains, and the enforcement of a constant supply of water under pressure sufficient to reach the top storey of every house in the borough; and also to substitute for the charges authorized by the existing Acts a scale of charges based upon "annual value," the mode of arriving at annual value being of a novel character, and at variance with a decision of the House of Lords, in which it was decided that "annual value" did not mean "annual rent," but the annual value to the owner after making necessary deductions for rates, taxes, repairs, &c. The report stated that if effect had been given to the Company's proposal, there would have been a hard-and-fast line fixed for the deductions, although the local rates actually paid by some of the places within the Company's limits vary from 2s. 1d. to 7s. 2d. in the pound; and this would have been manifestly unfair to consumers in the heavily-rated towns. The proposed scale also provided that the Company should not be required to supply any house at a less charge than 2s. 2d. per quarter, whereas under the Company's existing scale they were limited, as respected a large number of houses, to a much lower rate. Before embarking upon what was known to be a costly opposition, endeavours were made to come to an arrangement with the Company; but these endeavours failed. The Committee felt that, as they were forced into a contest in defence of the water consumers of the borough, it was an opportune time to seek certain amendments in the Company's Acts, so as to secure a limit to the Company's charge for water for trade purposes, a reduced scale for water used for sanitary and other public purposes, and a modification of the scale in respect of water supplied to dwelling-houses partly used as retail shops; to confer upon consumers the right to supply their own meters; and, in case Parliament decided to increase the scale of charges, to compel the Company to sell the portion of the undertaking lying within the borough, at a price to be settled by arbitration. The Sub-Committee considered that the effect of the Company's original proposal would have been to cast upon the water consumers in the borough an increased annual payment (over and above what it was contended, they were authorized to require if rateable value were taken as the basis of their charges) estimated at about £1000, which, if capitalized at $\frac{3}{4}$ per cent., would represent no less a sum than £30,000. It would thus be seen that the question of increased price was a very serious one, apart from the other objects of the opposition. As the result of the opposition before the House of Lords Committee, modifications were made in the Bill which reduced the estimated loss to the consumers in the borough to about £450 per annum, according to the Company's own figures; and in consequence of the strenuous opposition raised in the House of Commons, and the facts brought out there, the Committee refused to allow any increase in the Company's scale of charges. As this was the main object of the measure, the Company withdrew the Bill. The report was adopted.

BURSTING OF A RESERVOIR AT VALPARAISO.—According to a Reuter's telegram from Valparaiso, dated the 11th inst., nearly 100 houses have been laid in ruins, and several hundred persons drowned, in consequence of the bursting of a large reservoir, owing to heavy rains.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

The Edinburgh and Leith Gas Commissioners have, I would remark, exercised a very wise discretion indeed in the appointment of Mr. Gibb, of the Edinburgh and Leith Company's office, to the post of Treasurer to the Commissioners, and Mr. Cockburn, of the Edinburgh Company, to the post of Collector. Where capacity is admitted, seniority should always have a prior claim; and it is gratifying to everyone to find the Commissioners recognizing this principle, and giving these important positions to the gentlemen to whom I think everyone will admit they naturally belong. Both of the gentlemen are exceedingly well fitted for the posts to which they have been appointed; and I can safely predict that, so far as their departments are concerned, the Commissioners will have little trouble in carrying on their business.

Both the Edinburgh and the Leith gas stocks may be regarded as having reached high-water mark, and began to recede. The heavy distribution of the Companies' assets, which has yet to take place, may keep the stocks at a high figure for some time; but after that they may be expected to go down to the level at which the investing public estimate the credit of the city of Edinburgh. At present about £290 is paid for the privilege of drawing £10 a year, which is clearly not a sufficient return for the outlay; but the person who is able to acquire a share will, at the distribution, receive from the Companies about £50. Nearly the whole of this sum may be deducted from the present price to find the probable future return, which will, in all likelihood, be a little under 4 per cent. During the past ten days the 10 per cent. stocks receded from £299 to £292, but rose again to £296. The 9½ per cent. stock fell from £280 to £275, at which it has remained for more than a week.

The Arbroath Gas Commissioners, at their meeting on Monday, overcame, but only by a very narrow majority, an opposition which does not rise in estimation the more it is studied, and resolved to go on with the extension and alteration of their works, as recommended by Mr. R. Mitchell, of Edinburgh. The opposition seem to belong to the class—unhappily too common in public life—who build too much upon the notion that "sufficient unto the day is the evil thereof." They seem content to go on with the works in their present unsatisfactory state, until events arise which will require something compulsory to be done, instead of taking the wise course of foreseeing and providing for eventualities. The Perth Gas Commissioners experienced something of the same sort last year, when some of their number saw the time fast approaching when it would be necessary to make provision for a largely increased output of gas. They succeeded; and, in the meantime, so have their brother Commissioners at Arbroath, although, it is true, one of the minority has threatened to re-open the question.

At the annual meeting of the Cullen Gas Company on Thursday of last week, a circumstance occurred which I never recollect having seen before—the setting aside of the Directors' recommendation, and the paying of a higher dividend. The Directors proposed a dividend of 5 per cent.; but the shareholders, taking the matter into their own hands, fixed it at 7½ per cent.

If the story told by the *Scottish Leader* on Monday last has any foundation in fact, the treatment of the inhabitants of Dalkeith by the Duke of Buccleuch has not been by any means magnanimous. His Grace's policies adjoin the town; and, according to the paper named above, for about 60 years it was supplied with water from an artesian well within his grounds. The water was pumped up to the town by a water-wheel; but a fire, about two years ago, destroyed the building in which the pumping apparatus was situated, and it has never been restored. The Duke's Chamberlain is accused of having sought to place too binding restrictions on the Commissioners of Police, which could not be accepted; and the result is said to be that thousands of gallons of excellent water were allowed to run to waste at a time when the inhabitants "were on short supply, or had to pay a high price to the Edinburgh authorities for what they required." The Commissioners, it is said, proceeded to bore for water on ground belonging to themselves; and finding an abundant supply, were about to utilize it, when the Chamberlain interposed, and intimated that, as the pipes of the old supply, which passed through his Grace's ground, were to be used, interdict would be taken out against the Commissioners. The outcome of all is said to be that the Commissioners have been put to the expense of laying a new line of mains, and adopting a route along the public road. The inhabitants are now enjoying a most abundant supply of excellent water. The last-mentioned circumstance is of most importance; and if the Duke was a little stiff in his terms, he has apparently gained nothing by being so.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

At a meeting of the Greenock Corporation Gas Committee held yesterday, there was a difference of opinion as to whether they should recommend to the Police Board a reduction of 2½d. or 5d. per 1000 cubic feet off the price of the gas for the year 1888-9. Some of the members were disposed to be more cautious than others; their belief being that 2½d. reduction would be sufficient in the meantime, and that it would at any rate obviate the necessity for any increase being made in the general taxation of the ratepayers by the Police Board. On the other hand, the advocates of the greater reduction argued that year after year the rate of 3s. 9d. per 1000 feet has resulted in a substantial balance to the good, which has been handed to the Board for the purpose of reducing taxation. At this there has of late been a considerable amount of grumbling, as the gas consumers naturally object to paying a portion of the taxes of the non-consumers.

Referring to the prospective reduction in the price of gas both in Greenock and Glasgow, an Ayr newspaper draws attention to the position occupied by that town in relation to the price of gas charged by the local Gas Company. The writer does not consider that his town is worse situated, so far as the supply of coal goes, than either Glasgow or Greenock, yet the price there remains at the same high level; and there is not, he says, any appearance or expectation of any reduction. He further remarks: "Nor is it easy to see that under the present Company we shall ever be much better; and as the community are wisely opposed to the taking over of the gas-works, we suppose we shall have to carry the old man of the sea on our backs until electricity takes the place of gas lighting." If I mistake not, the price of gas in Ayr is 4s. 7d. per 1000 cubic feet, which must certainly be regarded as a somewhat abnormally high rate.

At the last meeting of the Airdrie Town Council, the Convener of the Fire and Lighting Committee (Mr. Rankin) suggested that the street lamps of the burgh should be lighted continuously for the usual lighting period of eight months of the year, including moonlight nights, at the same rate as 7s. for six months' lighting, after deducting sixty days from the eight months for supposed moonlight nights; the total extra cost being estimated at only about £32 15s. If the Council would agree to his suggestion, he anticipated that the Gas Company would light the lamps at 9s. 4d.

each all the year round, in place of 7s. for eight months; the total extra cost being only £32 15s. The Provost remarked that there was no doubt that they sorely needed light on some of the moonlight nights. Mr. Adam was also of opinion that the lamps should be lighted all the year round, as in the neighbouring burgh of Coatbridge. The suggestion was unanimously approved; and it was remitted to the Fire and Lighting Committee to make the necessary arrangements with the Gas Company.

At the meeting of the Mid and East Calder Gas Company yesterday week, Mr. S. Hislop was unanimously appointed Secretary, in room of his late father, who had faithfully discharged the duties of this post ever since the Company's formation. The meeting agreed to record in the minutes an expression of the great loss sustained in the death of a gentleman who had been one of the originators of the Company, and had always taken a lively interest in its affairs.

It is confidently expected that the Greenock Water Trust will, at their next meeting, agree to reduce the domestic water-rate from 10½d. to 9d. per pound of rental; being the amount by which it was increased a year ago, when the financial condition of the town looked much more satisfactory than it is now.

The Gourrock Burgh Commissioners have recently agreed upon carrying out an important scheme for the extension of the water supply of the town, which, it is said, will render it capable of meeting the wants of a population of 25,000. The water is to be brought from Loch Thom, which is part of the Greenock supply works. It is very pure, and can be supplied to houses on a much higher level than any that have yet been built. The Commissioners have agreed to borrow £2500 to pay for the works rendered necessary by going to a fresh source of supply. When the Gourrock Extension Railway is opened for passenger traffic, the new demands will probably exhaust all the present power of supply; and in the course of about ten years, it is thought that, with ordinary prudence in the management of the water-works, the assessment for water purposes may be reduced to 2d. per pound of rental.

Up till yesterday the week's pig iron warrant market was strong, and prices went up at a somewhat bounding rate. On Wednesday and Thursday Scotch iron touched 40s. cash per ton; being an advance of 7d. from the price yesterday week.

Matters continue favourable in the local coal trade. Sellers are now able to get orders more freely at the advancing quotations—in some cases 1d. and 2d. per ton higher for shipping sorts. It is just possible that the wages question will soon show itself both in Lanarkshire and in Ayrshire.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Aug. 18.

Sulphate of Ammonia.—The market has continued dull during the whole of this week; nevertheless the possibilities of an improvement still exist. Buyers are more or less on the alert; and it does not follow that they can by their cautious movements always control the market, even by a concerted action, which is not the case at present, nor likely to be. The principal enquiry, however, is for the end of the present and the beginning of next year; and it is, to say the least, a favourable symptom that the limits are based on to-day's values. But these producers do not think of accepting; preferring to take their chance about the future—the tendency of the nitrate market buoying them in their hopes of better prices by-and-by. In consequence of the present position, the transactions are very small; and the unseasonable weather contributes no little to the present inactivity. To-day's quotations are £11 7s. 6d., Hull and Liverpool; and £11 6s. 3d., Leith.

LONDON, Aug. 18.

Tar Products.—The feature of the week has been an active demand for anthracene, which, owing to its scarcity, is difficult to procure even at advanced prices. Other products are flat. Stocks are low; and distillers are therefore not affected by the operations of dealers. Prices may be taken as follows: Tar, 17s. 6d. to 21s. per ton. Benzol, 90 per cent., 2s. 10d. per gallon; 50 per cent., 2s. 4½d. per gallon. Toluol, 1s. 8d. per gallon. Solvent naphtha, 1s. 2d. per gallon. Crude naphtha, 30 per cent., 1s. per gallon. Light oil, 3½d. per gallon. Creosote, 1½d. per gallon. Pitch, 12s. to 13s. 6d. per ton. Carbolic acid (crude), 3s. 4d. per gallon. Cresylic acid, 9d. per gallon. Tar salts, 15s. per ton. Anthracene, 30 per cent., "A" quality, 1s. 6d. per unit; "B" quality, 1s. 3d.

Ammonia Products.—Sulphate is distinctly dull; and notwithstanding that considerable shipments have been made during the week, new orders are undoubtedly scarce, although prices quoted do not show a fall on last week. Prices: Sulphate of ammonia, £11 5s. to £11 7s. 6d. per ton, less discount. Gas liquor (5° Twaddell), 8s. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 1½d. per lb. Carbonate of ammonia, 3½d. per lb. Muriate of ammonia, brown, £18 per ton; white, £27. Sal ammoniac, £30 per ton.

[From the *Chemical Trade Journal*, Aug. 18.]

Sulphate of Ammonia.—This market still continues dull for prompt delivery; but as there is so little offering, prices have not seriously receded—£11 7s. 6d. being the figure offered by speculators by whom all the present business is being done. Although the price f.o.b. Leith has followed the slight decline, at other ports there has been a fair business doing, and the shipments have been well maintained. Beckton quotes at £11 12s. 6d.; while business has been done in London outside makes at £11 13s. 9d. Hull value is £11 7s. 6d.; and Leith and Liverpool may be fairly stated to be £11 5s. The Sulphate of Ammonia Association is doing good work in disseminating information relating to the price and shipments from the various ports; and we understand the Council is busy preparing a new edition of the "Handbook" on the employment of sulphate for the use of farmers, agriculturists, and market-gardeners.

Tar Products.—Benzoles still retain their old price; and 2s. 4d. for 90/90's has, we understand, been paid during the past few days. As for 50's the price remains unchanged; and 2s. 8d. is mentioned as its extreme value. There is a good demand for solvent naphtha at old rates. Creosote is moving off well; and the better quality, known as Lucigen oil, is being largely shipped to the Spanish mines. Crude carbolic is easier; and we have heard of as little as 7d. per gallon being accepted for crude disinfecting cresylic. Anthracene is very firm. Sales have been made of "B" quality, at 1s. 2d.; while 1s. 6d. is being asked for "A." Pitch may be quoted at 13s. to 13s. 6d. at port of shipment. Distillers seem holding for an advance, as inquiry for parcels generally leads to the reply that they have none to sell.

EXTENSION OF THE BRENTWOOD GAS-WORKS.—Owing to a contract having been entered into by the Brentwood Gas Company to supply a large additional quantity of gas to the new County Asylum, as well as to the increase of their business generally, the Directors are about to considerably enlarge their works, in order to meet the requirements of this extra consumption. The new works have been designed and will be carried out under the direction of Mr. Jabez Church, M. Inst. C.E., of Westminster. It may be mentioned, as an indication of increased business in gas and water supply in Essex, that at the present time Mr. Church is engaged in enlarging, reconstructing, or altering no fewer than six gas and water works in the county.

BRIGHTON AND HOVE GENERAL GAS COMPANY.—The half-yearly meeting of this Company is to be held on the 7th prox., when the Directors will submit their usual report on the working of the undertaking. They state that it is their intention to reduce the price of gas 2d. per 1000 cubic feet on and after Jan. 1, 1889. They announce, with much regret, the death, on July 27 last, of Mr. J. O. N. Rutter, who was for nearly 50 years the highly-esteemed Engineer and General Manager of the Brighton Gas Company, whose honourable and useful career has ended at an advanced age. The following dividends are recommended:—At the rate of 10½ per cent. per annum on the original shares; 7½ per cent. per annum on the "A" shares; and 6 per cent. per annum on the "B" preference shares. The amount available for these dividends is £32,142 18s. 4d.

WEYMOUTH CONSUMERS' GAS COMPANY.—The half-yearly general meeting of this Company was held last Thursday, under the presidency of Mr. R. Damon. The Directors in their report recommended the declaration of dividends at the rates of 10 and 7 per cent. per annum on the two classes of stock. The Chairman, in moving the adoption of the report, said that, notwithstanding the reduction in price, there had only been a very small increase in the quantity of gas supplied in the six months ending in June last, as compared with the corresponding period of 1887. He quoted from a memorandum prepared by the Secretary and Manager (Mr. James Lowe), to the effect that there had been a decrease in the gas-rental to the extent of £322; tar had slightly increased in price, and £37 more had been received for it; and the returns for sulphate had been better, to a similar amount. The report was adopted. Thanks were accorded to the Chairman and Directors, as well as to Mr. Lowe, who was congratulated on his restoration to health.

CORK GAS CONSUMERS' COMPANY.—The annual meeting of this Company was held last Tuesday—Mr. T. Mahoney presiding. The Directors' report, recommending a dividend at the rate of 8 per cent., was alluded to in the *JOURNAL* last week. In proposing the adoption of the report, the Chairman pointed out the increase in the freights, and said there would probably be a still greater increase. This, he remarked, was a good sign of the revival of trade. He next referred to the question of electric lighting, which he said had been frequently discussed by the Directors. While admitting that in London there might be an opening for electric lighting, elsewhere it could not compete with gas on account of the cost of production. Mr. Denny Lane, their Secretary, had told them, at the height of the Edison fever, that he never met an electric invention of Edison's that he had not been familiar with for years. This view had been confirmed by others. The Chairman warned the shareholders not to part with their shares under any apprehension of the introduction of electric light. The report and statement of accounts were adopted.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST. (For Stock Market Intelligence, see ante, p. 328.)

Issue.	Share	When ex-Dividend.	Dividend or Dr. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.					£ s. d.
GAS COMPANIES.								
590,000	10	12 Apr.	10½	Alliance & Dublin 10 p. c.	10	18—19	—½	5 10 6
100,000	10		7½	Do. 7 p. c.	10	13—14	—¼	5 7 1
300,000	100	2 July	5	Australian (Sydney) 5½ p. c. Deb.	100	110—112	..	4 9 3
100,000	20	30 May	10	Bahia, Limited	20	23—25	..	8 0 0
200,000	5	11 May	7½	Bombay, Limited	5	7—7½	..	5 0 0
40,000	5		7½	Do. New	4	5—5½	..	5 9 1
380,000	Stock.	15 Feb.	11	Brentford Consolidated	100	225—230	..	5 2 2
110,000	..		8½	Do. New	100	165—170	..	5 2 11
220,000	..	14 Mar.	10½	Brighton & Hove, Original	20	43—45	..	4 13 4
320,000	20	12 Apr.	11	British	20	45—47	..	4 15 9
50,000	10	14 Mar.	11	Bromley, Ordinary 10 p. c.	10	20—22	..	5 0 0
39,000	10		8	Do. 7 p. c.	10	13½—14½	..	5 10 4
328,750	10	30 May	8	Buenos Ayres (New) Limited	10	13½—14½	..	5 10 4
200,000	100	2 Aug.	6	Do. 6 p. c. Deb.	100	106—109	..	5 10 1
150,000	20	10 Aug.	7	Cagliari, Limited	20	25—27	..	5 3 8
550,000	Stock.	12 Apr.	13½	Commercial, Old Stock	100	266—271	..	4 19 8
130,000	..		10½	Do. New do.	100	207—212	+2	4 19 0
121,234	..	28 June	4½	Do. 4½ p. c. Deb. do.	100	120—125	..	3 12 0
557,320	20	14 June	12	Continental Union, Limited	20	45—46	..	5 4 4
242,680	20		12	Do. New '69 & '72	14	29½—30½	..	5 10 0
200,000	20		9	Do. 7 p. c. Pref.	20	35—37	..	4 17 3
75,000	Stock.	28 Mar.	10	Crystal Palace District	100	205—215	..	4 13 0
234,060	10	27 July	13	European, Limited	10	207—212	+½	4 18 1
120,000	10		13	Do. New	7½	18½—19½	+½	5 0 0
354,060	10		13	Do. do.	5	12½—13½	+½	4 16 3
5,468,350	Stock.	15 Feb.	13½	Gaslight & Coke, A, Ordinary	100	255—260	+1½	5 0 0
100,000	..		4	Do. B, 4 p. c. max.	100	100—105	..	3 16 3
665,000	..		10	Do. C, D, & E, 10 p. c. Pf.	100	263—268	..	3 14 7
30,000	..		5	Do. F, 5 p. c. Pf.	100	127—132	..	3 15 9
60,000	..		7½	Do. G, 7½ p. c. do.	100	185—190	..	3 18 11
1,300,000	..		7	Do. H, 7 p. c. max.	100	170—175	..	4 0 0
468,000	..		10	Do. J, 10 p. c. Pf.	100	261—266	..	3 15 2
1,061,150	..	14 June	4	Do. 4 p. c. Deb. Stk.	100	120—123	+1	3 5 0
294,850	..		4½	Do. 4½ p. c. do.	100	125—130	..	3 9 3
650,000	..		4	Do. 6 p. c. do.	100	175—178	..	3 7 5
3,600,000	Stock.	11 May.	10	Imperial Continental	100	206—209	+1	4 15 8
75,000	5	14 June	6	Malta & Mediterranean, Ltd	5	5—5½	+½	5 9 1
560,000	100	3 Apr.	5	Met. of Melbourne, 5 p. c. Deb.	100	114—116	..	4 6 2
541,920	20	14 June	6	Monte Video, Limited	20	20—21	..	5 14 3
150,000	5	30 May	10	Oriental, Limited	5	9½—9½	..	5 2 7
60,000	5	28 Mar.	7	Ottoman, Limited	5	6—7	..	5 0 0
People's Gas of Chicago—								
420,000	100	2 May	6	1st Mtg. Bds.	100	104—109	..	5 10 1
500,000	100	1 June	6	2nd Do.	100	95—100	..	6 0 0
100,000	10	26 Apr.	10	San Paulo, Limited	10	16—17	..	5 17 8
500,000	Stock.	29 Feb.	15½	South Metropolitan, A Stock	100	315—320	..	4 16 10
1,350,000	..		12	Do. B do.	100	244—249	..	4 16 4
141,500	..		13	Do. C do.	100	250—260	..	5 0 0
550,000	..	28 June	5	Do. 5 p. c. Deb. Stk.	100	135—140	..	3 11 5
60,000	5	29 Feb.	11	Tottenham & Edm'ton, Orig.	5	11—13	..	4 4 0

WATER COMPANIES.

717,467	Stock.	28 June	9	Chelsea, Ordinary	100	253—258	+1	3 9 9
1,720,560	Stock.	12 Apr.	7	East London, Ordinary	100	197—202	+1	3 9 4
700,000	50	14 June	9	Grand Junction.	50	124—128	+½	3 10 4
708,000	Stock.	10 Aug.	10½	Kent	100	269—274	+½	3 16 7
1,043,800	100	28 Aug.	9	Lambeth, 10 p. c. max.	100	258—263	+1	3 8 5
406,200	100		7½	Do. 7½ p. c. max.	100	200—205	..	3 13 2
200,000	Stock.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	117—120	..	3 6 8
500,000	100	27 July	12½	New River, New Shares	100	347—352	..	3 8 10
1,000,000	Stock.		4	Do. 4 p. c. Deb. Stk.	100	123—127	..	3 8 0
902,300	Stock.	14 June	6	S'hwk & V'shall, 10 p. c. max.	100	161—166	..	3 12 3
126,500	100		6	Do. 7½ p. c. do.	100	157—162	..	3 14 1
1,155,066	Stock.	14 June	10	West Middlesex	100	264—269	..	3 14 4

* Ex div

† Next dividend will be at this rate.

THE QUALITY OF THE LONDON GAS SUPPLY

DURING THE FOUR WEEKS ENDED AUG. 14.

[From returns to the Metropolitan Board of Works by Mr. W. J. DIBBIN, F.I.C., F.C.S.]

COMPANIES—DISTRICTS.	ILLUMINATING POWER. (In Standard Sperm Candles.)						SULPHUR. (Grains in 100 Cubic Feet of Gas.)						AMMONIA. (Grains in 100 Cubic Feet of Gas.)					
	Maxi- mum.	Mini- mum.	Means.				Maxi- mum.	Mini- mum.	Means.				Maxi- mum.	Mini- mum.	Means.			
			July 24	July 31	Aug. 7	Aug. 14			July 24	July 31	Aug. 7	Aug. 14			July 24	July 31	Aug. 7	Aug. 14
The Gaslight and Coke Company—																		
Notting Hill	19.1	17.7	18.7	18.5	17.7	*	11.1	8.2	9.3	10.5	9.8	*	0.3	0.0	0.0	0.0	0.0	*
Camden Town	16.8	15.5	16.2	16.3	16.4	16.0	12.2	8.2	11.1	9.9	9.0	10.0	0.4	0.2	0.3	0.3	0.3	0.3
Dalston	17.1	16.5	16.8	16.7	16.6	16.9	13.8	10.5	12.8	12.8	12.2	12.3	0.4	0.0	0.3	0.3	0.2	0.0
Bow	17.3	16.4	17.0	16.7	16.6	16.8	10.7	5.0	6.8	6.1	6.2	7.8	1.1	0.3	0.9	0.8	0.4	0.4
Chelsea (Fulham)	17.0	16.5	16.6	16.6	16.9	16.8	13.7	10.2	13.4	12.4	11.5	11.8	0.4	0.0	0.0	0.1	0.0	0.1
Do. (Nine Elms)	16.9	16.3	16.8	16.6	16.4	16.5	12.6	8.6	12.0	9.3	9.1	9.7	0.4	0.0	0.1	0.2	0.3	0.1
Kingsland Road	17.7	16.6	17.0	17.1	16.8	17.3	13.9	5.6	12.2	10.4	11.1	11.4	0.4	0.0	0.1	0.1	0.2	0.1
Charing Cross (48-inch main)	16.8	15.6	16.6	16.5	16.3	16.0	10.0	5.6	9.5	8.3	10.0	6.1	0.8	0.2	0.8	0.7	0.7	0.4
Do. (district main)	16.7	15.7	16.5	16.3	15.9	16.3	10.7	8.0	10.1	9.5	10.0	8.1	0.9	0.2	0.5	0.7	0.3	0.4
St. John's Wood	17.5	16.1	16.5	16.9	16.5	16.6	11.8	9.4	10.9	10.6	10.0	10.1	0.8	0.4	0.6	0.7	0.6	0.7
Lambeth Road	16.7	16.0	16.2	16.4	16.5	16.4	11.8	7.8	9.8	10.1	9.1	10.0	0.4	0.2	0.3	0.3	0.3	0.3
Upper Holloway	16.4	15.9	—	—	16.0	16.2	12.1	10.1	—	—	—	10.8	0.8	0.2	—	—	—	0.5
Westminster (cannel gas)	21.8	20.8	21.0	21.1	20.9	21.3	12.2	9.2	10.5	10.5	10.3	9.9	0.3	0.0	0.0	0.2	0.1	0.2
South Metropolitan Gas Company—																		
Peckham	17.4	16.1	16.6	16.7	16.4	16.7	10.0	7.2	8.5	9.0	9.1	9.4	0.4	0.0	0.1	0.0	0.0	0.0
Tooley Street	17.0	16.1	16.4	16.6	16.4	16.7	15.0	10.7	12.4	12.2	11.6	12.7	0.2	0.0	0.1	0.0	0.0	0.0
Clapham	16.7	16.0	16.3	16.4	16.4	16.4	13.5	9.8	11.8	10.7	11.2	12.1	0.0	0.0	0.0	0.0	0.0	0.0
Lewisham	16.7	16.0	16.5	16.4	16.3	16.5	10.8	8.0	10.2	9.4	9.7	8.6	0.4	0.0	0.0	0.1	0.0	0.0
Blackfriars Road	17.1	16.0	16.6	16.6	16.2	16.2	16.4	9.2	11.4	14.1	11.3	14.1	0.4	0.1	0.3	0.3	0.3	0.2
Commercial Gas Company—																		
Old Ford	17.5	16.4	17.1	16.9	16.7	16.8	10.2	6.4	7.5	7.7	8.1	8.8	0.2	0.0	0.1	0.1	0.1	0.1
St. George's-in-the-East	17.2	15.7	16.5	16.8	16.5	16.9	13.5	6.5	10.8	7.2	8.6	9.4	0.6	0.4	0.5	0.5	0.5	0.5

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PRESSURE.—In excess on all occasions.

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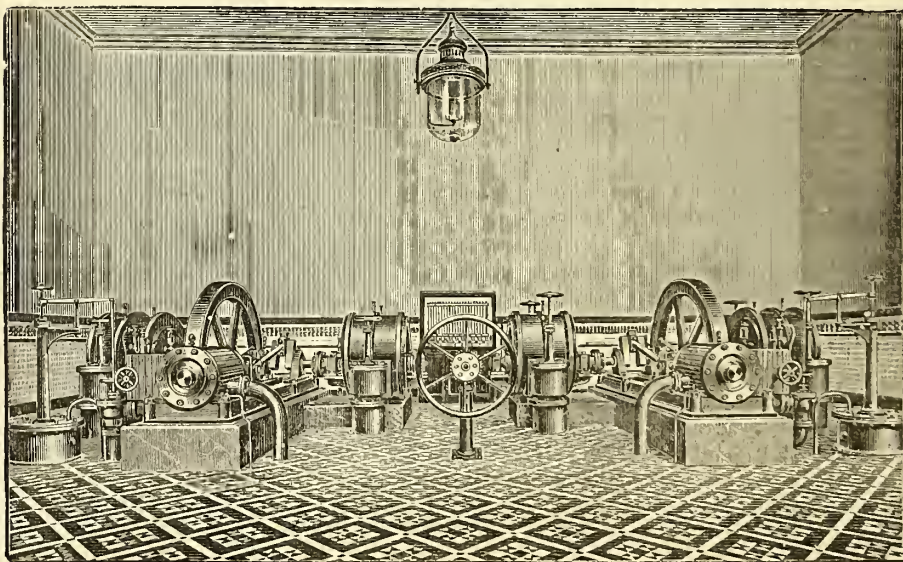
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TITLE AND INDEX TO VOL. LI.

In consequence of several inquiries as to the above, we call our readers' attention to the paragraph which appeared in our issue for the 24th ult., (p. 157), and remind them that a Title-page and Index to Vol. LI. of the JOURNAL—January to June, 1888—have been prepared, and will be forwarded by the Publisher post free on receipt of a post-card.

TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion; but as the Advertisement sheet of the JOURNAL is sent to Press the first thing on Monday Morning, Advertisers will please bear in mind that Orders for Alterations in or Stoppages of PERMANENT Advertisements should be received Not Later than Two o'clock on SATURDAYS.

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THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, AUGUST 28, 1888.

THE LOCAL GOVERNMENT ACT.

WE have so often referred to the progress through the House of Commons of the Local Government (England and Wales) Bill, that now the measure has passed it is right [that we should devote some attention to this great piece of legislation as a whole, with special reference to those portions of it which particularly affect the interest with which the JOURNAL is most closely identified. We begin, therefore, by recommending every one of our readers resident in those parts of the kingdom affected by the measure to procure a copy of the Act, and to study it carefully, with a view to understanding

the magnitude of the change that is to come over the internal administrative organization of the country as from the beginning of next year. This is not precisely a holiday task; but the trouble will be well repaid. Parliament has done nothing like this for very many sessions. It is a solid, serious piece of constructive legislation, with only the slightest bearing upon party politics, and with nothing in it to form an election cry, or to catch votes by pandering to unwholesome party appetites. Whether it will work well or ill cannot, of course, now be known. It is quite possible that, as soon as it is put into operation, flaws of drafting or definition may be detected of more importance than much that has aroused the fiercest controversy in the House; but it is idle to waste time in anticipations of such evils, which will be vexatious enough when they come. Lawyers will soon rush to the front with books explanatory of the Act; but it will be best to study the measure itself. Although it forms, as published, a substantial bulk of printed matter, it is not more voluminous than many a Corporation Act, and does not look so portentous as did the Orders containing the multitudinous amendments proposed while it was in Committee. It is divided into six parts, containing altogether 126 clauses, and three schedules. The first part constitutes the County Councils, the establishment of which is the great feature of the Act. These Councils will consist of the Chairman, Aldermen, and Councillors; and to them will be entrusted the administrative and financial business of their county, as defined by the terms of the Act, precisely as in the case of a borough divided into wards. The county councillors are to be elected, one only for each electoral division, for three years, and will consequently all retire together. The Chairman is to hold office for one year, during which time he will be a Justice of the Peace. Such is the composition of the last new popular governing body, the constitution of which it is to be supposed is the fruit of experience gained in connection with all other elective local authorities.

Gas companies will be in touch with these new bodies at a number of points. First, and of great importance, is the matter of assessment. It is to be hoped that this part of the work of the County Councils will be done properly. The execution of the Acts relating to weights and measures, including gas-meters, will be part of the duties devolving upon the County Councils, as will the registration of rules of scientific societies. All main roads will also be placed under their control; so that gas undertakings will be delivered from the multiplicity of highway authorities by which they are occasionally plagued. But every authority having power to light the roads in their district will have the same power and duty to light any main road in their own area. The Rivers Pollution Prevention Act, 1876, will also be administered by the County Councils; so that a necessary piece of sanitation that has hitherto suffered from being nobody's business will at last come into hands strong enough to carry its provisions into effect, and manufacturers will be treated with greater uniformity than hitherto. An important proviso is that County Councils are to have power to oppose Bills in Parliament, and are relieved from the obligation to obtain the consent of owners and occupiers for this purpose; but they will not be able in like manner to promote Bills. Boroughs named in the schedule which on June 1 last had a population of not less than 50,000, or were counties in themselves, are to enjoy the position and privileges of being separate counties named "County Boroughs" in the Act. On the other hand, the local authorities in boroughs of less than 10,000 inhabitants are to be merged in the new governing authorities for the counties in which they are situated. A writer in *The Times* hails this extinction of the small borough authorities as a blessing, for the reason, among others, that these places are often hotbeds of corruption and jobbery. This is a severe, and, as it appears to us, an uncalled-for commentary upon bodies which, on the whole, have done fairly well; and especially, in respect of jobbery, the size of boroughs is not always a protection to the ratepayers.

The most striking of all the changes wrought by the Act is in connection with the government of London. After all the fruitless talk about the reform of the municipal arrangements of the Metropolis, it is very remarkable that, almost as an incident of this large measure, London is to be endowed with more administrative autonomy than it has ever enjoyed before. The County of London will be constituted of the huge "province covered with houses" now known as forming parts of Middlesex, Surrey, and Kent; with its own Sheriff, Court of Quarter Sessions, and Commission of the

Peace, and all the unity of administration that this separation implies. The number of county councillors for London will be just double the number of members of Parliament authorized for the different boroughs of the Metropolitan area; with one-sixth of the number of county aldermen. All the powers, duties, and liabilities of the Metropolitan Board of Works—but not, it is to be hoped, the bad name of this body—are to be transferred to the new authority, who are declared the lawful successors of the old organization. Thus the County Council for London will start fully equipped with a heavy load of work and responsibility. A noteworthy point in the new order of things is the absence of any provision for the payment of the Chairman of the Council. The present Chairman of the Metropolitan Board of Works has £2000 a year for his trouble; but his successor will have more to do for nothing, although he may have a paid deputy. With regard to roads in the County of London, these may remain under the care of the Vestries, acting as District Councils under the Act. The new Court of Quarter Sessions for London may have a Stipendiary Chairman, or Deputy-Chairman, who will be empowered to sit alone. There is nothing authorizing the London County Council to meddle in any way with the supply of gas, except to test it; and the powers of the Board of Trade in connection with the Gas and Water Works Facilities Act are not specifically transferred to the new authorities. It is well understood, however, that this may come in time, when the new machinery has got into proper working order. There is a provision in the Act whereby a Secretary of State may transfer at any time a portion of his present duties to a County Council; so that if these organizations should command public confidence, the process of decentralization may be carried out to a considerable extent without necessitating a fresh Act of Parliament for the purpose.

In this review we have not been able to do more than summarize, in the briefest possible fashion, the leading provisions of one of the most important reforms of the present reign in regard to local self-government. One can hardly yet realize how great a change is to come over the nature of county administration with the beginning of another year; but the announcement that there will be creations of county stocks, just as there are now borough stocks, will perhaps help more than any other statement to indicate how thorough and far-reaching the change will be. It, of course, remains to be seen whether the fullest possible benefit is to be derived in practice from the alterations in county government enacted by the Legislature. Some people are sanguine enough to believe that London, for instance, will almost immediately quicken into independent, conscious political life as a whole; and that the carelessness and apathy of its population as regards everything relating to the men who spend the rates, and the objects for which the money is spent, which has always been such a hopeless obstacle to truly responsible local government for this huge Metropolis, will disappear like darkness before the dawn. We doubt it. London is too big, its people are too divided by sheer latitude and longitude, for there to be anything of that close knowledge of the real characters of its public men which in smaller aggregations of humanity constitutes such a precious safeguard for the proper working of an electoral system. Nobody knew who were the true men and who the self-seekers on the Metropolitan Board of Works, before the Royal Commission brought the doings of this moribund body into unwonted publicity. No local governing body in any other part of England could have gone on so long, without the public generally knowing something about the characters of the members, as the Metropolitan Board of Works has done in London, with all its newspapers. There is little prospect of a really effectual change in this respect; but we must hope for the best. With regard to the rest of the country, it is but justice to the magistrates as a body to bear testimony (before they are relieved of even so much of their duties as will shortly be transferred to their elective successors) to the public spirit, efficiency, and respect for economy which they have displayed in their administrative work. It is to be feared that the new authorities, having the feeling that they are dealing with their own moneys, may be more lavish in expenditure than their predecessors, and may in this respect be induced to follow the bad example set by many reformed Municipalities when city and borough stocks were as great novelties as county stocks will be for a few years to come. Many homilies have been preached in advance upon this topic, however; and so we will say no more about it, but conclude this notice of the Local

Government Act with the expression of a hope that it may be found in actual working to justify the trouble that the Administration and Parliament have taken concerning it.

THE AFFAIRS OF THE LIVERPOOL UNITED GAS COMPANY.
The Liverpool United Gas Company have just held their annual general meeting; and, as will be seen from the report of the proceedings in another column, the statement that the Chairman (Mr. E. Lawrence) had to make to the proprietors was of a very satisfactory character. We do not use this somewhat hackneyed expression merely with reference to the balance-sheet of the Company, although this fully merits the description; but rather with regard to something that follows from these figures. It was pointed out by the Chairman that, whereas a twelvemonth ago (owing, as he said, to the bad state of trade in the city and district) the consumption of gas was restricted, and the Company did not earn their full dividends upon the year's working, this year circumstances have materially changed for the better, and the improvement in the trade of Liverpool is reflected in the condition of the Company's revenue account. Such a reflection cannot but be gratifying to the good citizens of Liverpool who happen to be fortunate enough to hold stock in the Gas Company; for if anything is capable of adding to the satisfaction with which an honest man regards a profitable investment, it is the thought that his own prosperity is the consequence of well-doing on the part of his neighbours and those with whom he does business. The Directors are not exempt from the common lot of their kind upon similar occasions; and the chorus of congratulation which they may have expected to follow upon the Chairman's statement was broken by a single voice of hostile criticism, lifted up by a gentleman who seemed to think that the gas undertaking of the Wallasey Local Board, with which he avowed his own connection, was much better managed than that of the Company, especially in the matter of their coal supplies. It is remarkable how much local criticism finds to feed upon in the coal contracts of the Liverpool United Gas Company, the disposal of which is never satisfactory to everybody happening to be either directly or indirectly interested in such matters. As the Chairman pointed out, however, the manufacture of gas by a Company under the supervision, as regards illuminating power and purity, of a City Corporation, is a very different matter from the supply of nominally the same commodity by a Local Authority for their own profit. The occasional cropping up of these continual topics at Gas Companies' meetings does no harm; and when the points raised can be disposed of so quickly and satisfactorily as was done by the Chairman of the Liverpool Company, the attraction of the meetings for shareholders of an inquiring mind is materially enhanced, without leaving any unpleasant savour behind.

THE LANCASTER CORPORATION AND THEIR GAS MANAGER.

In another column will be found the report of Mr. C. Armitage, the Gas Engineer to the Corporation of Lancaster, upon the working of the undertaking in his charge during the past twelve months; and a very good showing it is. There is some pleasure in looking at a statement of this character. In making 20-candle gas at a net cost of only 11·68d. per 1000 cubic feet, with a leakage account of but 3·29 per cent., Mr. Armitage has certainly done admirably for his employers. In the course of the debate in the Town Council upon the report and accounts of the Gas Department, Alderman Hatch, after complimenting Mr. Armitage upon his work, took credit to the Gas Committee for their treatment of their Manager. He said: "They paid him a fair salary, and they did not interfere with him continually in suggesting this and suggesting the other thing in matters they knew very little about." It is most gratifying to find such a state of things existing in relation to the gas supply of Lancaster as is depicted in these words, after all that one has heard of late respecting the treatment of Gas Managers by some Corporations. Of course, we cannot deny that the aphorism that good servants make good masters applies in this case; but also, on the other hand, it may be cited in order to show that good masters make good servants. If the Lancaster Corporation have a good officer in Mr. Armitage, they certainly know how to treat him, if, as Alderman Hatch remarked, they pay him well and leave him alone in matters of detail. We are no advocates of the principle of making the Gas Manager the master instead of the servant of his employers. He has a place, and he should be kept in it; and it is, moreover, a great relief for the Manager when he knows he can rely upon

his Committee to take that responsibility in matters of policy which rightly belong to them. The Manager can no more assume the proper functions of his Committee than can the Committee usurp those of the Manager. Examples of the latter blunder are, however, much more frequent than of the former. All this requires to be taken to heart by those whom it may concern. For the present, we have only to congratulate Lancaster upon the possession of Mr. Armitage, and Mr. Armitage upon finding a sphere where not only is there room for his abilities, but where also these are appreciated. We have no wish to exalt Mr. Armitage as though he were a *rara avis in terris*. There are good Gas Managers outside Lancaster; but in Lancaster there is evidently an example of the right man in the right place, which makes it pleasant to contemplate.

REMARKABLE NEWS FROM SWANSEA.

STRANGE intelligence reaches us from Swansea, where the relations between the Corporation and the Gas Company have lately been somewhat strained, in consequence of the Company having applied for a Provisional Order, which was strenuously opposed by the Corporation with only moderate success. The Company have been compelled to raise the illuminating power of their gas beyond the point at which they can produce it from Welsh coal—a peculiar result of the public-spirited action of the Town Council to diminish the amount of money which the Company must spend locally for their supplies! In view of the fact that they did not earn their dividend last year, when selling a less expensive article, the Directors of the Company have been compelled—much against their will, as we must believe—to raise the price of gas by 4d. per 1000 cubic feet, which has, of course, brought them into great disgrace with the Town Council, who are talking about adopting electric lighting and all sorts of retaliatory measures. The most remarkable thing in connection with this condition of affairs in the borough of Swansea is, however, that some benefactor of his species (whose name is at present unknown) has put himself in communication with some of the members of the Town Council, and has offered to light the town for nothing, provided that the Corporation will adopt a particular lamp, the character of which has not transpired. That there might be no mistake about it, the member who brought the matter under the notice of the Town Council showed that any town containing more than 80,000 inhabitants might be similarly favoured; for this was the only condition insisted upon by the undisclosed philanthropist. Another member vouched for the lamps in question as being “extremely beautiful;” and it was remarked that, by adopting them, the town would save the £3770 a year paid for the public lighting. There is some mystery about these lamps; for in the letter in which they were offered to the Corporation of Swansea, it was stated that they would be provided and fixed, and kept clean and in working order, free of cost to the town, and the tenderer would also “pay the cost of water, should it be necessary to “use water.” What can this mean? Has the concealed philanthropist discovered a way of burning water in street lamps? And even so, how can he provide and maintain them for nothing? There is something mysterious about it all, which the Corporation of Swansea ought, in mercy to a bewildered public to clear up by promptly accepting the offer of the unknown; and in this, as there is nothing to pay, there can be no risk. Their duty to the ratepayers demands nothing less; for as the choice lies between the Gas Company, who require to be paid for their work, and a person who offers a supply of beautiful lamps—with water—for nothing, it can scarcely be doubtful on which side the choice of the thrifty Welshmen will incline.

PROPOSED GAS MANAGERS' ASSOCIATION FOR THE EASTERN COUNTIES.—Mr. H. Wimbhurst, the Manager of the Sleaford Gas-Works, has been inviting an expression of opinion by the managers of gas-works in the eastern counties, on the subject of a suggestion made by several members of The Gas Institute who have charge of works in that portion of England that a District Association should be formed for those counties. It is proposed to hold a preliminary meeting in some convenient town (Peterborough has been mentioned as most suitable) in the last week in September. Several gentlemen—including Mr. J. Carter, of Lincoln, and Mr. J. Barton, of Peterborough—have offered Mr. Wimbhurst their support; and the project only awaits favourable reception by the general body of East Anglian gas managers to be established on a working basis. Mr. Wimbhurst will be pleased to communicate with any manager who has not received a copy of the circular he has been sending out on this matter.

Water and Sanitary Affairs.

AN ambitious project for supplying Paris with water has been submitted to the Municipality of the French capital by M. Ritter, a Swiss Engineer. In this scheme the three Jura lakes of Neuchâtel, Bienne, and Murten, in connection with the new Hagneck Canal and the River Aar, are treated as three natural reservoirs; and the supply is to be drawn off from the lake of Neuchâtel by a heading about 260 feet below the surface of the water. The latter seems a somewhat extraordinary arrangement; but the most formidable part of the project is a tunnel 22 miles in length, to be formed under the Jura Mountains—an engineering achievement akin to that of the Channel Tunnel so ardently advocated by Sir Edward Watkin. From the lake of Neuchâtel to Paris the distance is 312 miles. It is computed that the work could be executed in six years, at a cost of £12,500,000. It will be interesting to compare this with some of the schemes for supplying London with water from a remote point. Mr. Bateman proposed to bring a supply of 230 million gallons per day from North Wales, the distance being 183 miles, and the estimated cost £11,400,000. Messrs. Hemans and Hassard devised a plan for supplying London with water from the lakes of Cumberland and Westmoreland; the quantity being 250 million gallons per day, and the distance 270 miles. The estimate for this undertaking was £13,500,000. It will be seen that the cost assigned for the Paris scheme comes midway between the estimates for the two London projects. Yet the distance to be traversed in the French scheme is 42 miles greater than that of the longest proposed for London. In amount, the estimate of M. Ritter falls nearly £2,000,000 behind the sum which has been expended on the Metropolitan Water-Works. But the capital of the London Water Companies has been spent in distributing as well as in collecting the water; and the population supplied is 5,482,000, compared with 2,261,000 in the French capital. As an engineering scheme, M. Ritter's proposal is highly creditable to his ingenuity. The financial feature is the difficulty, considering what this Jura tunnel is likely to cost, despite the clever appropriation of hydraulic power from contiguous rivers. Allowing that French land is cheaper than English, yet if Messrs. Hemans and Hassard considered £13,500,000 requisite to bring a supply from Ullswater along a route of 270 miles, we hardly see how M. Ritter will be able to pierce the base of the Jura range, and traverse 312 miles, for £1,000,000 less.

Yet more analyses! When will the chemists leave the river alone? Sir Henry Roscoe has suggested that there should be an exhaustive examination, physical and microscopical, of the condition of the foreshores of the Thames from Barking to the mouth of the river, including the whole of the estuary. We understand that this exploration is to extend along the coast to Clacton on the one hand, and Margate on the other. The Works Committee have approved the proposal, and the Metropolitan Board of Works have adopted it; so that it is to be done. The steamer *Bazalgette* is to be told off for the expedition, like another *Challenger* scouring the seas in search of scientific information. Sir Joseph Bazalgette is to send an assistant to examine and report from an engineering point of view; while Mr. Dibdin, with two assistants, is to carry out the chemical inquiry—the whole affair to be under the superintendence of Sir H. Roscoe. It is rather surprising to find that the work is to be done in a fortnight. If there are many samples to be taken, this period of time can scarcely include the completion of the analyses. The object of the exploration is to provide accurate data as to the present state of the foreshores, in anticipation of any complaints as to injury done by carrying the sewage sludge out to sea. If Southend or Clacton, Sheerness or Margate, venture to assert that they are assailed by floating sludge, the Metropolitan Board will fall back on chemistry, and produce the analyses. Yet it will not be the Board, but the County Council, that will have to look the matter in the face. Perhaps the new authority will upset everything, and have nothing to do with sending the sludge to sea. New brooms sweep clean; and Sir H. Roscoe's report on the forthcoming voyage of discovery may be coolly ignored. Sir Robert Rawlinson protests against the scheme of the Metropolitan Board in respect to the sewage; and in so doing makes a somewhat remarkable statement. He estimates the volume of the London sewage at 200 million gallons per day, after which he argues that the new works are to treat 90 million gallons, and asks, “What is to be done “with the 110 million gallons over and above?” This is to forget that the Barking works only deal with the sewage

belonging to the northern side of the river; while other works at Crossness take the sewage of the southern side. It would also be interesting to know where Sir Robert gets his estimate of 200 million gallons per day. It is always difficult to arrive at the true total of the London sewage, as that portion on the northern side which comes from the higher levels is not pumped, but flows on to the outfall by gravitation. But Sir J. Bazalgette reckons on an average of no more than 162,500,000 gallons of sewage per day when the population has risen to 5,200,000. In one instance, we find him taking a yet lower estimate for the sewage. Mr. Dibdin appears to reckon on 160,000,000 gallons. In a letter on the sewage question by Mr. E. Rider Cook—a leading member of the Metropolitan Board—we find it stated that “the returns made by the Engineer and Chemist show that the average daily flow of the sewage, from May to September, was practically 175,000,000 gallons.” The range is rather wide; and we should like to know which is nearest the mark. The population of London is under 4,800,000.

MASONIC.—In the list of candidates for the October election to the Royal Masonic Institution for Girls, we notice the name of Annie Winifred Belton, who is an orphan niece of Bro. William Belton, P.M. 117, P.G.O., Shropshire, Secretary and Manager to the Shrewsbury Gas Company. The case is, we believe, a very deserving one; and Mr. Belton asks us to mention it, in the hope that those of his brother gas officials who possess votes will, if possible, kindly aid him in securing the election. He will gladly afford any desired information, or forward cards detailing the case to anyone willing to assist.

AMERICAN GASLIGHT ASSOCIATION.—The Secretary of this Association (Mr. C. J. R. Humphreys) has issued to the members his usual announcement as to the arrangements for the forthcoming meeting, which is fixed to take place at Toronto on the 17th, 18th, and 19th of October. He states that, according to present indications, the gathering will be eminently successful. The following papers have already been promised:—“Experience in Distributing Gas under Extremely Low Temperatures,” by Mr. D. H. Geggie. “Observations during Many Years’ Experience in the Gas Business,” by Mr. James R. Smedberg. “Construction of Gas-holders with Wrought-Iron or Steel Tanks above Ground,” by Mr. F. Mayer. “The Steam Stoker and Improved Charger,” by Mr. A. Q. Ross. “Daily Experiences and Observations of a Gas Manager,” by Mr. James Somerville. “Coals for Gas Making,” by Mr. J. D. Perkins. A special feature of the meeting will be the offer of a prize of \$25 for the best paper on “Naphthalene.” This will be the first time the Association has met in Canada; and there is no doubt the proceedings will be interesting and profitable.

IRON AND STEEL INSTITUTE.—The autumn meeting of this Institute took place in Edinburgh last week (the proceedings opening on Tuesday), under the presidency of Mr. Daniel Adamson, of Manchester. The members received a hearty welcome from the Lord Provost (Sir T. Clark), as representing the Municipality, and the Principal of the University (Sir W. Muir), as representing the Senate. The business was transacted in the Examination Hall of the University. The reading and discussion of papers occupied the members till one o’clock, and after luncheon in the Library Hall, the rest of the day was devoted to an inspection of the celebrated Broxbourne Oil-Works, with alternative excursions to the Newbattle Collieries and the Leith Harbour and Docks. In the evening, at the invitation of the Lord Provost, Magistrates, and Council, the members of the Institute attended a *conversazione* in the Science and Art Museum. On Wednesday morning the business of the meeting was concluded; and the remainder of the day was spent in visiting the Forth Bridge. In the evening the annual dinner took place at the Waterloo Hotel. On Thursday the members visited the Glasgow Exhibition. The meeting, on the whole, was highly successful.

THE OHIO GAS SPRINGS.—American papers report the proceedings of Dr. Ernest Weisenbauer, Professor of Geology in the University of Heidelberg, who has gone to America to investigate the district of the natural gas springs at Findlay, in the State of Ohio. He is of opinion that the extent of these springs has been much underrated, and that, at a considerable depth below the township of Findlay, there is an immense cave filled with gas which might easily explode. The Professor made use of a shaft through which the gas rises to the surface in order to connect a very sensitive telephone apparatus with the solid strata lying beneath the gas receptacles, and he came to the conclusion that a more or less solid non-conducting mass, about a mile in thickness, is interposed between the huge gas cave and a glowing furnace. At first he could not credit what the indications pointed to; but a protracted investigation, carried on at various points within a radius of three miles, has convinced him of the fact. He believes that the heat of this subterranean furnace is 3500°. He considers that the average distance of the cave from the surface is about 1200 feet, and that it is even less beneath the town of Findlay. It is right to add that Professor Gilbert, of Washington, has expressed great doubt as to the correctness of the conclusions or observations of the Gorman geologist. Notwithstanding the above, the *Progressive Age* is of opinion that the supply of natural gas in America will be early exhausted.

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(FOR STOCK AND SHARE LIST, see p. 390.)

BUSINESS on the Stock Exchange during the past week was decidedly quiet; and taken altogether the markets have ruled flat. This was partly owing to the general want of activity; but it was also in a measure produced by Continental affairs—the Boulanger elections and the Crispi note. Money has been in good demand, and the market has shown increased activity; but the Bank rate remains unchanged, and there is no apparent probability of any alteration in the near future. Gas was extremely quiet at the beginning of the week, but rapidly became more brisk. It is very firm; and there is every reasonable prospect of a further advance in favour. The Metropolitan Companies especially have been in good request; the demand, indeed, exceeding the supply. The condition of the Metropolitan Electric Supply Company may have something to do with this. It will be remembered that less than a month ago this Company’s prospectus was issued with a tremendous flourish of trumpets. There was a good demand for the shares—whether a genuine or an artificially fomented demand we cannot now discuss—and Metropolitan gas stocks had a heavy fall. But a rapid change has come over. The electric shares are at a very large discount, if indeed they are saleable at all; while the old reliable illuminant stands as firm as ever. This is not encouraging for the gas “bears” in the future; and we shall not expect to see another electric lighting prospectus for some time to come. As the result of the week, all three of the Metropolitan Gas Companies have advanced. Brighton and Hove has also improved, thanks to its prosperous past half year. Foreign undertakings have been steady, without any alteration but a rise in Buenos Ayres debentures. There has been rather more activity in Water; and the same slow and progressive rate of advance in quotations which has characterized the last two months is still in action. Lambeth is the chief gainer; and Chelsea and Southwark and Vauxhall are also slightly higher.

The daily operations were: On Monday a single transaction in Monte Video was all the business marked in Gas; and two transactions in Water were the sum total. Tuesday was more active, but business was still much below the average. Commercial new rose 1; Gaslight “A,” 2; and South Metropolitan “B,” 3. In Water, Chelsea advanced 1. Wednesday’s Gas business was light; not one of the big issues being touched at all. Buenos Ayres debentures improved 1. Water was firm and unchanged. Gas was more active on Thursday. Brighton and Hove advanced 1. Water was noticeable for the firmness of Lambeth; the 7½ per cents. improving 4, and the debenture, 1½. Friday’s Gas business was only moderate, and nearly all in Gaslight “A.” Quotations were unchanged, as also were those for Water stocks. Business in Gas on Saturday did not present any particular feature; but all prices marked were good. Water was wholly neglected.

ELECTRIC LIGHTING MEMORANDA.

THE VALUE OF THE SHARES OF THE LAST NEW ELECTRIC LIGHT COMPANY—THE FINANCIAL CONDITION OF A LONDON ELECTRIC LIGHT COMPANY—FORESIGHT OF A LONDON VESTRY—THE STRUGGLE BETWEEN THE EDISON AND WESTINGHOUSE COMPANIES.

THERE is already wailing among speculators respecting the Metropolitan Electric Light Company, the shares of which were, so the financial newspapers recorded, “jumped at” upon the day of issue. The subscription list was only open for one day; and the “ground bait” in the shape of newspaper articles commendatory of the prospects of the adventure having been judiciously used, the consequence was that some people applied largely for shares, believing that they might possibly get a few. To their surprise and chagrin they were taken very largely at their word. One individual who signs himself “A Miserable Investor” has published a letter complaining how he applied for a large number of shares, expecting to get perhaps one-tenth, and was surprised to receive an allotment of nearly three-quarters of his application. The best of the joke, however, was to come. An hour or two after receiving his letter of allotment he sent to his stockbrokers to inquire the value, and was informed that the shares were at 10s. discount—meaning, of course, that this sum, which he paid on application, had been thrown away. Next day they went to 15s. discount; and at the time of writing his letter the injured one found that they were quoted at 30s. discount, “quite nominal.” Our financial contemporary *Money* remarks that this little affair carries its own history written upon its face. We should add that it also preaches its own moral. The “Miserable Investor” was the cause of his own misery—a condition of human life which is constantly recurring, but which is none the less exasperating on this account. It is evidently a case of overreaching speculation recoiling on itself. It is all very well now for the victim of an artfully-prepared scheme for getting hold of the money of the public to describe himself as an “investor.” There is, however, very little of the air of genuine investment about this bit of business. For the rest, it looks very likely that the successful launching of the South Metropolitan Electric Light Company’s shares, and the present condition of the unfortunate subscribers, will check that revival of interest in this class of stocks which the advent of the Company was supposed to signalize.

An electric lighting concern which has been cited upon different occasions as being in a very promising condition technically and

financially, is the Kensington and Knightsbridge Electric Lighting Company, Limited—at least, this appears to be the full name of the lighting installation which has begun operations in the select neighbourhood of Kensington Court. But according to the last statutory return of the Company it appears that, whereas the nominal capital is £250,000 in £5 shares, only 6020 shares have been taken up. Of these 5000 are considered as fully paid, and probably represent the contractor's interest, while upon 400 shares £5 has been called, and £3 per share upon 620 shares. The calls paid amount to £3060, and unpaid to £800. If this is the best that Kensington can do for the electric light in its midst, it does not look very promising for its prospects in less wealthy neighbourhoods, whatever the electric lighting journals may say respecting the admirable result of the experiment.

The Vestry of St. James's have evidently determined to take a leaf out of the book of the Municipality of Paris, for they have resolved that they will "not approve of any concession or licence being granted to any electric light company to supply such light to the parish, unless the licence provides that, after the shareholders of such company have received an annual dividend of 10 per cent., one-half of the surplus shall be set aside and applied towards the funds of the parish, or in diminution of the charge for lighting by electricity the public streets." It is to be hoped that no harm will happen to the streets of St. James's until this provision comes into force. The indebtedness of the Vestry to the Paris Municipality for the idea is obvious. It might, however, have been thought that, before putting such a resolution upon their minutes, the Vestry would have inquired how the arrangement works in the city where it is actually in force in connection with the gas supply. If they had taken the trouble to satisfy themselves upon this point, they would probably have been less eager to adopt and publish the resolution.

The two most celebrated and successful systems of electric lighting by incandescence—the Edison and alternating transformer systems—are about to be placed in sharp competition in the City of New York, where the Westinghouse licensees are building a large station to compete with the Edison Company. In connection with this rivalry, a strong attempt is being made to prejudice the public mind, and to induce the authorities to take action against the introduction of the high potential currents employed in the Westinghouse system, upon the ground that they are dangerous to life. With this view, a long list of fatalities caused in America by the strong currents (whether used in connection with arc lighting or otherwise) during the last twelve months, has been prepared and laid before the New York Board of Electrical Control, who have been rather alarmed by this statement. It has, on the other hand, been pointed out that the appalling frequency of fatal accidents in the United States from electric lighting currents is traceable to the makeshift and cheap manner in which so much of this class of work is done there, and which would not be tolerated anywhere else. Physiological experiments with electrical currents of high potential have been instituted upon living animals, in order to obtain light upon the question; but beyond the infliction of a great deal of pain upon a number of unoffending creatures—less with a view to the interests of true science than in those of advertising electricians—nothing has come of them. It has been ascertained that an alternating current of about 250 volts will kill a large dog; and it is supposed that a man would have been killed under the same circumstances. But no decisive action has been taken upon these revelations. The authorities are afraid of discouraging a fresh development of electric lighting enterprise upon experimental evidence which, whatever its intrinsic value, comes before them with the taint of trade rivalry; and although the regard of the average New Yorker for advertisement in business is unbounded, he is a humane man, and the suspicion that dogs are being tortured to serve the interests of the Edison Company, will not tend to make him love them more, or to favour their rivals less.

SPIRAL-FRAMED GASHOLDERS.

THE question of the guide-framing of gasholders is decidedly occupying the attention of engineers at the present time—a consideration that is forced upon one by various signs; the latest being the paper read before the Manchester District Institution of Gas Engineers by Mr. T. Newbigging last Saturday, and which will be found in another column. The object of the paper was to bring into prominence a new suggestion for the guiding of gasholders from the base (dispensing with all superstructure for this purpose), which has been offered by Mr. William Gadd, of Manchester, who has apparently been studying the subject well since Mr. W. H. Y. Webber's paper, read at last year's meeting of The Gas Institute, appeared in our columns. Mr. Gadd joined in the discussion this paper elicited in the JOURNAL; and he made some very pertinent observations upon Mr. Webber's proposals. He has now ventured to formulate a device of his own, with practically the same object in view, and has gone even further than anybody who has yet attempted to solve the problem—with what practical success time will show. It is almost certain that his proposal will meet with many adverse comments, besides the dead weight of passive obstruction which all novelties of such a daring character must encounter. Our redoubtable correspondent who writes under the *nom de plume* of "Theory and Practice" will most probably give him a raking fire of criticism; and querists will not be wanting to echo the cry of "*Cui bono?*" which is so convenient in these controversies. For it must not be forgotten that those who advocate a new departure of this nature have all their ground to make good

before they can advance. Engineers accustomed to the established order of things want to know, in the first place, what is to be gained by way of compensation for the risk of abandoning tried methods of construction for something which they are perfectly right in regarding as the fruit of a theorist's brain. It is possible to make this inquiry in perfect good faith—not incuriously condemning theory as such, but asking it to make good its credentials before being accepted as a safe guide for practice. It will be well to grant in advance the existence of this good faith, in order that discussion may be void of recrimination.

First, then, let us understand what is to be gained by such an endeavour as that in which Mr. Gadd has embarked, under Mr. Newbigging's patronage, and in which he follows other daring innovators. It is well that the question has been put forward this time under the hand of an experienced gas-works constructor; for Mr. Newbigging is able to place upon record some data which it is necessary to bear in mind. He shows that in comparatively small gasholders the actual weight of metal in the ordinary kinds of guide-framing above the tank is nearly equal to, or even exceeds that of the holder itself. The proportion decreases with the increasing capacity of the holder, under certain circumstances, although this rule is not invariable; and indeed it is only in the last entry of Mr. Newbigging's table that this becomes apparent. It would perhaps be safer to say that the proportionate cost, rather than weight, of the external aerial guide-framing becomes smaller as holders increase in magnitude, from the fact of the heaviest guide-framing being largely composed of cast iron, costing less than half that of the wrought iron of the floating portion. Owing to this consideration, it may be found that Mr. Newbigging's estimate of a saving of 50 per cent., to be realized from the abolition of what we may term the superior guide-framing of a large holder, is rather excessive. His statement may be found to right itself in this respect, however, in cases where carriage constitutes an important element in the cost of works of this class. And, on the other hand, if the proportionate cost of guide-framing is lessened with the bulk of gasholders, the time occupied in erecting and adjusting it increases; so that there would not be half the trouble and delay in getting new holders into work if the superior guide-framing were dispensed with. There are few gas managers of lengthened and varied experience to whom this latter consideration does not appeal strongly. To sum up, then, a saving of nearly half the cost and quite half the time and trouble in the erection of gasholders is ample justification for the pains of those who seek to tell us how the superior guide-framing may be rendered unnecessary for gasholders. There is, of course, a way of looking at the question in which the possible economy may be made to appear insignificant. It is only a few more tons of iron to put up, while the job is in hand; and it does not work out to very much on the total cost of providing storage for every 1000 cubic feet of gas. But this is not an engineer's view of a structure. To the thorough constructor, every superfluous ton of iron is not only abhorrent as so much "matter in the wrong place," its presence is an element of weakness in the structure, since, if unnecessary, it is probably harmful; and it must always require a similarly unnecessary expenditure for maintenance and keeping in order. All these reflections must occur to every constructor when he is told of a way by which the ends he is accustomed to provide for in a certain manner may be gained by a shorter route.

Briefly stated, Mr. Gadd's suggestion is that a gasholder will sustain itself by its bottom guide-rollers alone, if the guides in which these work are disposed spirally in the tank, instead of vertically after the ordinary fashion. As Mr. Newbigging remarks, the idea is very simple; and he adopts it unhesitatingly, as it is illustrated by Mr. Gadd's models. It must be confessed that such a proposal for getting over the difficulty is enough to take away the breath of an old gasholder builder; but the subject is too important to be lightly treated, still less ridiculed on account of its apparent outraging of all precedent. Let us, therefore, examine the plan for what it is worth. It is obvious that if a gasholder is guided (say) in two spiral channels placed opposite to each other in the tank, any overturning movement (from wind) on the part of the holder—supposing this to take effect along the diameter passing through the rollers—would make the windward one bear against the upper flange of its channel, while the leeward one would bear against the lower flange of its channel. Multiply this action all round the curb by the number of rollers and channels, and verticality is ensured. All this is clear enough from a model. It must be ascertained, also, that the holder would not have any tendency to screw itself out of its guide-channels; but this it could scarcely do. Granting, therefore, that Mr. Gadd's prime object of securing verticality of the floating vessel by his system of spiral guides is secured, as proved by models—and Mr. Newbigging's testimony should be conclusive on this head, even if the models had not been shown to the members of the Manchester Institution—it may be asked what remains to be proved in order to obtain general acceptance of his suggestion?

There are several points to be settled, which can hardly be taken from models. Granted that a holder thus guided will be maintained vertical, notwithstanding its own instability and the effect of wind, it follows that the entire scheme of its system of internal stays must be reconsidered. A very much stronger bottom curb would be required, which might be provided without a great additional weight of metal; and this would have to be firmly connected to the top curb, not merely by vertical stays (for which there would be less need than under the existing system), but also, and more particularly, by spiral ties. It would be necessary

to make some provision for transmitting to the bottom curb all the strains called into existence by the new system by means of stout members made for the purpose, and so taking all of them off from the side sheeting. Unless this requirement were attended to, even if the holder did not fail from buckling, it would be impossible to keep it from leaking, owing to the shifting of the sheets and rivets under the strains along the sides. Then it must be considered that to make a holder revolve on its vertical axis during its inflation, means a certain amount of friction in the guide-rollers; and this again means additional work for the exhaustor. What amount of mechanical work is involved in causing the last holder of Mr. Newbigging's examples, weighing 107 tons per 120 feet diameter, to travel along a path inclined at an angle of 45° under the conditions, as to fit of the rollers, &c., to be expected in the circumstances? We say nothing about any difficulty of making the spiral channels, and fitting the tangential bottom rollers into them, as these are matters that would not dismay a good gasholder builder if he once undertook to make a thorough job of the work. And one is compelled to ask the other questions very much in the dark; for the whole proposal is of such an extraordinary character that judgment must be suspended upon all the points left unsettled by Mr. Gadd's models.

Here, therefore, we must leave the subject for the present; only congratulating the Manchester District Institution upon having had before them such an interesting paper, over which the individual members may be pardoned for shaking their heads many times before making up their minds respecting the matters of which it treats. Mr. Newbigging must be credited with having the courage of his convictions in fathering such a proposal; and it is only what is due to his reputation to treat his remarks upon the subject with respect. It is possible that we may have to wait long for the first realization of Mr. Gadd's project, since a new departure of this kind can only be made at considerable expense, which many people will hesitate to incur for the sake of an experiment. Yet, under favourable circumstances, a proof of the theory upon a sufficiently convincing scale should not be extravagantly costly. These are matters, however, upon which it is not our province to decide. If words mean anything, Mr. Newbigging is pledged to help Mr. Gadd, to the utmost extent of his power and opportunities, to carry out his novel project—unless, of course, the full light of discussion which will now bear upon it should reveal some fatal objection which he has overlooked. His statements are sufficiently explicit upon this point. He emphatically describes Mr. Gadd's device as, in his own belief, "a successful attempt" to solve the problem of dispensing with the superior guide-framing of gasholders without sacrificing anything of the safety of these vessels, and, of course, without detriment to their fulfilling the object of their existence. This is a bold position for an eminent Consulting Engineer to take; and we may be sure that Mr. Newbigging has counted the cost and weighed the responsibility he has assumed in regard to the subject. The proposal thus stands on a different footing to that which it would have occupied if the communication had been Mr. Gadd's paper, explaining his own ideas. As such we have discussed it, in the belief that the matter is not destined to end as merely an interesting portion of the transactions of the Manchester Institution. For a complete novelty in engineering construction of the kind, it has been put forward under very weighty recommendation; and it should be dealt with as a very practical and serious proposal. We have no desire to place upon Mr. Newbigging's shoulders more responsibility in regard to the proposal than he desires, or than his words warrant; but in insisting upon the gravity which his sponsorship has imparted to it, and which is not an idle compliment to him, we are convinced that we do no more than what we shall be supported in by public feeling.

THE Toulouse Gas Company are about to light the theatre in that city with 1000 incandescent electric lamps of 10, 16, and 20 candle power, distributed in two circuits, and so arranged that should an accident happen to one circuit it would not lead to the extinction of the light in other parts of the building. Each circuit is supplied by a 500-lamp dynamo, worked by a double-cylinder "Otto" gas-engine of 50-horse power. The engines are fixed outside the theatre, but at a short distance from it, in an underground chamber. They are of special construction, and have been made by the Company. The incandescent lamps have been attached to the old gas-fittings; and the work has been carried out entirely under the direction of M. Ernest Brouardel, Manager of the Centre and South of France Gas Company.

It has of late been discovered, says the *Scientific American*, that flowing wells of water can readily be obtained by boring in all that part of Utah lying northerly about 100 miles and southerly about 200 miles from Salt Lake City, and in the San Pete Valley. This part of the territory is thickly settled. Towns of from 500 to 5000 population are numerous; and farmers and town residents are availing themselves of this abundant and easily obtained supply, to the partial neglect of the old method of irrigating ditches. A good flowing well will irrigate five to six acres, saving the expense of a yearly water-tax, and having the water daily at command, to be turned on or off as desired. Nearly every residence in the beautiful city of Provo has its own artesian well, part of which is frequently utilized in a fountain in the front yard, throwing a copious jet 30 feet into the air; while hydrants are stationed at intervals in the garden, barn, and elsewhere about the grounds. These wells are being rapidly extended.

Technical Record.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

The Seventy-fifth Quarterly Meeting of this Institution was held at Doncaster on Saturday last; and more than usual interest attached to the proceedings from the character of the communication made by Mr. T. Newbigging on the subject of "Gasholders without Upper Guide-Framing," to which more particular allusion is made in our "Essays" columns to-day. Before the business commenced, the members had luncheon together at the Elephant Hotel; and afterwards adjourned to the Council Chamber at the Town Hall (which was kindly lent for the occasion by his Worship the Mayor, Mr. Alderman Wainwright), where the business was commenced under the presidency of Mr. Thomas Duxbury, of Darwen. The minutes of the last meeting having been read by the Honorary Secretary (Mr. Harrison Veevers, of Dukinfield), two new members were elected—Mr. Tom Settle, Manager of the Gas-Works, New Mill, near Huddersfield; and Mr. William Drewry, Manager of the Gas-Works, Cleethorpes. Thereafter the President took the opinion of the meeting as to whether Mr. Newbigging's paper should be the next business, or the adjourned discussion on Mr. Dalgliesh's paper read at a previous meeting. It was almost unanimously agreed to take the former course; the members doubtless being largely influenced by the fact that not only had Mr. Newbigging arranged for two models to be prepared to illustrate the paper, but that Mr. Gadd, whose invention was to be described, was present, and would thus be able to answer any questions on the subject of his arrangement. The text of the paper is given on the opposite page; and after it had been read, and the working of the models duly explained, a series of questions was addressed to Mr. Newbigging and Mr. Gadd, which led to further interesting information being given. A hearty vote of thanks to Mr. Newbigging, for the trouble he had taken in bringing the matter before the Association, having been passed, it was determined to further adjourn the discussion of Mr. Dalgliesh's paper till the next meeting of the Institution, to be held in November, as Mr. Dalgliesh (who was unable to be present on Saturday) was desirous of supplementing his original paper by some further remarks before the subject was open for debate. Mr. Dalgliesh's supplementary paper is given to-day in another column (p. 374). Before concluding the proceedings, a vote of thanks was accorded to the Mayor of Doncaster for his courtesy in placing the Council Chamber at the disposal of the members for their meeting. At three o'clock, conveyances were in waiting to take the members and a considerable number of friends to view the ruins of Conisbro' Castle, some five miles from the town; but time did not permit of any very extended stay there, as, from the early hour at which the return trains were due to leave Doncaster, it was necessary to complete the items of the programme at a somewhat early hour. The members therefore assembled for tea directly on their return; the main body leaving for Manchester by the 7.40 p.m. train. After tea, a few complimentary toasts were given; among others a special vote was passed to Mr. R. Bridge, the Engineer of the Doncaster Corporation Gas-Works, for his courteous reception of the members, and the trouble he had taken, in conjunction with the Committee of the Association, to render the meeting, as it was, a pronounced success.

THE Boston (U.S.A.) Gas Company have agreed to supply gas for public purposes in Boston proper (during the next five years) at the rate of \$1 per 1000 cubic feet. The old agreement requires the payment of \$1.20.

WE learn that an amalgamation between the Sanitary Institute of Great Britain and the Parkes Museum has taken place, and that the objects of the two societies will in future be carried on by the Sanitary Institute, which has lately been incorporated.

In a circular just addressed to the Council of the London Municipal Reform League, the Chairman (Mr. J. F. B. Firth, M.P.) points out that among the questions which are "ripening for solution" are increased powers to the new Municipal Council for London to be created under the Local Government Act, so as to bring under their jurisdiction the gas and water supply of the Metropolis.

MR. WEBSTER, whose system of sewage treatment has been already referred to in the JOURNAL, has found, since filing the specification of his patent, that the employment of positive electrodes made of any other material than iron is of little or no practical value in treating sewage and similar impure liquids. He has therefore filed an amendment limiting the patent to the use of positive electrodes of iron, except in the case of the filtering process.

THE result of the investigation by the Finance Committee of the Salford Corporation of the matters referred to them in connection with the Town Clerk's tendered resignation, of which mention was made in our columns last week, has been the suspension of this official. The charge against him is one of misappropriating moneys which he has received on account of registers of voters, and which he should have paid over to the Borough Treasurer. The matter is causing considerable excitement in the borough, especially as Mr. Graves has disappeared.

GASHOLDERS WITHOUT UPPER GUIDE-FRAMING.

By THOMAS NEWBIGGING, of Manchester.
[A Paper read before the Manchester District Institution of Gas Engineers, Aug. 25.]

A valuable paper on "The Guide-Framing of Gasholders" was read by Mr. W. H. Y. Webber, of London, at the meeting of The Gas Institute held in Glasgow in 1887.*

In treating of the subject, the author did not advocate or suggest any new principle of guiding the structures in question, but contented himself with endeavouring to show that, by a modification of the ordinary arrangement of bottom rollers (which he proposed to duplicate and strengthen, to bear the extra strain which would be thrown upon them), and by the addition of tangential rollers, the upper guide-framing, or the greater portion of it, might be dispensed with. The present paper is intended to describe a recent invention of Mr. William Gadd, of Manchester, whereby an entirely new principle is introduced, by the application of which a gasholder may be securely guided from the bottom curb; the whole of the elevated framing being done away with, whilst at the same time the strain of wind or snow pressure upon the holder has the effect of producing greater rigidity in the structure. How this is accomplished I will explain immediately.

The weight of the guide-framing of gasholders, as usually designed and constructed, if composed of wrought-iron standards, slightly exceeds that of the floating vessel; and if of cast-iron columns, the weight of the framing is greater still. It follows, therefore, that the cost of the guide-framing of a holder amounts to about one-half the cost of the complete structure.

I have various recent examples of gasholders and their guide-framing, which I have put together in the form of a table, which may be quoted in support of this position.

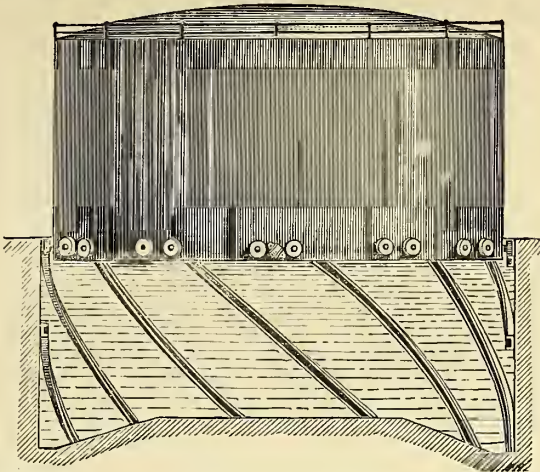
Description.	Weight of Holder or Bell.	Weight of Tank Guide-Framing.	Weight of Upper Guide-Framing.	Total.
	Tons.	Tons.	Tons.	Tons.
Single-lift holder, 50 feet dia., 16 feet high.	18	3	17	38
Do., 72 feet dia., 18 feet high.	44	5	40	89
Do., 80 feet dia., 20 feet high.	47	5	50	102
Do., 80 feet dia., 28 feet high.	49	9	53	111
Two-lift telescopic holder, 80 feet dia., each lift 20 feet high.	70	6	82	158
Do., 80 feet dia., each lift 20 feet high.	61	7	70	138
Single-lift holder, 100 feet dia., 24 feet high.	66	7	75	148
Two-lift telescopic holder, 120 feet dia., each lift 24 feet high.	107	12	86	205

Now, such being the facts, it is evident that if the upper guide-framing of a gasholder could be dispensed with altogether, and equal or greater stability and safety in the rise and fall of the floating vessel secured, a saving of about 50 per cent. would be effected in the cost of construction and erection. An attempt—and, as I believe, a successful attempt—to secure this condition of safety, whilst dispensing with the elevated framing of gasholders, has been made in Mr. Gadd's invention—two models of which I have the pleasure to submit. Like most important inventions, the means for attaining the end contemplated are as simple as they are effective and beautiful. So simple are they, indeed, that the excellence of the invention will be obvious at a glance; and the first thought that strikes us on examining the models is one of wonder that the expedient has never been thought of before.

Briefly stated, the invention for dispensing with the elevated guide-framing consists in placing the channel or other guides within the tank at an angle, like the thread of a screw, instead of in the vertical plane, as has hitherto been the invariable practice. The guide-rollers attached to the bottom curb of the holder are ranged either radially or tangentially with the sides of the vessel; and as they work in the channel or rail guides provided for them, a helical or screw-like motion is communicated to the floating vessel as it rises and descends in the tank. The arrangement is shown in the accompanying figure.

The guides attached to the tank sides may be placed at any angle from 45° upwards. In the models before you they are fixed, one at an angle of 45°, and the other at 60°, which latter is probably the most suitable for single-lift holders. The effect of thus arranging the guides is obvious. So long as the rollers are free to move within the guides, it is impossible that the holder can tilt so as to get out of the vertical; the tendency of wind or other pressure exerted against the sides or on the roof of the vessel being to produce what may be described (imperfectly, however) as a locking action, which will sustain the holder in the upright position, however great the strain, whilst the resisting strength of the rollers and their carriages. Whilst this locking or gripping action gives rigidity to the vessel, enabling it to resist the overturning force, the rollers are perfectly free to rise and descend within the guides.

Adopting Mr. Webber's description—and I see no reason to question its accuracy—that the gasholder, as at present constructed, may be compared to a pole whose lower end is placed in



a socket, though not resting on a base, it may be pointed out that it is just the absence of this bottom bearing which accounts for the inherent weakness of such structures. It will be seen, however, that the holder, as now proposed to be guided, has almost as positive and substantial a bearing as it would have if lifted bodily out of the tank and placed upright on the ground. It is in this that the chief value of the invention consists; for at the present time the tank-guides, owing to their vertical direction, afford no actual security against tilting—their only office being to prevent the swaying of the vessel to and fro when under stress of outside pressure.

It is evident, further—and this is a most important consideration—that immediately the strain comes upon any part of the holder under the new conditions of guidance, the resisting action of the whole of the guides, both front, back, and sides, is brought into operation, one-half the rollers being in tension and the other half in compression; and the vessel is literally held with (to use a paradoxical expression) a grip rigid yet loose.

It will be seen, therefore, that by the proposed new method of construction, the guides within or upon which the bottom rollers work, answer not merely the purpose of guiding the vessel in its rise and fall, but also serve as cramps or grips, withstanding, by their locking power, whatever strain may be exerted against the holder, whether laterally on the sides, or perpendicularly upon the roof. As a matter of fact, the effective capability to resist strain—assuming that the floating vessel and its trussing are sufficiently strong—is only limited by the strength respectively of the guides and that of the carriages and rollers.

It may be suggested that a holder thus guided and kept in the upright position solely from the base, will need to be strengthened in the upper curb, so as to overcome the crushing force exerted by wind on the sides. A moment's consideration, however, will show that this is not necessary. As at present constructed and guided, gasholders are capable of resisting the maximum crushing strain that is exerted by the greatest wind pressure upon their exposed side—i.e., a pressure equal to 20 lbs. to the square foot exerted upon a plane represented by 50 per cent. of the area of vertical transverse section of the holder. The elevated framing does not relieve the crushing strain in any degree; on the contrary, it assists or aggravates it by presenting a rigid support to the leeward side of the vessel. I should scarcely have mentioned this, had it not been urged as an objection.

The only possible danger that can arise is that of distortion or dislocation; and this can readily be obviated by giving the vertical supports or stays inside the holder more of the form of a girder than at present. Probably the triangular form, with the base of the triangle at or near to the bottom curb of the holder, would be the best. These would receive the strains exerted against the sides and roof of the vessel, and transmit them to the bottom curb and rollers, and thus secure the stability of the whole. It will be urged as an objection to this that the effect will be to add weight to the holder which was previously in the guide-framing. Any such addition, however, if required, will be trifling as compared with the weight of the guide-framing as at present constructed, and will be very far from neutralizing the economical advantage of dispensing with this framing altogether.

With the exception above noted, there need be no change in the mode or materials of gasholder construction. It is not unlikely that steel may be employed more generally in these structures than heretofore; and this, whilst allowing a reduction in the weight, will greatly increase the power of the trussing to resist strain from outside.

It may be pointed out that the probable cause of most of the accidents which have arisen in the overturning of gasholders under wind pressure was owing to the want of rigidity in the bottom carriages and rollers, allowing of the swaying to and fro of the floating vessel, thus causing sudden impact against the vertical columns, which have been snapped off by the blow; and the holder, being guided at neither top nor bottom, has been overturned by the wind. It is one of the chief merits of the present invention that rigidity of the rollers is secured as a natural consequence of the method of arrangement of the guides; and is not dependent on either the skill or the attention of the workmen employed in construction and erection.

The ordinary method of counterbalancing gasholders, where counterbalancing is required (as in the case of holders whose

* See JOURNAL, Vol. L., p. 171.

diameter is small when compared with their depth), will not be necessary under the proposed system; for the same result will be obtained by increasing the length of the roller path, by placing the guide-rails in the tank at a less angle.

Perhaps it will be suggested that, with the tank-guides constructed and fixed as described, there will be difficulty experienced in raising the holder for repair when the water is out of the tank. This objection has no force. All that is required under the new conditions is to arrange the lifting screws and chains so that the pull will be in a slanting direction, when the vessel will be raised with as much ease as at present.

Exception may be taken to the invention from an æsthetical point of view. It may be urged, with some show of reason, that the only possible ornamentation in connection with a gasholder is supplied by the elevated guide-framing, and that wanting this the floating vessel standing above ground without apparent support will be a somewhat ungainly object. True, the holder might be ornamented round the top ring with palisade or open chequer-work; and other methods of ornamentation may be adopted. Whether this be so or not, however, appearance will not weigh for one moment with those who are concerned in providing the capital required to be expended on such structures; and neither ought it to do so, when the advantage in the saving of cost is so manifestly in favour of the proposed method of construction. This saving is not confined to the ironwork of the holder, but extends also to the underground tank. The necessity for the provision of piers or counterforts, and large and expensive foundation-stones for the bases of columns or standards, will disappear; the tank for such a holder being cylindrical both inside and outside the walls, from base to summit. Again, in the case of holders made for shipment abroad, there will also be the saving of about 50 per cent. effected in the cost of freight. In these days of active rivalry in the methods of artificial illumination, whatever improvements tend to keep down the capital of a gas-works will be welcomed.

NEW GAS MAP OF LONDON.—Mr. Preston Davies has just completed a new map of the Metropolitan and Suburban Gas Companies' districts, in the preparation of which he has had the assistance of the Engineers of the several Companies whose limits are defined. These are: The Gaslight and Coke, South Metropolitan, Commercial, Harrow, North Middlesex, Hornsey, Tottenham and Edmonton, Lea Bridge, West Ham, West Kent, Bromley, Crystal Palace, Mitcham and Wimbledon, Wandsworth and Putney, Richmond, and Brentford. The map has been arranged for the addition, if required, of the districts of the remoter Companies lying around the Metropolis.

PRESENTATION TO MR. WM. W. GRAY, OF CAMBRIDGE.—Last Thursday afternoon, the *employés* of the Cambridge University and Town Water-Works Company presented to the Manager, Mr. William W. Gray, a testimonial, in the form of a silver-plated biscuit-box, suitably inscribed, as a mark of their appreciation of the kindness they had always received at his hands. In accepting the testimonial, Mr. Gray alluded to his long connection with the Company, which, he said, extended over a period of nearly 23 years; and he remarked that, as they all knew, his first object was the success of the undertaking. In studying that, they were really benefiting themselves. Before the presentation, the *employés* and Mr. Gray took tea together; and the proceedings altogether were of a very pleasant character.

EXTENSION OF GAS SUPPLY IN SOUTH AMERICA.—We learn from an esteemed correspondent that the new gas-works which are about to be constructed at Buenos Ayres, under the supervision of Mr. G. E. Stevenson, Assoc. M. Inst. C.E., will be the largest yet built in South America, and will be capable of manufacturing 1½ million cubic feet of gas daily. The Company which is going to start the works and compete with the existing undertakings is quite a local one, and is on the co-operative principle. The shareholders are gas consumers, and will get 10 per cent. reduction in the price of their gas. The works are being put up by a syndicate, whose intention is to build a number of works in the country. Besides those at Buenos Ayres, they expect to erect others at Rosario, the town of next importance in the Republic, having 70,000 inhabitants. The works there will have a capacity of 600,000 cubic feet per diem. In the town of Paraná, the capital of the province of Entre-Rios, works are to be constructed capable of turning out 100,000 cubic feet of gas daily. These are all indications of a satisfactory extension of gas supply in South America.

RUST ON IRON.—At the meeting of the Iron and Steel Institute in Edinburgh last week, Professor A. Crum-Brown gave a description of the chemical processes involved in the formation of rust on the surface of metallic iron exposed to ordinary atmospheric conditions. He said that iron remains quite free from rust in an atmosphere containing oxygen, carbonic acid, and water vapour, as long as the water vapour does not condense on the surface of the iron. They could follow the whole process of rusting, and divide it into stages; these stages being really separate, if they took proper precautions. When once the process was started, it went on more rapidly, because the porous rust not only did not protect the iron, but favoured, by its microscopic character, the condensation of water vapour from the air as liquid water. A piece of iron, therefore, which has begun to rust will continue rusting in an atmosphere not saturated with water vapour—an atmosphere in which a piece of clean iron would not rust—because the liquid water will condense on the microscopic rust from such an atmosphere, but not on the bright iron.

OIL AND OTHER ILLUMINANTS, AND THEIR EFFECT ON THE CONSUMPTION OF GAS.

By JAMES DALGLIESH, of Glossop.

[Supplementary Paper presented to the Manchester District Institution of Gas Engineers, Aug. 25.]

When reading my paper on this subject at our December meeting in Manchester,* I endeavoured to give the origin of various illuminants connected with artificial lighting—viz., from pine, resinous bark of trees, oily kernel of a nut, fat of animals, and the bitumen and naphthas of the mineral kingdom, in conjunction with a porous material which was provided to be dipped in these luminous combustibles; eventually leading to the invention of the torch, the candle, and the lamp. I also referred to the introduction of our illustrious illuminator of the world—gas; the production and distribution of petroleum oil (its commercial and financial position); and the use of electric light—but as an opponent, gave it as my opinion that oil was the most formidable, owing to its bountiful supply and the means of obtaining it.

I now wish to state a few facts connected with its use; and leave them to tell their own sad tale. A pamphlet circulated by the Hospital Sunday Fund, in June, 1886—entitled, "Within the Hospital Walls"—stated that the House Governor of a London Hospital said: "Every week we have to admit several people suffering from burns and explosions caused by paraffin-lamps; and nearly every week an inquest is held in London on somebody killed by them." Mr. Charles Marvin, who has written largely on the use of petroleum as an illuminant, says "that it is notorious that in every country the increase in the use of petroleum has been accompanied by an increase of accidents; and it was not surprising that I should feel saddened, that, in promoting a larger use of petroleum by my writings, I had at the same time multiplied death and disaster!" About the spring of the year named—on the steamer *Vaira* on the Volga—a paraffin-lamp accident caused the loss of more than 100 human beings. The baths at Scheveningen were burnt down through a paraffin-lamp; and Hampton Court narrowly escaped a similar fate. Captain Shaw, of the London Fire Brigade, says that 10 per cent. of the fires are caused by the paraffin-lamp. On Oct. 18, 1871, a cow accidentally kicked over a paraffin-lamp in a wooden shippin, setting the structure on fire; and the wind speedily carried the flames to an adjoining timber-yard on the banks of the Chicago River. From thence they spread through the whole city, destroying 20,000 buildings, and making 100,000 persons homeless. About 250 persons perished in the flames; and it cost Chicago a sum of nearly £60,000,000.

Throughout the United Kingdom, most distressing accidents and deaths are almost daily recorded in many of our valuable journals; and yet the consumption of paraffin and petroleum oils continues to increase. True, in numerous houses, where the poor of our large towns and cities dwell, there is no provision made by the landlords for the use of gas. There are hundreds, and in some towns thousands of houses where there are no gas-fittings, and the tenants are of such a character that it would be unwise to trust them with a quarter's gas supply; and these go to increase the percentage not using gas. Most of this class used to burn candles, and no doubt have recently substituted petroleum oil as their illuminant. If it had been possible for the engineers and managers of the various gas companies and corporations to have furnished me with the actual number of houses not fitted up for the consumption of gas, and the number with defective fittings, they would have shown gas in a more correct light. In my own district, hundreds of houses are without gas-fittings, and hundreds so wretchedly "hung"—not fitted—with ½-inch gas-pipes, and the rest to match, that tenants cannot use them. I do not think there is a district in the United Kingdom with such bad internal fittings—apologies for fittings; and when before the Committees of the House of Commons and the House of Lords in 1879, seeking for additional capital, &c., the writer exhibited numerous curiosities called gas-fittings, which greatly astonished even the opponents of the Bill.

In the towns shown in the table given with my former paper, where the consumption of gas is from 2,000,000 to 6,000,000 cubic feet per mile of main, there should not be much difficulty to cope with oil or the electric light; and the engineer must be a happy man. But where the consumption is only ¼ to 1 million cubic feet per mile, with 50 to 60 miles of mains and a hilly district, it is a difficult task, particularly when he has always to provide maximum dividends, good gas, &c.—all has to be good, but the manager's salary.

Notwithstanding our numerous difficulties, and the evil times, it is our duty to advance the interests of our shareholders or the ratepayers, as the case may be, and still exclaim: "Heave away, lads, we're not dead yet." Let us hope that good may come out of evil.

THE WATER SUPPLY OF NEW YORK.—The Commissioner of Public Works of New York states, in discussing the water supply of the city, that although 110 million gallons are supplied daily, the increase in consumption has reduced the head 4 feet. In order to economize until the new aqueduct is in operation, the meter system is being rapidly extended. There are now 16,532 meters in use, accounting for 24 million gallons, for which the city receives £164,588. If the whole of the supply were metered, the city should receive at least £1,000,000 per annum, instead of only a little over £500,000.

* See JOURNAL, Vol. L., p. 1091.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

OFFICIAL REPORT OF THE PROCEEDINGS AT THE ANNUAL MEETING IN GLASGOW.

We conclude to-day the publication of the report of the proceedings at the above meeting, commenced in the JOURNAL last week.

On the reassembling of the members after the adjournment for luncheon, the first business was the reception of the report of the Scrutineers (Messrs. J. Cameron, of Glasgow, and A. Mackenzie, of Edinburgh) of the balloting-papers. It showed that the undermentioned gentlemen had been elected as the

OFFICE-BEARERS FOR 1888-9.

President—George R. Hislop, Paisley.

Vice-Presidents—Samuel Stewart, Greenock; R. Robertson, Bathgate.

Secretary and Treasurer—Robert S. Carlow, Arbroath.

Auditor—D. Bruce Peebles, Edinburgh.

Committee—J. M'Gilchrist, Dumbarton; J. Adam, Pollok-shaws; T. D. Hall, Montrose.

Mr. HISLOP: Allow me to thank you all or placing me in the President's chair for the next twelve months. I was inclined to shrink from the responsibility of conducting the affairs of the Association for the coming year. But I must yield to the powerful influence of my friends; and I have to thank you for so unanimously returning me to that position. I shall endeavour, to the best of my ability, to discharge the duties devolving on me as President; and I hope the interests of the Association will not suffer in my hands. I have already been President twice; so that this makes my third election to the presidential chair in twenty years. I was anxious that the duties of this responsible office might have fallen on some other member; but I have yielded to the request of the Association, and I thank you for the honour you have conferred upon me.

PLACE OF NEXT MEETING.

It was agreed to hold the next meeting of the Association at Dunfermline.

MR. KEILLOR'S PAPER.

Mr. G. Keillor (Nairn) read a paper on "Automatic Gas Lighting." This will be found in the JOURNAL for the 7th inst. (p. 246).

Discussion.

The PRESIDENT: Mr. Keillor has succeeded admirably in overcoming the difficulties he had to contend against in lighting the pier-head lamp at Nairn. He did not mention that the pier is 200 feet long; and that the lamp is 500 feet distant from the main, and is raised to a height of 30 feet. You can readily imagine the difficulty of getting along the pier during a storm, when the waves are dashing over the masonry; and I think Mr. Keillor has managed very well to surmount the difficulty. Looking at the matter from a pounds, shillings, and pence point of view, I find that it takes about 13s. to keep a flash-light burning for a year, which is the only other way in which automatic gas lighting can be carried out; so that it would cost five or six times as much to keep up a flash-light as it does for the interest on the first cost of adapting the electric appliance according to the plan brought before you by Mr. Keillor.

Mr. T. D. HALL (Montrose): I am sure we are all very much indebted to Mr. Keillor for the able manner in which he has brought this matter before us; and it is doubtful whether there is one here, connected with the gas profession, who does not know of some place which could be lighted by this method more efficiently than is being done at present, especially steeple clocks, where very often the flash-light is not used, but the lamplighter has to climb a ladder or a stair every time the gas is lighted. For harbour and beacon lights, Mr. Keillor's plan would be very useful, and very convenient.

Mr. KEILLOR: I may explain that the station governor has this effect—that there is an arrangement connecting the top wire, which passes a current up the lamp-post to the lighter. The action of the lighter turns the gas on and off by means of a ratchet. The reverse takes place when we reduce the pressure. The governor falls when the pressure had been brought below 12-10ths, and connects the lower wire.

The PRESIDENT: It may be pointed out that the tap (or cock) which leads to the main towards the pier can be opened and shut. If you open the tap at the entrance to the pipe leading to the lamp, you can regulate the light and put it out. A battery can be placed anywhere, so long as you carry the wire to the lamp. One battery is sufficient.

Mr. W. CHEYNE (Briton Ferry): In our place we have to light a range of lamps three miles out at sea. Mr. Keillor's plan would not suit us, because the tide falls 35 feet, and you could not protect the wire.

The PRESIDENT: The battery can be placed above the highest level.

Mr. CHEYNE: Our system of automatic lighting has worked for five years without any trouble.*

The PRESIDENT: How much does it take to light the lamps?

Mr. CHEYNE: It takes 5 cubic feet of gas per hour to supply a flash-light to 12 lamps. The lamps are lighted every tide during the winter.

The PRESIDENT: But the flash-light is very expensive. If the price of gas is 3s. per 1000 cubic feet, and you burn 1-10th of a cubic foot constantly for every flash-jet, it costs 2s. 8d. a year of 8760 hours; if the price is 4s., it costs 3s. 7d. a year. At the rate of 5 cubic feet of gas per hour for 12 lamps—i.e., $\frac{1}{2}$ cubic foot per lamp—if the pilot light is constantly burning, the cost for gas for a year would be 11s. at 3s., or 14s. 9d. at 4s. per 1000 cubic feet. Comparing these figures with the sum necessary for interest on the cost of the electric gas-lighter, which would only be from 2s. to 3s. per annum, it will be apparent that great economy would result by the use of Mr. Keillor's arrangement.

Mr. A. SMITH (Aberdeen): And Mr. Cheyne's arrangement has to light the lamps every tide.

Mr. CHEYNE: The light has to be furnished for the ships coming into the port twice every 24 hours. You could not carry out a wire.

Mr. KEILLOR: The whole of my apparatus can be fitted up in the lamp itself; and when you send the gas to the lamp, the light is ready.

Mr. CHEYNE: But you would require to put a battery on every lamp?

Mr. KEILLOR: Yes; in your circumstances.

Mr. A. MACPHERSON (Kirkcaldy): The thanks of the Association are due to Mr. Keillor for the excellent paper he has brought under our notice. He has arranged his system very ingeniously, and apparently very effectively. In his case I do not suppose it could be better managed; but Mr. Cheyne's method is possibly the most satisfactory in his special circumstances. I have used electricity for another purpose; and it only shows that, if we take advantage of it, electricity, instead of being our great rival, can be made a very obedient servant, and of great use to us. We fill our district gas-holder about a mile from the works; and on the main through which we send the supply I fitted up a little governor. When the gas is shut off, the governor rises and rings an electric bell, and the man knows he has to look to the pressure at once, so that we have the pressure checked without going to see when the holder is filled. By taking advantage of electricity, we may save ourselves a great deal of trouble—in fact, might even use the electric light, just to show the superiority of gas over it. The thanks of the Association are due to Mr. Keillor for the lucid way in which he has described his model.

Mr. KEY (Tradeston, Glasgow): All these arrangements are very ingenious; and the author deserves credit for his ingenuity. In 1873, the late Mr. Abraham Malam read a paper to the West of Scotland Association, at their meeting in Dumfries, in which he described his arrangements for the automatic lighting of street lamps by electricity.* He had a glass cylindrical jar containing an annular glass cylinder, sealed in acid, forming (with carbon and zinc) a battery. When the evening pressure was put on, the gas was admitted to the outer annular chamber; and, acting on the surface of the acid, sent up the liquor in the inner tube, thereby coming in contact with the zinc and carbon, completing the circuit, and causing the gas to be immediately lighted. When the pressure was withdrawn from the mains, the liquor in the outer cell rose, and that in the inner tube lost contact with the zinc and carbon, and the gas was extinguished.

The PRESIDENT: I am sure it will be of great advantage to us to know, should occasion require us to do similar work, that we have Mr. Keillor's example as a precedent to guide us in respect of automatic gas lighting.

MR. M'GILCHRIST'S PAPER.

Mr. J. M'Gilchrist (Dumbarton) next read the paper on "Selling Gas," which was given in the JOURNAL a fortnight ago (p. 287).

Discussion.

The PRESIDENT: You have heard a very interesting paper, prepared and read in his own inimitable way by Mr. M'Gilchrist; and we shall now be pleased to hear any remarks.

Mr. BELL: Does the money turn the spindle of the index of the prepayment meter?

Mr. M'GILCHRIST: This is a case of contracting with the gas company. If a customer wishes to purchase 1000 feet of gas, he pays his money, and the gas inspector turns on the gas. When the quantity paid for has been consumed, the gas is turned off.

Mr. KEY: From the title of this paper, I expected something very humorous and very racy; and I have not been disappointed. No one but Mr. M'Gilchrist could have put his paper in such pleasing phraseology. I think his plan of engaging canvassers, or those who receive a percentage for the collection of money, for the purpose of canvassing for gas consumption, is a very good one. He might have gone a little further, and suggested the wheelbarrow man; for, in the early days of the Edinburgh Gas Company, bags made of leather or other material were filled with gas, and hawked about the streets in a two-wheeled barrow, and sold to one person here and another there for one or two nights' supply. The customers could then see the volume of gas they were receiving. Meters are a great mystery to many people.

Mr. S. STEWART (Greenock): I agree with Mr. M'Gilchrist that there should be small payments, as there would be much more gas consumed if we had them. I do not think it is right to take large deposits. By doing so you prevent many people from burning gas. I know that many people in Greenock do not use gas because they cannot pay the deposit. I do not think we should

* Mr. Cheyne's arrangement, which was brought under the notice of the Association at their meeting in 1883, was described and illustrated in the JOURNAL for March 6 of that year (p. 413.)

* See JOURNAL, Vol. XXII., p. 682.

press people too hard. Of course, a great deal of caution should be exercised; but I cannot understand why gas companies should expect to carry on their business without risk. Ordinary traders do not ask their customers to make deposits; and I do not see the force of gas companies doing it. There is a very strong feeling against meter-rents; and, in my opinion, meters should be supplied free. I agree with Mr. Key that Mr. M'Gilchrist has given us a very able paper.

Mr. G. R. HISLOP (Paisley): I cannot agree with Mr. M'Gilchrist in the matter of supplying meters free; but I maintain that it would be right to charge for them only the annual cost of maintenance. That is as far as anyone can be expected to go in this direction. No doubt the "power of littles" may be made manifest by encouraging the use of gas amongst small consumers. In Paisley we are very lenient in regard to deposits. We exact them from all parties with whom we are not acquainted; but, as a rule, the deposit is returned on the first account being paid. Suppose we take a deposit of 4s., and the consumer burns 4s. or 5s. worth of gas, the amount is deducted at the end of the first quarter; and I think the justification of this course will be manifest when I tell you that our loss from bad debts is only $\frac{1}{2}$ per cent. on the gross revenue. Though the deposit is exacted, the system we go on does not involve any hardship. We "square accounts" generally at the end of the first quarter; but if we are not very sure about the parties, we continue the deposit until the second quarter. It is all settled up, however, before the end of the year.

Mr. A. MACPHERSON (Kirkcaldy): Like the other speakers, I have to congratulate Mr. M'Gilchrist on the able manner in which he has brought this subject before us, and on the admirable way in which he has treated it. I see no objection to canvassing for consumers. Although it may be a little expensive, it would pay in the end. There cannot be any danger in canvassing on the prepayment system, for we should be sure of our money. Many people would gladly burn gas who do not now use it for the simple reason that they cannot pay the quarterly accounts; but if we had monthly accounts, small consumers would make an effort to pay. They could go to the office and pay for a quantity of gas as often as they pleased; and it would be their duty to watch and see when the gas was about to run out. I cannot agree with the suggestion to do away with meter-rents. I do not think the abolition of these rents is fair. Suppose we put a three-light meter into the house of a consumer who burns (say) 5000 cubic feet of gas per annum, and a similar meter into the house of one who burns 10,000 cubic feet, there is the same amount of capital expended in measuring the 5000 as in measuring the 10,000 cubic feet; and it goes on in increasing ratio for the larger consumer. I think a small deposit is very beneficial until we know the customers with whom we are dealing. If a stranger comes to us for a supply of gas, we ask if he has burnt gas before; and unless he can produce a clear bill for his last payment, we exact a deposit of 5s. until he makes two payments, after which the deposit is cleared off by the next bill. There is one thing, I think, which we ought to impress on the people, and that is that we should have the control of the gas up to the point of consumption. My experience within the last few years has been that speculative builders run up houses to sell; and the gas-pipes are simply thrown in. There is no regard to size or anything else; and the tenants are not a couple of months in possession before a complaint is made that they cannot get gas in some part of the house, and that the lights are jumping. Until gas companies make a determined stand, and say they will not supply any gas until they are satisfied that the fittings are proper, there will be no remedy. If we combine to have the control of the supply, or at least to see that the fittings are properly put into houses, our duties will be simplified, and a great deal of extra pleasure and certainly additional light will be given to consumers of gas in general. If ever such an ideal company as Mr. M'Gilchrist has sketched is formed, we shall all know where to get a most efficient and humorous manager—viz., in Mr. M'Gilchrist himself.

Mr. A. DONALDSON (Edinburgh): Mr. M'Gilchrist does not mention any discount allowed to consumers who pay their accounts within a certain period. I think this is a good plan, and has worked well in several places.

Mr. A. SMITH (Aberdeen): There is a large amount of useful information in Mr. M'Gilchrist's paper. It would be a great matter if we could get short payments, the want of which keeps many consumers back. In regard to the supervision of pipes laid in buildings, I may mention that in Aberdeen building is going on rapidly, and that there is no supervision. We have no charge of the pipes, as our duties, according to our Act, cease at the main. The result is that in many cases the pipes are simply thrown into the houses; and the waste and loss to the consumers are very great. The defects are so serious that wet meters have become of no use, and dry meters have to be introduced. I think the gas-supplying authorities should have the supervision of fittings in houses.

Mr. G. KEILLOR (Nairn): In June, 1887, I brought the subject of weekly collection before my Directors. They thought it would be a complicated and troublesome system; but after I explained it, they saw there would be no risk, and that it would be simply a matter of working out. We have a collection-book specially made up with two double money columns. When a consumer commences on the weekly system, we begin to collect. We enter the quantity of gas consumed, and then total up the collection; and at the end of three months, if there is any balance, it is shown on the other side. When I first started, an insurance agent told me he was quite certain it would not be more troublesome to collect

gas-rents weekly than it was to collect insurance premiums. We have 530 consumers, of whom 113 are on the weekly system, and 57 are new consumers. The money collected from these 57 last year was £109. The collector—a young lad—calls twice a week, on Thursday and Saturday, and we pay him 5 per cent. on the amount brought in. He does the whole of the work in three or four hours each week. Our selling price for gas is 7s. 6d. per 1000 cubic feet, less 10d. discount for cash; but no discount is allowed to those who pay weekly. Gas for cooking and heating purposes is sold at 4s. 7d. per 1000 cubic feet; the supply being by special meter, and, as a rule, by a separate service-pipe.

Mr. HISLOP: Does the consumer pay for the hire of the meter?

Mr. KEILLOR: Yes, for lighting purposes; but not for cooking.

Mr. M'GILCHRIST, in reply, said that he thought the subject of weekly payments and consumers' internal pipes and fittings should be taken up by the Committee, who should prepare and present a report to the Association. Something should really be done to draw in more consumers from the class to which he had referred. Twelve years ago he persuaded the Corporation of Dumbarton to adopt a standard of sizes for internal pipes for the supply of houses; and from that period no pipes had been introduced in new buildings in Dumbarton without being inspected by a representative of the Gas Corporation. If they were, upon inspection, found not to be in accordance with the standard of sizes issued by the Corporation, they were turned out, and replaced by pipes of proper dimensions. The general public were grateful for this action of the Corporation. Upon the matter of discounts for early payments, he argued that, when gas consumers had three months' credit, they should not be allowed more than a month afterwards to pay their accounts. Referring next to the question of meter-rents, he said he was sorry that Mr. MacPherson had not been educated up to the point of supplying meters free; but this was his misfortune rather than his fault. Replying to the argument about the unfairness to the large consumer of not charging meter-rents, Mr. M'Gilchrist said the same argument would apply to a railway company, which would, on the same lines, be entitled to charge more for a 20-stone traveller than a 10-stone traveller. In every business difficulties such as these had to be encountered; and they must be overcome. Customers must be treated not altogether on their individual merits, but according to a broad, general principle, which should apply to every class of consumers, and at the same time tend to forward the interests of companies supplying gas. Mr. Hislop had always been antagonistic to free meters; but he (the speaker) trusted that Mr. Hislop would live to see the error of his way. It would, in his view, tend to the advantage of gas corporations if the charge for the meter was included in the price of gas. When the meter-rent prevented people from consuming gas, the manufacturer should, in his own interest, give way. Consumers of gas should be treated in much the same way as traders treated customers. If complaints should be made, rather than make a fuss about the matter, say: "We will allow it." Gas companies should have a little more of the spirit of give and take about them, and should not stick to the hard-and-fast lines of the past. With regard to deposits, Mr. M'Gilchrist contended that if it was left to the option of gas managers to charge or not to charge deposits, it placed them in an awkward position. Supposing a man were to pay his gas account for two years in succession, it did not follow that he was an honest man. The third year he might run up a bill and not be able to pay, or disappear; and the loss had ultimately to be borne by the consumers who paid their accounts regularly. When a man of dishonest habits got into debt, he sometimes felt inclined to go off to another town rather than pay up his arrears. Therefore, he (the speaker), thought that the deposit system was a check which acted in favour of the company or the corporation, and did no harm to consumers because they got more interest on their deposits than they could get in other securities. He had known cases in Dumbarton where the consumer wanted to increase his deposit because it was a good investment. Mr. Hislop, in speaking of the system adopted in Paisley, said it was an argument in its favour that the bad debts amounted only to $\frac{1}{2}$ per cent. on the revenue. Looking to the gas revenue of Paisley, this must amount to a considerable sum per annum. Were Mr. Hislop to adopt the Dumbarton system, this $\frac{1}{2}$ per cent. of bad debts would appear on the other side of the account. Again, gas companies were not like ordinary commercial firms in the matter of customers. The ordinary trader could select his customers, and sell only to such as he approved of; whereas an incorporated gas company must supply gas to every ratepayer who applied for it, irrespective of his financial standing. Mr. M'Gilchrist concluded by saying he was glad that the subject which the President had selected for him had been so well received by the gentlemen present.

MR. SMITH'S PAPER.

Mr. J. Smith (Rosewell) then read a paper on "Regenerative Furnaces for Small Gas-Works." It appeared in the JOURNAL for the 14th inst. (p. 288).

Discussion.

The PRESIDENT: I hope you will enter heartily into the discussion of this subject, which is a most interesting one, and one which is intimately connected with the success or otherwise of a gas company. I trust that those who have a direct interest in, or who intend to adopt a similar furnace, will take part in the discussion.

Mr. ALEX. SMITH (Aberdeen): There is no question that this

gentleman deserves great praise, for he has accomplished a smart piece of work. There is one point to which I wish to direct attention, and that is the position of the producer. It appears to me that he would have some difficulty in taking the clinker off the sides, on account of being so far under the setting. We are told that the cleaning out is done only once in 24 hours. I should have thought it would have had to be done more frequently—perhaps once every six hours. There is no doubt this is a step in the right direction.

Mr. S. STEWART (Greenock): I have to congratulate our friend on his very ingenious arrangement. I approve of the system of having the producer inside. In the Klönne bench we take out the clinker once in every 48 hours; the time depending on the fuel used. If we are careful to choose a fuel containing a small percentage of ash, the clinkering may not be required for a considerable time. Mr. Smith's arrangement is useful, because it allows the use in small gas-works of only a few retorts in one oven; and, what is much more important, it enables them to keep the retorts in heat during the night.

Mr. D. YOUNG (Dalketh): I have visited the Rosewell Gas-Works, and seen this furnace in operation. I went there on a Monday forenoon, when the furnace had not been cleaned out for 60 hours; and in the retort-oven there was a good working heat. I have put in a setting on this principle; and if it produces the same heat, working spent shale and a not very good splint coal, I shall be well satisfied.

Mr. W. KEY (Tradeston, Glasgow): Mr. Smith deserves great credit for this setting. He has taken a decided step in advance; and those who alter their settings to save labour and wages and fuel do great good to the gas profession. This is a simple arrangement; and it speaks volumes for Mr. Smith's ability that he has to draw his clinker only once in 24 hours, while keeping up a good heat.

The PRESIDENT: I gladly join the members who have spoken in thanking Mr. Smith for bringing this subject before us in such an interesting way. No doubt it has cost him much thought and trouble; but he will gain advantages in many respects from the use of this furnace. Perhaps at a future meeting Mr. Smith will favour us with the fuller results of the working of the furnace.

Mr. SMITH: Mr. Young has kindly answered one of the questions in regard to the length of time which elapses between the cleaning of the fires. We generally clean the fire every day except Sunday. The clinkering at first caused us some difficulty; but since we began to use spent shale, clinkering, in the sense of clinkering, has not had to be resorted to for three months. If we just touch the clinkers, they loosen without difficulty, and the stuff falls away.

The PRESIDENT: You speak of not clinkering on Sundays. Do you work the retorts on Sundays?

Mr. SMITH: There is not much difference in the quantity of fuel used on Sundays as compared with other days.

Mr. KEY: Will Mr. Smith inform us how he gets the clinker off his furnace-bars, where the primary air comes into contact with the fuel?

Mr. SMITH: We never try to take the clinkers off there. There is a quantity of black ash at the bottom; but there is nothing spread on the bottom to make clinkers. Whatever clinkers there may be are on the top, where we can easily get at them.

MR. KEY'S PAPER.

Mr. W. KEY (Tradeston, Glasgow) read the last paper, which was on "The Scrubbing, Condensing, and Washing of Coal Gas," and has already appeared (*ante*, p. 290). After reading his paper, the author experimented with crude oil, to show how its contact with gas deteriorates the illuminating power. He explained that when he made the experiment with oil at a low heat, the effect was to put out the gas; and he accounted for the failure of his experiments in the presence of the members by stating that the oil was at too high a temperature.

Discussion.

Mr. J. DONALDSON (Lochwinnoch): I think the thanks of the members are due to Mr. Key for his able paper, dealing as it does with an entirely new departure in gas manufacture. I consider that the plan of taking the tar from the gas before it enters the condensers is a valuable one, and that a very great saving will be effected by so doing. It should recommend itself to all gas managers. As Mr. Key would have shown by his experiment, the illuminating power of gas is depreciated by coming in contact with cold oil; and by his arrangement this would be much reduced, and the gas kept up to the standard illuminating power with a much less quantity of rich coal. This is no new idea of Mr. Key's, as he mentioned it to me more than a year ago.

Mr. P. WATSON (Stirling): Is this a patent?

Mr. KEY: No.

Mr. WATSON: Is it working anywhere?

Mr. KEY: It has only been working on the small model I have shown you.

Mr. A. MACPHERSON (Kirkcaldy): We are obliged to Mr. Key for his excellent paper, and for the exceptionally fine diagrams with which he has illustrated his remarks. I have had a notion for a long time that it is wise to separate the hot gas from the tar as soon as possible, and not allow them to travel together, as the illuminating power is thereby deteriorated. Mr. Key's proposal, therefore, is nothing new. In regard to the scrubbing arrangement, I think it is a good one. I do not mean to say that Mr. Key's apparatus is the best that could be adopted; it is the

principle I am speaking of. Some years ago, when Mr. Miller, of Innerleithen, brought the subject before us, he worked on the same principle. He had converted a large disused tank into a sort of settling-pit, where the gas was allowed to separate, and the tar to drop. I have no doubt this "whisking" of the gas will have the effect he says the machine will have, of extracting a large proportion of the tarry particles from the gas before it passes on. Then in regard to the condenser, there is no doubt that if he keeps his condenser pipes clean by extracting the tar, he will have far more effective working from his condenser than if it were to become coated inside with tar. The condensing of gas is a thing that does not receive sufficient attention. The condensing apparatus ought to be thoroughly under the control of the manager of the works. I can maintain my illuminating power by watching the temperature at which the gas is being discharged at the outlet of the condenser. In this respect, Mr. Key is bringing forward a principle which is well known to us, but which is perhaps not acted upon so fully as it might be. I know a number of people who would rather have a low temperature at the outlet of the condenser, at the expense of the illuminating power, than measure the gas hot. An apparently large leakage account is no loss, but a profit. By reducing the temperature of the gas to perhaps 30° or 40°, we effect a saving on the register of the station-meter, but at the cost of the illuminating power of the gas; so that it is really no saving at all. Though you have a higher leakage account, it may not be a loss but a gain. The temperature at which the gas is discharged from the condenser is, I consider, a most important element. In regard to the scrubbing arrangement, I am not quite sure that it will be effectual. There will be a certain amount of tarry matter carried forward; and I am afraid the corrugated sheets will become clogged up. Mr. Key's apparatus reminds me of Mr. Whimster's washer turned upside down, or that of Mr. Reid, of Leith. It is a little varied in construction, but the principle is the same. There is no doubt that, in purifying gas, intimacy of contact between the washing material and the gas is the main thing before we can hope to accomplish the object at which we aim. If this is effectual, and gives us intimate contact, the machine will be successful. In regard to the failure of Mr. Key's experiment, I do not see how he could expect to have success, because he tells us he took the oil from the inside of the gasholder. Instead of reducing the illuminating power, I think he should increase it. Of course, if you put in oil from an oil-works it will be different. I know nothing worse for reducing the illuminating power than a fine naphtha tar in the bottom of the washer.

Mr. G. R. HISLOP (Paisley): With a great deal of what Mr. Key has said I agree; but there are various opinions entertained on some of the points he has brought under discussion. There is no doubt that this is a new feature in washing gas. In my opinion, it matters little where you get rid of the solid particles, if you do get rid of them. There is no doubt of the damaging effect of some condensers on the illuminating power of the gas; and for this reason we have long ceased to put up condensers in the old form. We have pipe condensers; but they are different from what is known as the ordinary pipe condenser. The pipes are set in rows, and closed in a tank at top and bottom; and as they are made exactly level, the water runs down the pipes, and they are kept as clean as if they had been washed with a brush. That is the form of condenser I have adhered to for a long time. I agree with Mr. Key as to the effects of tarry matter in the other form of condenser, and therefore I have discontinued its use. I make it a point to have the temperature of the gas carefully examined. It will be found to be a great advantage to maintain the temperature as high as possible, even at the risk of losing a large quantity of ammonia. The benefit of maintaining a high heat is great, because the hydrocarbons are deposited in the main, and they are largely lifted up again and carried away. What is deposited in the colder weather is immediately taken up again. It is important to keep the temperature as high as possible, consistent with taking the impurities out of the gas on its way to the station meter. I aim at keeping it at 55° in winter; and it is a rare occurrence if it goes down to 50°. From the time the gas leaves the condenser until it gets to the end of the scrubber, I lose perhaps 15°; so that were I to take observations at the end of the condenser, my gas would be seriously deteriorated before it reached the end of the scrubber.

Mr. J. M'CRAE (Dundee): The first thing that occurs to me is that we ought to be indebted to Mr. Key for the manner in which he has brought this subject before us; but although we may admire his diagrams, that is no reason why we should adopt his theory without examination. I ask what benefits are to be derived from adopting this process. Has it been worked in any place? Is it not a fact that this corrugated iron will be seriously affected by the foul gas passing along? Will this corrugated iron not be filled up, so that you will have two smooth surfaces rubbing together? In regard to the placing of the scrubber before the condenser, it is like putting the cart before the horse. We have all learned that the gas should be gradually lowered in temperature, and that the temperature should be noted at certain points with care and regularity. I presume this is done in all well-managed gas-works. Mr. Key censured the adoption of annular condensers. I do not see the force of that. In my opinion, there is no part of the process of gas manufacture so little known to the gas engineer as the effect of condensers on the heavy hydrocarbons contained in coal gas; and I question whether we, after leaving this hall, shall be very much further enlightened by what we have heard. He has been severe on annular condensers. As an engineer who has erected annular condensers this falls heavy.

What is the meaning of a condenser? Do you not depend upon the weather; and must not the condenser be affected by the temperature prevailing at the moment? It is quite true that in winter you must use means to check excessive condensation. This is done in all well-regulated works. The temperature is taken into account; and the moment you go below 70°, you close the sluices of the internal pipes of the annular condensers, and thereby the condensing power is reduced, and the gas kept at an equal quality. I should like to know the cost of this apparatus as compared with the annular condenser, and also to be informed what is to be gained by using it. We should know how far, and to what extent, the various temperatures affect the illuminating power of the gas. A very important difference exists here, and it is not commonly known; but it is well that it should be understood. For example, if you, with a certain mixture of coal, supply 26½-candle gas in the summer time, what quality of coal would you require to use to supply a similar quality of gas in the winter time? This is a point which many have overlooked; and it demands much consideration. It is well known that excessive temperature, either high or low, has a decided effect on coal gas; and the question ought to be suggested for solution to some gas manager who has the means of ascertaining what that effect is. Some years ago, another Gas Association took up this question; but I do not know that very much good came of their investigation. I think some definite results might be arrived at, and information obtained which would be important to us all.

Mr. A. SMITH (Aberdeen): It should be borne in mind that there are a great number of annular condensers being erected; and unless Mr. Key has something definite on which to condemn these appliances, I do not think he should have brought the subject so prominently forward. The annular condensers occupy much less space than the pipe condensers; and you have the same power over the one as over the other. I think a number of condensers should be thrown out of use during the cold weather. From the discussion of this paper, I do not consider we should run away with the idea that there is no condenser right, but the one adopted by Mr. Hislop. That would be most absurd. Mr. Key's diagrams of his scrubbers are very beautiful. But I am a good deal of the opinion of Mr. McCrae, that you must have means for washing them out; and my experience is that the simpler you can make apparatus for gas manufacture and purification the better. To my mind, Mr. Key is, in this respect, taking a step in the wrong direction. I am not so sure that driving the gas at the rate of 300 revolutions a minute is calculated to improve it. If this is found to be good, a jet of steam would clean the corrugations. Although I cannot agree with Mr. Key, I thank him for bringing forward this subject.

Mr. HISLOP: I hope Mr. Smith will not go away with the idea that I hold that there is nothing in creation like the condensers I have. I simply stated what I had adopted in preference to other kinds. Many of these things are merely matter of opinion; and I simply put forward my ideas on the subject.

Mr. MACPHERSON: Mr. Smith included me as one of the condemners of annular condensers. I did not condemn them, because I think that properly constructed annular condensers can be as well controlled as any others.

Mr. S. STEWART (Greenock): I quite approve of what Mr. McCrae and Mr. Smith have stated in reference to the use of annular condensers.

Mr. KEY: The object of my paper was to raise a discussion; and I am pleased with what has taken place, because it was for the purpose of obtaining an improved method of conducting our business that the paper was prepared. Mr. MacPherson agrees with me as to the temperature to be maintained throughout the apparatus; but when he comes to the washer, he expresses the fear that it will become clogged. That is an utter impossibility, as the water and the clean gas can never clog up the corrugations by this arrangement.

Mr. MACPHERSON: We have had examples of clogging in other things.

Mr. KEY: At 60° it is an impossibility; but if you go down to freezing point, you will have naphthalene. As to the form of the washer, Mr. MacPherson says it reminds him of Mr. Whimster's or Mr. Reid's; but they are not at all alike. The principle of Mr. Whimster's is a system of boxes; and Mr. Reid's is a long vessel with a revolving cylinder, and having a number of trays lifting up water, which percolates through to the gas. I say that it is spray that is wanted, and not drops of water. Anyone looking at it will see that there is no resemblance to either Mr. Whimster's or Mr. Reid's plan. Mr. MacPherson thinks the oil may be expected to enlarge the flame of the gas; but I am perfectly certain that, when at a low temperature, the oil will depreciate the gas 50, 60, or 80 per cent. I shall keep some of this oil for the purpose of making further experiments; and perhaps you may hear of it again. Mr. Hislop seems to think it does not matter how or where we get rid of the tarry particles, so long as we do get rid of them; but I hold that we should remove all the tarry matter from the gas before we pass it into the condensers. I propose to take it out before it enters the condensers, leaving the coolers and condensers to do their own work. Mr. Hislop agrees with me about the annular condensers. Others may have different methods of arriving at their conclusions. I have noticed the thermometer inside an annular chamber go up when the sun rose; and I have seen it go down 20° in five minutes in a shower of rain. The condenser I recommend is something we can go by—something we can regulate by the movement of a lever. Mr. Hislop also

agrees with me about maintaining the heat, and as to the loss of temperature between the condensers and the scrubbers. He has told us it often loses 15°—just what I stated in my paper. Mr. McCrae has asked what benefit will be derived from this arrangement. I cannot give the benefit in pounds, shillings, and pence; but I have formed a very good opinion of the loss sustained under the present system. I say that at least 10 per cent. of the value of your coal will be saved every day during winter by this arrangement. What other benefits will be derived can only be found out when the system is put into operation. As to the choking of the corrugations, I say it cannot be, because, with gas passing in at from 120° to 160°, such a thing as any solid matter being there is an impossibility. The liquor I obtained at the outlet was very liquid indeed.

The PRESIDENT: While thanking Mr. Key for his paper, I must say that it would have been of much more value had he given us some practical results. A pound of theory has been in vogue; but what we want is the ounce of fact. If he had put the apparatus to the test, and given us some facts after he had had it in use, it would have been much better for us all. He has spoken of having had it "in pickle" for a number of years. It would certainly have been better if he had put it in operation. We have for some months been working with an apparatus at Dawsholm, but do not mean to say anything about it until we are able to state something definite. It was premature on the part of Mr. Key to give us only theories; he should have waited until he could show us actual results. The 10 per cent. saving of coal on which he reckons is merely a matter of assertion. It is easy enough to say such a thing; but if there is nothing to support it, it would have been far better if it had never been said. We have now come to the end of the list of subjects for discussion; and I ask you to accord a hearty vote of thanks to the readers of the various papers. They have added very much to the success of the meeting; and I think we shall go away much the better for all we have seen and heard.

THE PRESIDENT'S MEDAL.

Mr. J. McCRAE (Dundee) said that there were two very pleasant features characteristic of the Scotch gathering of gas managers. In the first place, the meeting was always agreeable; and, in the second place, its end was always pleasant. They had come to the close of one of the best meetings the Association had ever held; and a very pleasing duty had fallen on his shoulders, to present Mr. Terrace with the highest honour the Association could confer on him—viz., the presidential gold medal. It was not alone the intrinsic value of the medal, but it was something to hand down to one's children, to show the estimation in which he was held by his brethren in the craft; and he was sure no one who had preceded Mr. Terrace had more worthily earned the distinction than their present President. With these remarks, he asked Mr. Terrace's acceptance of the medal, assuring him that every member of the Association, absent as well as present, wished him many years of happiness and prosperity.

The PRESIDENT thanked the members for their great kindness in awarding him the medal, and Mr. McCrae for the happy manner in which he had expressed their sentiments in making the presentation.

VOTE OF THANKS TO THE SECRETARY.

Mr. HISLOP said the meeting should not be allowed to break up without remembering one gentleman who had done so much to ensure its success—viz., the Secretary; and he had great pleasure in moving a hearty vote of thanks to him for the energy and ability he had displayed in conducting the affairs of the Association.

The proposition was carried with applause.

Mr. CARLOW, in returning thanks, said it had been a great pleasure for him to be their Secretary during the past year; and if he had done anything to further the business of the Association, and make the meeting a success, he was amply repaid by seeing so large a gathering of the members.

This concluded the business of the meeting.

In the evening the members and their friends dined together in the Royal Bungalow of the Exhibition—Mr. Terrace presiding. After dinner some time was spent in viewing the exhibits. The following day an excursion was made from Glasgow to Lech Lomond and Loch Long; a pleasant day being spent.

In his report on the technological examinations of the City and Guilds of London Institute for the present year, Sir Philip Magnus (the Organizing Director) says that there has again been a large increase in the total number of candidates. In 1887, 5508 were examined, of whom 3090 passed; in 1888, 6166 were examined, of whom 3510 passed. The increase in the number of candidates is 86 less this year than last. Examinations have been held this year in 49 different subjects, in seven of which less than ten candidates presented themselves. The subjects in which the least number of candidates came up are those connected with the chemical industries; and the Examiners in these subjects generally remark that few of the candidates are found to possess that combined knowledge of scientific principles and of technical processes which is desirable. The average percentage of failures has fallen from 43·8 to 43·1; and from the separate reports of the Examiners it appears that in most subjects there is a distinct improvement in the quality of the candidates' written answers and practical work. Of the 3510 successful candidates, 758, or 21·6 per cent., have passed in the Honours grade, as against 21·9 per cent. last year.

NORTH OF IRELAND ASSOCIATION OF GAS MANAGERS.

THE PAPERS READ AT THE ANNUAL MEETING AT LISBURN.

In the JOURNAL last week we published a general report of the proceedings at the first annual meeting of the above-named Association, held at Lisburn on the 14th inst., with the Inaugural Address delivered by the President (Mr. E. Stears). We give to-day the three papers read, with the discussions which took place thereon.

Mr. W. R. FEATHERSTONE (Dundalk) read the first paper, entitled—

THE UTILIZATION OF TAR AT DUNDALK.

The low prices offered for tar at Dundalk caused me to use up all my surplus; and, after 18 months' experience, I estimate the value of our tar to be at least 30s. per ton. We have no steam power to spray the tar, yet for weeks no coke was consumed; tar taking its place in the furnaces.

The following extracts from our annual statements of accounts prove the value of tar:—

Cash received by Sales each Year ending June.

	1885-6	1886-7	1887-8
	£ s. d.	£ s. d.	£ s. d.
Coke	553 5 2	603 14 4	795 10 5
Tar	104 0 4	91 15 8	150 5 1
Liquor	28 3 9	35 16 4	51 11 5
	£685 9 3	£731 6 4	£997 6 11
Coal carbonized	2943	2776	2764
	Tons.	Tons.	Tons.
Coke sold without tar burning in 1887			670
Do. with do. in 1888			1015

Increased coke sales in one year = 345

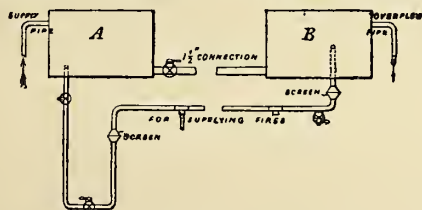
The surplus tar was used in various ways. It was employed for firing retorts; for roadways and footpaths; for the gasholders, in lieu of paint; for mixing with fire-clay, to repair the furnaces, retorts, &c.; and for stopping leaks in the gasholder tank.

In making tar concrete, the material—cinders, stone riddlings, gravel, &c.—should be first drenched with water, and regularly puddled. Then add 1 gallon of tar to 3 bushels of material, and thoroughly mix into a slush. Do not heat either stuff or tar. This mixture can be laid at any time in dry weather. For the retort-house, a flooring of tar concrete is hard and clean. It stands heat, rough carts and horses, tipping coals, with the usual turning, backing, &c. After twelve months, it is a decided improvement over the stone paving it replaced, as one man can run 5 cwt. of coal in a handcart with less trouble than 2 cwt. with the old paving. The main flue does not affect it, running underneath. To lay concrete, first get a good foundation by levelling and rolling. Spread the mixture, drench it with water, and roll and pour on water until both tar and water issues out in streams, and a skin forms on the surface. Leave it to dry; then coat it well with boiling tar and 1 pint of paraffin oil to a gallon of tar—about 1 gallon of tar and oil to 5 square yards; then dust it over with sand, and in ordinary summer weather it will rapidly dry, set, and become waterproof. This can be thoroughly well done for from 9d. to 1s. per square yard. For tarring the gasholder, I first scraped off all the old paint, and then coated it thinly with hot tar, thinned with paraffin oil.

To ascertain the daily stock of tar in the yard tank, an old meter-case forms a float, weighted to sink in liquor but float in tar. A staff with a pointer indicates the height of the tar; and, with very little assistance, the float can be raised to the top of the liquor, and thus determine the depth of both tar and liquor separately.

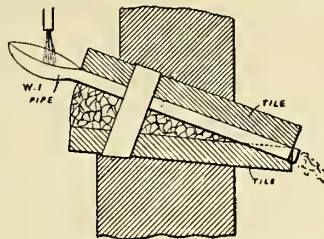
I do not consider it advisable to burn tar closer than 2 feet, or even 2 ft. 6 in., from the point of ignition to the bottom of the retorts, without protection. I make the tar-burner to swing out of the way like an ordinary bracket; and find brass or lead nipples better than iron.

In using tar for firing, I employ the arrangement shown in the drawing. The tar is lifted direct from the yard store-tank by an ordinary force-pump fixed against the wall outside the retort-house, into tanks placed upon the retort-beds, two tanks to a bed, connected direct by 1½-inch pipes along the top of the bed. The tar is supplied to the burners by a ¾-inch service-pipe, taken from the bottom of the tank A. This pipe descends to within 2 feet of the retort-house floor; then rises where a screen is fixed, and runs



along the front of the mouthpieces to a similar screen. But the pipe enters the tank B 12 or 15 inches higher up. Along the front, tees (plugged up) are fixed, to screw on a bracket as required. The advantages of this arrangement are that the tanks can be easily emptied, vapour does not form in the pipes and cause a bad flow, but a circulation is formed; and when the tar is low, the vapours do not block the pipe. The screens cleaning the rising tar do not clog; and the flow can be reversed, and screened tar used to clean its own screen—any sediment being run off at the tap.

The furnaces consume coke only when it cannot be sold, or when the tar is low in the tank. A lump is made with two tiles, banded and packed wedge-shape; and into these grooves are cut for a



1½-inch wrought-iron pipe, opened at the end to receive the tar. They are let into the wall over the furnace-door when a coke fire is converted. A coke fire can be turned into a tar-burning fire without any stoppage.

Discussion.

The HONORARY SECRETARY (Mr. J. Whimster, of Armagh) said he was very glad to have heard Mr. Featherstone's paper, which was upon a subject of the deepest importance to every member of the Association. It was a great thing, in his opinion, to have the means of utilizing tar satisfactorily; and it seemed to him Mr. Featherstone had been very successful in his work. With reference to the portion of the paper which dealt with the use of tar for the making of roads, he was very much surprised at the idea of drenching it with water. He had hitherto believed that it was necessary, for the successful employment of tar in this way, that it should be kept as dry as possible; but he now saw his mistake. He thought this idea of Mr. Featherstone's a very useful one. Again, with reference to the burning of tar, Mr. Featherstone's description of the system he adopted was most interesting; and he (Mr. Whimster) was sure the author had hit upon the right thing in that respect. It was a most reasonable and sensible one, and had in Mr. Featherstone's hands worked with most satisfactory results. He was very glad to have had the opportunity of hearing so practical a paper on such a subject; and he was sure the information it contained would be useful to them all.

Mr. J. GIBB (Newry) desired, with the Secretary, to express the pleasure it had given him to hear Mr. Featherstone's paper, which contained a great deal of information that would prove useful to them. The subject was, as Mr. Whimster had stated, one of the very greatest importance to them, because they could get little or nothing for their tar; and it was of the utmost importance to them that they should have a satisfactory mode of utilizing it. The arrangement which Mr. Featherstone had described to the meeting was an excellent one; and the author had introduced several things of which he (Mr. Gibb) had no idea. The arrangement by which Mr. Featherstone had obtained complete circulation of the tar was certainly ingenious, and overcame several great difficulties. He wished to express his appreciation of the valuable hints the paper contained, and which he thought might be taken advantage of by them all with profit. There was one point, however, which he did not catch very clearly when listening to the reading of the paper, and upon which he would be glad of a little more information, and that was exactly how far the pipe from which the tar issued was allowed to project into the air.

Mr. FEATHERSTONE said he had already fully explained in his paper how the tar was introduced into the furnace; but he might say further, in reply to Mr. Gibb's question, that the pipe conveying the tar was put just so far into the furnace that the tar, on issuing from the end of the pipe, dropped right into the middle of the fire.

Mr. GIBB said he had another question which he would like to have answered, and that was with regard to the smoke resulting from the burning of the tar. He wished to have some information as to the arrangement by which Mr. Featherstone got rid of the smoke, as he did not deal with this matter in his paper.

Mr. FEATHERSTONE replied that the tar burned with a white flame; and there was no smoke from it. Consequently, there was no smoke to get rid of.

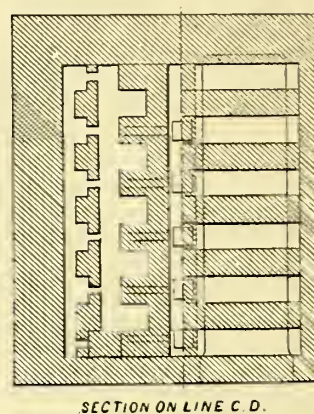
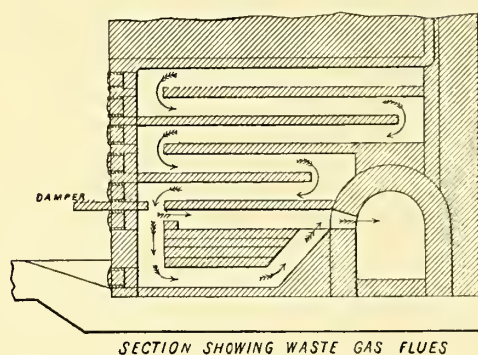
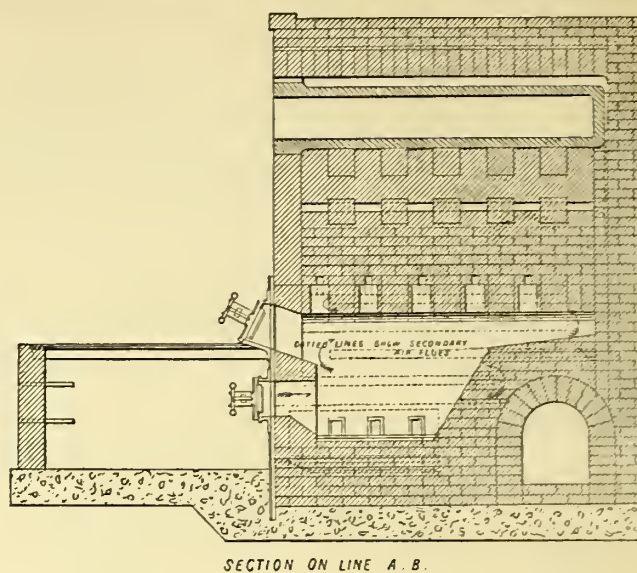
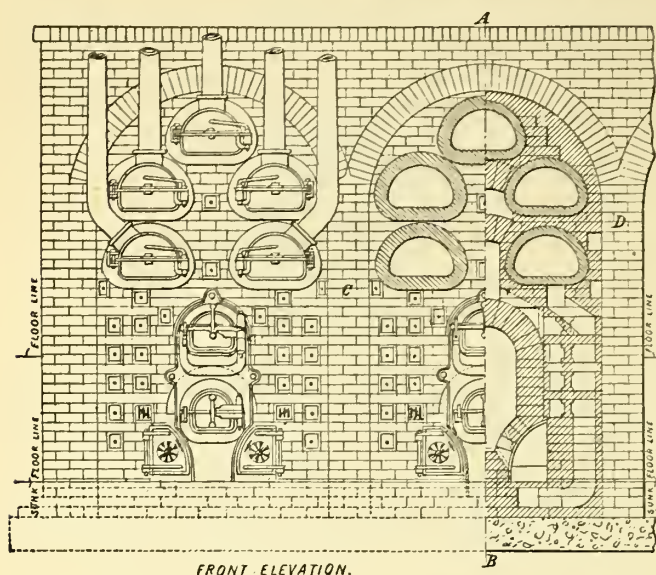
The PRESIDENT remarked that the fact that there was no smoke showed that the tar was being consumed.

Mr. FEATHERSTONE said this was perfectly correct. If the fires were all right, the tar was completely consumed; and therefore there was no smoke. It was necessary, however, in order to obtain the complete combustion of the tar, that the fire should be kept up to the proper heat; and the tar burned so brilliantly in the furnace that at night it looked like a star.

The PRESIDENT said they were all much obliged to Mr. Featherstone for his paper, and also for having answered the questions put to him.

Mr. A. WADDELL (Newtownards) next read the following paper:— EXPERIENCE WITH MR. G. R. HISLOP'S REGENERATIVE FURNACES.

The regenerative system of heating has, up to the present, received very little attention from gas managers in this country. Indeed, one would think from the results claimed for it by English and Scotch managers who have adopted it, that it would long ere this have obtained a footing on this side of the Channel. But perhaps, we are all too slow to move out of the old ruts of ordinary routine, and adopt the newer methods which the more daring or



more speculative spirits have attempted, and in some instances with marked success. It may be that we are all too conservative of what has the stamp of approbation from those who have made gas so successful as an illuminant in the past, and fear to differ from them or cast a reflection on their judgment. Others perhaps may have been deterred from giving the system a trial, lest the cost should exceed the profit; or they may have had serious doubts as to the genuineness of the claims put forward on its behalf. Be that as it may, I think I am safe in saying that the system has not been adopted yet in any part of Ireland, except in Newtownards; and therefore I consented the more readily to give you the result of my limited experience.

Whatever system can show the most favourable results on the year's operations must, of necessity, carry the day. Gas has now two very powerful opponents, each competing for a share of the patronage of the public—electricity and oil. The latter is a very powerful opponent, because of its cheapness; the other, because of its brilliance. Therefore gas, to hold its own, must be produced at the lowest possible price; and, in order to do so, the gas manager must be keeping his eyes open to every improvement which promises a saving of expense or an increase of production. I do not know that I can serve the North of Ireland Association of Gas Managers better than by simply telling them what I have done, and with what results.

At the beginning of November last, I had completed the work of taking down two old ovens containing four retorts each, and replacing them by two new ovens with settings of five retorts, heated by Mr. G. R. Hislop's gas producers and regenerators. During the last few years the regenerative system of firing has formed the subject of many instructive and interesting papers read before Gas Associations; and I think you will agree with me that the conclusions to be drawn from them, and the discussions which followed, are that to obtain a uniform heat throughout a setting, combustion must take place not at one part, but along the whole length of the oven, and that it is desirable to take as much heat from the waste gases as economy will allow. Few managers even of large works care to adopt elaborate and consequently expensive regenerators; while managers of small works find the cost absolutely prohibitive. The conclusion, therefore, is in favour of the shallow-chamber principle, such as forms the subject of this paper.

I will endeavour to describe to you, with the assistance of the diagrams, Mr. Hislop's system, so that you may judge how far it meets your approval or otherwise. The producer is 3 ft. 6 in. high, 1 ft. 9 in. wide, the bottom 3 ft. 6 in. in length, formed by arches as shown, being supported and kept air-tight by cast-iron plates, each having three port-holes through which primary air passes, after being adjusted (as desired) by discs in air-tight doors. Underneath these port-holes a pan containing water is placed, which has part of the waste gases carried under it, so as to

evaporate steam in order to soften any clinker that might form, or to keep it from forming. This saves the expense of raising steam and laying down steam pipes, and only requires a water pipe introduced on the top of the triangular door frames, from which the water drops into the ash pans. The top or arch of the producer is continued the full length of the oven, having port-holes in the centre, through which the producer gases pass into the combustion chamber, and meet the secondary air supply, which has been heated by travelling along flues situated between the producer and the waste gas flues; passing finally by port-holes into the combustion chamber directly opposite the gas producer port-holes—causing the gases to mix well. The sides of the combustion chamber are formed by the same wall that protects the sides of the bottom retorts, on which arches rest; leaving port-holes equal in area to one-half the top of the chamber, from which the gases travel over and around the retorts and underneath the bottom retorts to the waste-gas flues, heating the secondary air, &c., and thence to the chimney. There is not in the whole building one specially-made brick. The setting is easily built; and every one of the flues can be readily got at if they require cleaning. But this I have had no need to do; the whole setting being quite clean after a season's work.

Some of the advantages of this over the old or direct system of firing, are regularity of heat in the retorts, and greater control over the heat when stopped working, obtained by shutting the dampers and discs. One fire will then last ten or twelve hours; and even then there is heat sufficient to burn off a moderate charge in four hours. This is a great advantage where there is a desire to do away Sunday labour, or in small works where in summer enough gas is made in 12 hours to serve for 24 hours.

In adverting to the results, I may say that we have been able to make at the rate of 8000 cubic feet of gas per mouthpiece every 24 hours—an increase of 60 per cent. as compared with the old system of firing; for then it was difficult to maintain a make of 5000 cubic feet per mouthpiece every 24 hours. We charge the retorts every four hours; fill the producer every three hours; and clean the same once every 12, and sometimes once every 24 hours. But as this means only the drawing of ash or soft clinker from the bottom door by a rake, and dropping the contents of the producer (meanwhile held up by a thin arch of clinker, preventing the cold air from entering the oven during the process), this seldom takes more than two or three minutes. The saving of labour is thus very considerable. Judging from the condition of the retorts as they now are, I have good reason to believe that they will last one-half longer than when built in an oven heated by a direct fire. The appearance of the producer and regenerators also justifies me in saying that they will last at least two, if not three, settings of retorts. During the same time, if working with common furnaces, it would have been necessary to rebuild and repair them a dozen times; so that, although the common furnace is much cheaper at

first, the expense of rebuilding and repairing it for say six years, would make it nearly as expensive per annum without any of the important advantages.

Since introducing this system of heating, we have made 560 cubic feet more gas per ton than formerly, with 30 per cent. of the coke produced; and I have no doubt we shall be able to do better this year. From the beginning, we have had continued satisfaction; and I would not for a moment think of resetting any retorts on the old plan of firing. My opinion is that this system will continue to force itself upon gas engineers and managers until it becomes universal.

Discussion.

Mr. NISBETT (Aughnacloy) observed that he was sure he was expressing the opinion of everyone present when he stated that the paper they had just heard was a most important one, and the subject one that deserved their very best attention. He had listened with great interest to Mr. Waddell's communication; and had profited very much by the account he had given of Mr. Hislop's regenerative furnace. It was to their advantage to give careful consideration to all the most recent improvements in the appliances for the production of gas with the smallest amount of labour and cost.

Mr. WHIMSTER endorsed the remarks of Mr. Nisbett with regard to the interesting character of the paper they had just heard; but, proceeding to discuss the merits of the regenerative furnace, he remarked that, while he looked upon the make per retort as being pretty high, he did not consider that the use of this particular furnace would result in much saving. There was one matter upon which he would like some information, and that was as to how far below the surface Mr. Waddell had to go in the erection of his furnace. He also wished to know how high the furnace was.

Mr. WADDELL said he had to go 3 ft. 6 in. below the surface; and he thought the furnace was about 22 feet high.

Mr. WHIMSTER said there was no doubt that Mr. Waddell, according to the figures he had given them, had attained excellent results, as far as the quantity of gas produced per ton of coal was concerned; but he (Mr. Whimster) could not understand the enormous quantity of coke the author used.

Mr. WADDELL said it was absolutely necessary that the gases should become well mixed; and one of the advantages claimed for the use of the furnace in question was that this was effected. Again, it was most desirable that the mixing should not take place at one point, but all the way round.

Mr. WHIMSTER remarked that this was exactly what could not be done. The gases could not be made to mix all the way round. It would take place the moment they met.

Mr. WADDELL said he was pleased to have had his paper criticized; and he would try to benefit by the criticisms. There were, of course, many things which they would like to be able to do, but they could not succeed; and the only object he had in writing his paper was to give the members of the Association the benefit of the experience he had gained in the use of Mr. Hislop's furnace. With reference to the Honorary Secretary's statement that the percentage of coke used was very high, he (Mr. Waddell) admitted that this was so, but it was part and parcel of his experience; and this being the case, he felt he ought to mention it.

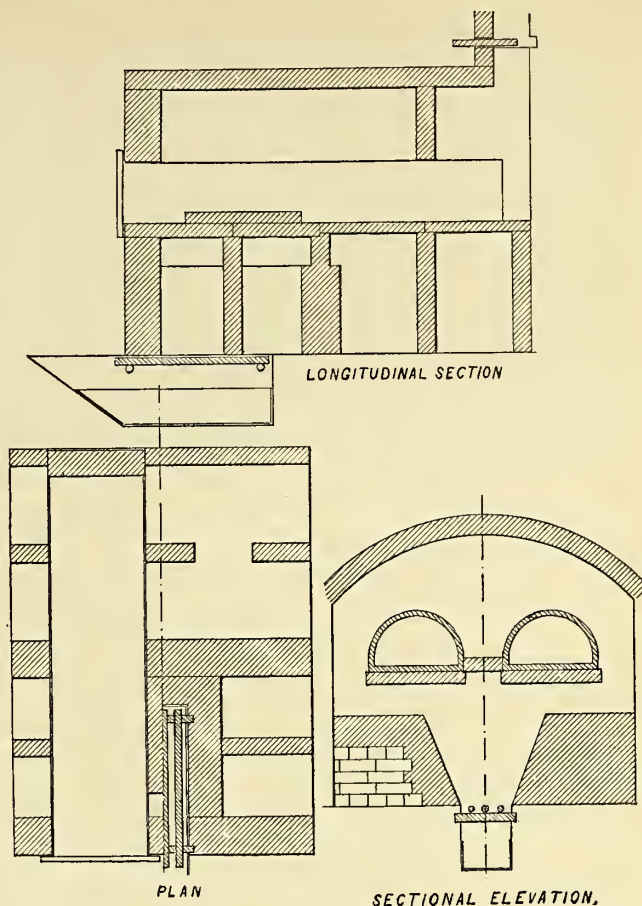
Mr. W. S. STORMONTH (Coleraine) said Mr. Waddell had given the members some very valuable information; and it should also be said that he had stood very good-naturedly the criticism of his paper.

Mr. J. ROBB (Limavady) then read the following paper:—

RETORT-SETTING FOR SMALL GAS-WORKS.

In attempting to lay before you a short account of a system of retort-setting adapted to meet the wants of a great many managers of small gas-works in Ireland, who, like myself, have to struggle against badly constructed works, small consumption during the summer, and very limited funds, I hope those who have more experience in these matters than I have, will deal leniently with any blunders I may make in the literary part of my work.

During the period I have lived in Ireland, I have been surprised at the yield of gas obtained per ton of coal in small works; some returns showing as little as 3000 cubic feet on the consumers meters, while a great many average only 7000 to 8000 cubic feet on the station meters. Now, in looking for the cause of this, I find much of the evil is due to the want of summer consumption. The retorts are kept going all through the summer, and very often only charged once in two days. This style of working swallows up all the coke saved in winter; and then recourse must be had to coal. But why should this be so? Simply because if the heat on the retorts is once let down, it cannot be brought up again in anything less than a week or a fortnight. This may seem strange to some of you; but still it is a fact, and it is not to be wondered at, when we see the class of men who have hitherto had charge of these works. The salaries offered in some cases are not sufficient to procure proper food; and working as they do from six in the morning until twelve and occasionally later at night, there is no time for thought, and no money to spare to acquire knowledge from the experiences of their more favoured brethren. At the same time a lot of useless, nominal officials, have been drawing salaries, sometimes twice and even three times as much as that of the manager. If these salaries were given to the manager, who, with a little labour assistance could do all the work, he, having a little time at his disposal, would be able to improve himself; and, with the aid of an Association like this, the small works in Ireland



would soon bear comparison with those similarly circumstanced in England or in Scotland, and also prove more profitable for both producer and consumer.

Having to meet difficulties in carbonizing of the kind just described, I will simply relate how I got rid of them. When I took charge of the Limavady works about two years ago, out of nine retorts I had none that would work to my satisfaction. During good dry, mild weather, I could get a heat sufficient to yield 9000 cubic feet of gas per ton; but whenever cold wet weather set in, away went my heats, giving a correspondingly low return, of about 8000 cubic feet per ton, and requiring even then an expenditure of fuel equal to 90 per cent. of the coke made. In fact, it was the old story of the furnace white, and the retorts little more than red. The sudden drop in the temperature in wet weather was caused by the bench being built close up to a 14-inch outside wall, and the flues too small. To save the heat lost through the back wall at that time was impossible; but I determined to improve my retort-settings if possible. With a view to carrying out this purpose, I looked over all the styles of retort-settings I could think of, and consulted all the books and journals I could lay my hands on; but I could find very little that seemed just to suit my case. However, I got as much general information as led me to see that, through the smallness of my nostrils and flues, and the want of a proper mixing chamber for the gases, I was losing more than half the heating power of my fuel, as, instead of getting the theoretical 7000 units of heat due to the combustion of coke to carbonic acid, I was only getting in the oven the 2400 units due to its combustion to carbonic oxide. I therefore concluded that the oven ought to have a mixing chamber sufficiently large to allow the complete combustion to carbonic acid to take place before the gases circulated through the setting, and then have such an arrangement of flues as would utilize the gases as much as possible. My idea was to get the greatest heat at the front of the bed, and then by a zigzag course to extract the heat—the one chamber to act as an economizer to the other—and so keep up an equal heat along the retort. To find the capacity of my mixing chamber, I measured the air-spaces of my fire-bars. I have four air-spaces, each 21 inches long by 1 inch broad, which is exactly 84 square inches. The most economical velocity for gases is said to be 60 feet per minute; and my coke-space was 1 foot deep. I then calculated thus: Allowing, for practical purposes, an expansion of 1 cubic foot per degree Fahr. of heat generated for every 500 cubic feet of air entering the fire, and, as air absorbs heat very rapidly and just as rapidly gives it up, assuming that it attains a temperature of 500° Fahr. in its passage through the coke, and that the temperature on complete combustion to carbonic acid is 4500°; then $4500 - 500 = 4000$ cubic feet due to expansion, plus the 500 cubic feet entering = 4500 cubic feet per 500 cubic feet, which is equal to 9 cubic feet per foot of air entering the furnace. But my air entrance was not 1 foot, but 84 square inches; and this, calculated to a velocity of 60 feet per minute, gives 3 cubic feet as the size of the mixing chamber (independent of the coke-bed), which will allow the complete change to carbonic acid to take place.

The next point to be considered was the circulation of the hot gases. To effect this economically, the flues must be neither too

large nor too small; so by simply measuring their length and breadth, and distributing them into 3 cubic feet, and having no part contracted, except at the entrance into the main flue (and that only by the damper), I considered that the oven would be certain to heat up to about the full calculation, and if the flues were evenly divided, an equal heat would be obtained all through. To test this rule practically, I embraced an opportunity which presented itself. I had a double bed of iron retorts, which had not been in use for a number of years, owing to difficulties experienced in getting them to work. Last autumn I took them out, and, finding they were new, reset them in accordance with the principle I have just tried to explain; and, in order to meet the difficulty of the back wall, I built my flues vertically. I divided the oven into three compartments, the first division wall being placed immediately at the end of the furnace bars, and built up the coke bed to a thickness of 14 inches, the remainder $4\frac{1}{2}$ inches, and the second wall $4\frac{1}{2}$ inches all through. The retorts are set only 6 inches apart; and a tile covers this from the first division wall to about 6 inches of the front wall of the oven. The flame from the furnace travels under the bottoms of the retorts, up the sides of the first division, down the sides and under the bottom of the second division, on to the third division, which ascends the same as the first to the damper, which is on the top of the arch, where the waste gases escape into the main flue.

I have now arrived at the most important point in my paper—viz., the practical results. This oven was started on Oct. 1, 1887, and a separate account of the working was kept until March 1, 1888. Owing to my storage being very small, I had to damp down every Sunday, which was somewhat of a disadvantage. The retorts are Δ -shaped, 18 in. by 13 in. by 7 ft. 6 in. long; and the coal used was Arley Mine. There was no exhaustor; and the back pressure was 6 inches. From date to date, they carbonized 130 tons of coal, giving 1,298,300 cubic feet of gas; being 9980 cubic feet per ton. The largest yield of gas obtained in 24 hours was on Dec. 18—being 13,900 cubic feet; and the average make was 6000 cubic feet per mouthpiece per 24 hours. They returned in coke 4700 bushels, out of which we sold 2300 bushels. This shows 50 per cent. of the coke made used as fuel; but the same furnace would have heated six retorts. Our revenue from this source was increased about 200 per cent. Another important matter is that the furnace heats up to carbonizing point in twelve hours, if standing over for a lengthened period; and if from Saturday evening till about ten o'clock on Sunday night, four hours will bring it up to carbonizing heat. There is no difficulty in getting up the heat; on the contrary, we had to use very great caution, and damp down for half an hour at the end of every three hours before charging. After all, one of the sides melted; but, thanks to the use of Sellars's cement, when it had been repaired it was as good as ever.

After seeing the success of this setting, I erected a single bed of retorts on the same principle, following the same rule, and was rewarded with like success. Of course, the saving in coke is not the same, as I have often to damp down for three and four days together; but what I save when working (which is about 15 per cent.) restarts the oven. I am erecting a bed of three fire-clay retorts on the same principle; so I shall learn the adaptability of the rule to them also.

I hope this simple effort to help my brethren in small works will meet with their approval, and that we, in Ireland, may soon be able to stand comparison with similar works across the water. Seeing that the majority of the works in Ireland make from 1 to 3 million cubic feet of gas per annum, I hope it will also awaken a desire in all the members of this Association to aid them.

Mr. A. WADDELL (Newtownards) thought the Association were deeply indebted to Mr. Robb for his paper, which was upon a subject of very great importance to those who were connected with small gas-works. Mr. Robb had dealt with his subject in an able manner, and had made some very outspoken and appropriate remarks upon several points. There were some matters in the discussion of which a little plain speaking was necessary; and he thought Mr. Robb had complied with this requirement. He (Mr. Waddell) only regretted that there were not more like him.

The reading of papers then concluded. The subsequent proceedings were reported last week.

Register of Patents.

GAS MOTORS.—Hahn, E. J., of Frankfort-on-the-Maine. No. 10,176; July 20, 1887. [11d.]

This invention in gas motors is applicable to both rotary and reciprocating engines, and comprises arrangements for admitting and distributing the fluids and gaseous mixture and for igniting the latter.

In a rotary gas motor constructed with these improvements, the piston is fixedly connected with a narrow central disc with boss on the shaft. The latter is to a great extent relieved from the pressure in the cylinder by means of a hollow circular chamber formed at each side of the central disc. One chamber is in one with the back wall of the cylinder, and the other is a loose part which has its bearing in the front wall of the cylinder, and, by means of the cylinder cover and an intervening spring washer, is pressed against the central disc, causing a tight joint to be made against both sides of it. The bulk of the pressure of the explosion, which would otherwise come upon the shaft, comes thus on the chambers, and the force on the front and back walls of the cylinder; while the small remaining portion only comes on the narrow disc, and

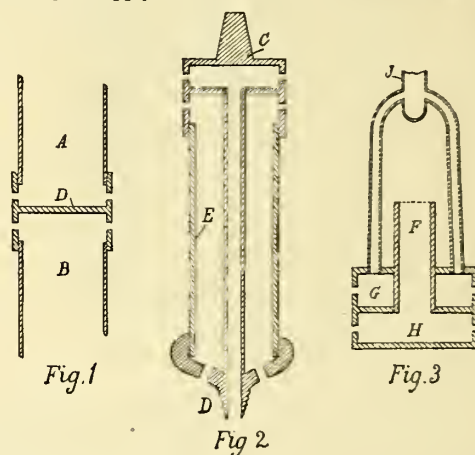
thence on to the shaft. The piston-shaped ignition-slide is worked from an eccentric cam on the shaft of the motor; a spring bringing the piston-slide down again. The valve for the inlet of the gas from the producer or carburetter (by preference arranged on the engine) is similarly worked from an eccentric cam on the opposite end of the shaft by means of a double-armed lever; a helical spring serving for raising and closing it. The air-pump for supplying the producer is worked by a crank-pin on the first-named eccentric cam. The pressure in the producer on the engine is kept constant by means of a yielding spiral spring; while the pump delivery-pipe is fitted with a back-pressure valve which closes during the suction.

GAS OR OTHER HYDROCARBON MOTORS.—Wordsworth, C. T., of Manchester. No. 11,466; Aug. 23, 1887. [8d.]

This invention (relating to improvements in gas or liquid hydrocarbon motors, parts of which are applicable to various types of liquid hydrocarbon motors) has for its object, firstly, to overcome the back pressure hitherto experienced in such motors; and, secondly, to provide means for admitting the gas or liquid hydrocarbon in suitable quantities for the purpose of increasing the efficiency of the motor.

GAS-BURNERS.—Walker, C. M., of Dulwich, Surrey. No. 12,952; Sept. 24, 1887. [6d.]

The patentee's proposal is to construct a circular burner in the form of a double socket, having a solid division about midway, so as to form an upper and lower chamber; the gas supply being led into either as may be desired. Both chambers are provided with holes or slits, varying in number, size, and proportion according to the size of the burner. One chamber is for gas, the other for air; the socket burner being fitted, one end to the gas supply, and the other in communication with the



air supply. In the illustrations, fig. 1 is the form of burner used in an ordinary regenerative suspension lamp, in which case A is the gas supply and B the air-way leading to the outside of the lamp. D is a solid partition. Where the gas is led upwards (as upon brackets, chandeliers, harp lights, tees, or other forms), the arrangement is as fig. 2, in which the gas is led up the pipe D (which screws into the gas-fitting at that point) to the burner. The upper part is plugged at C; surrounding D is an air-pipe E, with the base pierced with holes to admit air. To adapt the burner to regenerative lamps having no opening to the external air at the bottom, it is made as in fig. 3; the air-supply pipe F being led into the regenerator and left open at the top. H is the air chamber; G being the gas-box connected by two or more passages to the gas supply at J.

APPLICATIONS FOR LETTERS PATENT.

- 11,702.—CROWE, E., "Improvements in gas and hydrocarbon motor engines." Aug. 14.
- 11,756.—FLETCHER, W. F., "Improvements in gas-pressure regulators." Aug. 15.
- 11,789.—GARDNER, H., "A regenerative gas-burner." A communication from J. Cheuret. Aug. 15.
- 11,790.—ASHMORE, W., "Improvements in gasholders." Aug. 15.
- 11,809.—MAURICE, A. H., CARR, L., and OWEN, D., "Improvements in electro-meters and apparatus for measuring the electric potential of the earth and of its atmosphere, and of any other body or gas." Aug. 16.
- 11,914.—HELPS, J. W., "Improvements in the method of and apparatus for disconnecting gas and water mains, and for effectually closing the ends thereof." Aug. 17.
- 11,960.—CUTLER, S., "Improvements in the guide-framing of gas-holders." Aug. 18.
- 11,999.—POORE, W., "Improvement in gas-burners." Aug. 20.
- 12,068.—HARVEY, F. H., "An appliance for the immediate stoppage of bursts or leaks in water or gas pipes." Aug. 21.
- 12,117.—MUCKE, J., and STERN, W., "Improvements in regenerative gas-lamps." Aug. 22.

PATENTS WHICH HAVE BECOME VOID.

- [AFTER THE FOURTH YEAR.]
- 6983.—PRICE, A. P., "Purification of coal gas."
- 7121.—SIDDIWAY, S., "Gas-burners."
- 7284.—KING, C. W., "Gas motor engines."
- 7288.—KING, C. W., "Gas motor engines."
- 7436.—LANGDON, W. E., "Regulating the supply of gas by electricity."
- 7875.—ABEL, C. D. (Schrabetz), "Gas-governors."

REDUCTION IN PRICE.—The Bingley Improvement Commissioners last Tuesday announced that, as from the 22nd of June last, the price of their gas is reduced to 3s. per 1000 cubic feet, subject to discounts of 15, 17, and 20 per cent. on accounts up to £100, £150, and £200, provided they are paid within three months from the close of the half year to which they refer.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

MR. MACPHERSON'S REMARKS ON GAS-BURNERS AT THE NORTH BRITISH MEETING.

SIR,—In the "Editorial Notes" in your issue of the 21st inst., I notice you draw attention to a "term" used by Mr. MacPherson, and proceed to read me and others a lecture on the loose use of the word "regenerative." In looking over the report of the discussion on Mr. Hislop's paper, I find I am reported to have said: "I believe, from experiments, that a large chamber just below the point of combustion acts on the regenerative principle." Now, as I never made any such absurd statement, the "term" said to have been used by me must be credited to someone else—who, I do not know.

If you turn back to the discussion on the paper read by Mr. Wm. McCrae at our meeting in Stirling last year, you will find, from my remarks there, that I am as able to discriminate between what is and what is not regeneration, and am as anxious that the word should not be used loosely, as you are. Consequently, I think you must be indebted to your reporter for affording you the opportunity of making the necessary correction, "in the interest of precision of knowledge and expression." When, however, you were in your instructive mood, why did you not, "in the interest of precision of knowledge," draw attention to another reputed statement of mine, which occurs in your report, nine lines further down, that the "oxygen that passes through is given off as soot"—certainly as ridiculous a statement as the other, which I must, also, I am afraid credit to your reporter? Surely when you noticed the one, you might at least have given me the honour of an editorial notice of the other as well, unless, of course, you consider this latter to be in accordance with "the precision of knowledge."

I would not have troubled you with any correction of your report, however absurd and nonsensical, had it not been that I have thereby been raised to the dignity of an editorial notice on false pretences, which honour I must modestly disclaim any right to, as I did not use the "term" which has afforded the necessary opportunity of doing so.

A. MACPHERSON.

Kirkcaldy, Aug. 24, 1888.

[With regard to the matters mentioned in the above letter, we have only to say that the report of the proceedings at the North British meeting, of the correctness of which complaint is made, was supplied by the reporter engaged by the Association; and that the words which Mr. MacPherson denies having used are in the transcript of the reporter's notes as approved and passed for publication by the Revision Committee of the Association.—ED. J. G. L.]

READING GAS COMPANY.—In the report to be presented to the shareholders of the Reading Gas Company at their half-yearly general meeting to-day, the Directors state that the necessary plant has been placed in the new works, of which a description was given in the JOURNAL for the 14th inst., and the manufacture of gas for the supply of the Company's district is, for the present, carried on exclusively therein. The erection of the buildings, and fitting them with apparatus on the regenerative principle, has been a work of the greatest anxiety to the Engineer and to the Directors; but it has been carried to a most successful issue by their Engineer, Mr. E. Baker, Assoc. M. Inst. C.E. The works were brought into operation in the spring (as anticipated), and were found to answer all the expectations formed of them; and the Directors confidently hope that the result will be eminently satisfactory. The accounts accompanying the report show a balance of £14,193 available for division; and the Directors recommend the declaration of full dividends on all the stocks and shares of the Company.

BOURNEMOUTH GAS AND WATER COMPANY.—The half-yearly general meeting of this Company was held at the London Offices, 90, Cannon Street, E.C., last Friday—Mr. C. R. Mead in the chair. The Secretary (Mr. W. Cash) read the notice convening the meeting; and it was agreed to take as read the Directors' report and balance-sheet. The Chairman, in moving the adoption of the report, said it was a general thing for him to have the pleasure of presenting a favourable statement to the shareholders; and on this occasion he had to congratulate them on a more satisfactory condition of things than usual. The water-rental had increased to the extent of £369 beyond the amount for the corresponding half of last year; and the quantity of gas sold was nearly 13 millions in excess of that sold in the first half of 1887. He had pointed out, on former occasions, that it was to the advantage of the Company to study the interest of Bournemouth; and he was pleased to inform them that the Board had reduced the price of gas from 3s. 10d. to 3s. 6d. per 1000 cubic feet. This he was sure would be acceptable to the gas consumers of Bournemouth, and at the same time would enable the shareholders of the Company to divide 13 per cent. on the original capital, if it was considered desirable to do so. The report and accounts were unanimously adopted; and a cordial vote of thanks to the Directors and officers of the Company terminated the proceedings.

CARLISLE CORPORATION GAS AND WATER SUPPLY.—The gas and water accounts of the Carlisle Corporation for the past financial year will be presented at the next meeting of the Council. During the year £20,000 stock was created for gas-works purposes, £10,000 of which was to replace a mortgage; and out of the remainder certain sums have been paid into the city fund. The total income from the gas undertaking was £26,587; the total expenditure, £18,250. The profits therefore amount to £8337; leaving, after deducting the £2000 already paid into it, £6000 to go to the city fund. In the previous year the income was £25,608, and the expenditure £21,349; leaving £4258 of profits. So that the gas profits have been nearly doubled. In regard to the water accounts there was £20,742 stock created for water-works purposes and amount owing; and out of this sum there were mortgages amounting to £14,309 paid off. The total income for the year was £6934, and the expenditure £2546; leaving gross profits to the amount of £4388 to go to the district fund, under the new rule by which the profits will in future be paid over to that fund. In the preceding year the total income amounted to £6911, and the total expenditure to £3397; leaving gross profits to the amount of £3514. In the year 1886-7 a sum of £571 was deducted for depreciation; but under the recent resolution of the Council, such deductions, as in the case of the gas-works also, have been discontinued.

Miscellaneous News.

LIVERPOOL UNITED GAS COMPANY.

The Annual General Meeting of this Company was held last Tuesday—Mr. E. LAWRENCE in the chair.

The report presented by the Directors stated that the total revenue during the year ending June 30 last was £487,712 19s. 5d., and the expenditure £379,649 9s. 9d.; leaving a surplus of £108,063 19s. 8d., which had been transferred to the credit of the profit and loss account. After deducting the amount taken for the payment of the dividend declared last February, and the interest on the bond and debenture debt, there remained a balance of £44,095 8s. 5d. The Directors recommended the declaration of a dividend for the six months ending June 30 last of 5 per cent. on the ordinary consolidated stock, and 3½ per cent. on the 7 per cent. stock created under the Company's Acts of 1865 and 1882.

The CHAIRMAN, in moving the adoption of the report and accounts, said he did not think there was anything very special in the former to which he need call the proprietors' attention. The expenditure on the capital account had been very trifling; and, excepting for certain new mains, it involved only a sum of £4122 spent on the works. During the year it had been thought desirable to raise a certain amount of capital; and, as the shareholders were aware, there had been offered by auction £50,000 of the Company's "B" stock. The result of the sale was eminently satisfactory; the average price obtained being £153 5s. 1d. It might not be uninteresting to know that in 1883, when they sold stock by auction, the average price realized was £125 8s. 10d.; in 1884 it was £131 2s. 5d.; in 1885 it was £150 6s. 6d.; while this year it had risen to £153 5s. 1d. This, he thought, showed the satisfactory position in which the Company stood, and the confidence the public generally had in the undertaking. With regard to the revenue account, the total result would, he was sure, be felt by everyone to be satisfactory. It had resulted in a balance of £108,063 9s. 8d.; and, after paying the statutory dividends and the interest on the mortgage and debenture bonds, there was a balance remaining on the year's working of £6678 13s. 1d. Last year the accounts, it would be remembered, were not quite so satisfactory, inasmuch as on the twelve months there had been a deficit of £9000 on the working account—resulting from bad trade and a diminished consumption of gas in the town. The Directors felt then that there was no need to look upon this matter with anything like anxiety; and they came to the conclusion that there should be no alteration in the price of gas, trusting that with improved trade they would be able to wipe out the deficit. The consequence was that to-day it was wiped out, except the sum of £2329 11s. 7d.; and this small item, he might say with confidence, would totally disappear during the course of the ensuing year. Not only this, but he hoped that twelve months hence they would have a satisfactory balance in hand besides. Everything had been done to keep the works and the plant of the Company in the most efficient condition; and the working of the concern had been carried on in as economical a manner as in the past. Successful results had been achieved during the past year; and everything pointed in this direction in respect to the current year. In regard to the future, he did not like to indulge in prophecies, but he would just say that whatever progress the electric light might be making, at all events it had not interfered with the progress of gas. The two seemed to be going on side by side. If the supply of electric light was increasing, the increased demand for gas showed that there was an additional call for its manufacture. He was very much amused, when in London recently, on being told by a friend of his that a gentleman from Liverpool had said to him that the Gas Company were doing everything in their power to smother the electric light. He did not know what was meant by this; but he was not aware that the Company had taken any steps for the purpose of accomplishing such a thing, further than this—that if to continue their works efficiently and effectively, to produce and supply the public with a good, brilliant, and pure light, and to carry out their large undertaking economically, meant "smothering" the electric light, in that case he hoped they were doing it. In no other way that he knew of had they attempted to smother the light.

Mr. H. B. GILMOUR seconded the motion.

Mr. G. H. BALL asked what was the average cost per ton of the coal supplied to the Company, and said he also wished to have some information with regard to the tar contract.

The CHAIRMAN replied that the average price which they had paid for coal during the past year was, as nearly as possible, 10s. per ton; whilst the average price paid for cannel in the same period was about 19s.—making the average of both 14s. 9d. per ton. Their present tar contract was at 14d. a gallon.

Mr. BALL said in the face of this information he could not agree with the Chairman that the undertaking was worked on the most economical principles. If their coal was costing, on an average, 14s. 9d. per ton, they were certainly paying 2s. or 3s. a ton too much for it. He was able to speak with some confidence on this subject, because he had been connected with the gas undertaking of the Wallasey Local Board for the past nine years. There they had made a determined effort to get coals at as cheap a rate as possible; and the result was that the coal was now costing them about 11s. 9d. a ton, instead of 14s. 9d. as paid by the Liverpool Company. The illuminating power of the Wallasey gas was as high as that of the gas of the Liverpool Company. It was the duty of the shareholders not merely to pocket their dividends and be contented with them, but to see that the public were fairly considered in the matter. If the Company was worked on an economical basis, the price of gas might be substantially reduced; and his opinion was that they were not at present supplying gas at the lowest possible cost. For instance, they might get cannel at something like 12s. per ton, which would yield 33-candle gas. The tar contract was stated by the Chairman to be 14d. per gallon, and this was equivalent to about 17s. per ton; whereas in Manchester they were selling their tar at about 19s. per ton. He understood that their contractor had been favoured with some reduction with regard to tar in consequence of the low state of the market; but now that the price of tar was rising, it was only right that another rearrangement should be made with the contractor in the opposite direction.

The CHAIRMAN: What is the price of Wallasey gas?

Mr. BALL: I know it is 3s., whilst yours is only 2s. 8d. per 1000 feet. But you must remember that in Wallasey we pay something like 4½ or 4¾ per cent. dividend practically to our bondholders; and then we have a very large surplus which we apply to the reduction of our rates, so that the public get the full advantage of that.

The CHAIRMAN said the Directors were pleased with any suggestion tending towards the improvement of the manufacture of gas. At the same time he could not assent to Mr. Ball's conclusions; such, for instance, as the statement that from 12s. cannel they could get 33-candle gas.

Mr. BALL: What I meant to say was that the cannel was offered to Wallasey at less than 14s. per ton. I calculate that the carriage to Liverpool would be considerably less than with us; and therefore I am positive that you could get it for less than 13s.

The CHAIRMAN said he should still deny that they could obtain 33-candle gas from cannell purchased at 13s. a ton. The Directors fully realized that they were not merely trustees for the shareholders, but were also bound to do everything they could to provide the public with cheap gas. He maintained that they were doing so successfully. It was their duty to keep the illuminating power of their gas up to 20 candles; and if it fell a quarter of a candle below this, the Corporation complained that they were not doing their duty. It must be remembered that the quality of gas obtained from a certain material varied considerably with the weather; and it was necessary, therefore, for them to produce gas equal to 21 or even 21½ candles, in order that they might not fall below the standard. He denied that they used any richer material than was necessary to produce the desired results; and said that their Engineer (Mr. William King, M.Inst. C.E.) had devoted much time during the last few years to ascertain how far they could dispense with the use of superior material, and manufacture gas from less valuable coals. To some extent he had been successful; but it would be an absolute impossibility to carry it out to anything like the extent suggested. He assured Mr. Ball that the Directors, in making their contracts for coal, took every possible step to obtain at the very lowest price the material they required. Mr. Ball was inaccurate in his calculations with regard to the tar contract. The price which they obtained for tar was 20s. 4d. per ton—probably more than could be had under ordinary circumstances in the market. The contract referred to by Mr. Ball terminated last year; and the Company were now working upon a fresh contract.

The report and accounts were then approved.

The remaining business was of a routine character; the proceedings closing with the usual vote of thanks to the Chairman and Directors.

CROYDON COMMERCIAL GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Wednesday, at the Company's Offices, Katharine Street, Croydon—Mr. C. NEWTON in the chair.

The SECRETARY (Mr. W. J. Russell) read the notice convening the meeting; and it was agreed to take as read the Directors' report and the statement of accounts, an epitome of which appeared in the last number of the JOURNAL.

The CHAIRMAN said that it was now his duty to move the first resolution—"That the report of the Directors, with the accounts for the half year ending the 30th of June, 1888, showing a balance of £16,570 16s. 9d. available for dividend, be received and adopted." In submitting this resolution for the shareholders' acceptance, he said it would not be necessary on the present occasion to trespass long upon their time; for the past half year had not been a very eventful one, and the report and statement of accounts were so clear and satisfactory as to require very few observations in explanation. The Directors had upon the present, as they had upon nearly every previous occasion, to congratulate the shareholders upon the continued prosperity of the Company; and he hoped that this institution might be considered a permanent one. The shareholders would notice that the gas-rental received in the half year was about £600 less than in the corresponding period of 1887. The reduction of 3d. per 1000 cubic feet, which had taken full effect in the past half year, was equivalent to a loss of about £2200. This sum had been partially recouped, by an increased sale of gas of more than 10 million cubic feet, to the extent of £1500; leaving a deficiency of only £600, instead of £2200. Then with regard to the residuals, they had a very large increase in the sum-total; the increase being principally in coke—partly arising from the higher price they had received for coke, and partly due to the increased make, in consequence of the larger consumption of coals in producing the additional 10 million feet of gas sold. The amount obtained for residuals was £1700 in excess of the June half of 1887. On the other side of the account, the shareholders would see that they had to pay for the extra material and labour required to produce this greater quantity of gas. They would also notice that a very large sum had been spent in the half year for the repair and maintenance of the works. The Board deemed it advisable to put the works into a thoroughly efficient state of repair—not that they had fallen into a bad state—and he thought that the works would now compare favourably with any in the kingdom. They had taken advantage of the opportunity thus afforded of introducing some of the new engineering applications, which assisted them in the operations of manufacture. Consequently the gas for some months past had been of far higher illuminating power than in the previous few months, although then the quality of the gas as regards its candle power and its freedom from impurities was far in excess of the requirements of their Act of Parliament. It would further be noticed that a large number of stoves had been let out in the half year. Of course, these were perishable articles, and required a large sum to keep them in a state of repair. The working of the half year had produced a net profit which enabled the Board to recommend to the shareholders the payment of the usual dividends; and after doing so, and meeting interest on debentures and on the deposits for gas, they were enabled to carry forward about £242 more than they brought forward at the beginning of the half year. The amount of balance now being £16,600, and the sum carried forward after paying dividends being more than £6000, he thought with this large divisible balance, that if the present half year was as successful in its operations as the one which had just expired—and he had every reason to anticipate that it would be, from the experience of the last two months—when the Directors had the pleasure of meeting the proprietors again, the time would have arrived when the shareholders and the consumers would feel that they should have a further participation in the benefits which arose from this increasing prosperity of the Company.

Mr. W. HYSLOP seconded the motion, which was at once unanimously carried.

On the motion of the CHAIRMAN, seconded by Mr. MAONUS OHREN, Assoc. M. Inst. C.E., dividends were declared, payable forthwith, for the past half year, at the rate of 10 per cent. per annum on the capital of £51,600, and of 7 per cent. per annum on the capital of £137,500, and an additional dividend (under the sliding scale) at the rate of 3 per cent. per annum on the several classes of shares—all less income-tax.

Mr. HYDE, in proposing that the thanks of the meeting be given to the Directors and officers of the Company, said he thought it was scarcely necessary to say anything on that (the shareholders') side of the table. He might, however, remark that the accounts appeared to him to be an example of clearness and accuracy. The Chairman had told them that not only were they giving to the consumers a sum of upwards of £4400 a year; but, notwithstanding this, and notwithstanding the extent to which the electric light was being pressed forward, as well as petroleum (which he took to be a still greater enemy), they were enabled to carry over £242 more than they did on the last occasion. From this it appeared to him that the undertaking was being conducted in the most satisfactory way that it could be.

Mr. HALE seconded the motion, which was unanimously approved of.

The CHAIRMAN having suitably replied on behalf of his colleagues and the officers, the proceedings terminated.

TOTTENHAM AND EDMONTON GAS COMPANY.

The Annual General Meeting of this Company was held on Saturday last, at the Offices, Willoughby Lane, Tottenham—Mr. G. GARRE in the chair.

The SECRETARY (Mr. J. Randall) having read the notice convening the meeting, the report of the Directors and the statement of accounts, which were summarized in the JOURNAL last week, were taken as read.

The CHAIRMAN moved—"That the Directors' report and the statement of accounts for the half year ending the 30th of June, 1888, be received and adopted, and the report entered on the minutes of the proceedings of this day." He said that before he put the resolution to the meeting, he might perhaps be permitted to make a few remarks upon the report. As the shareholders would see, it was a short report; and he believed that all the Directors thought it was a very satisfactory one. Their view was to give a fair *résumé* of what had been done in the six months; at the same time not to elaborate, and perhaps puzzle the shareholders by too many details. The Directors, it would be seen, had been able to do that which he believed, just twelve months ago, the Board promised to do at the earliest opportunity—that was, to reduce the price of gas; and he hoped that they would be able to pay the proprietors the extra dividend at Christmas. The sale of residuals, they were glad to say, with the exception of tar (which continued very low), had improved in the last two half years. They had rather to mourn over the sale of coke; but with other residuals the markets had improved, and they had come out much better under this head than previously. Another pleasing thing he had to mention was that they were obliged to extend their mains to Winchmore Hill. The work was still in progress; but he believed, from what the Engineer (Mr. W. H. H. Broadberry) told him, in about a week's time the extension would be completed. The expenses for this work would come into the next half-yearly statement. In regard to the works, the Engineer reported that they were in excellent condition. They were now working up to the full power of the additions which they had made to the plant; and the time was not far distant when they would have to consider the question of further extensions if they continued at the same rate of increase. The increase had been at the rate of 8 per cent. per annum for the last three years—that was the absolute increase in the sale of gas in that period. The profit and loss account, including an amount of £3542 brought forward from the last half year, gave an available balance from which the Directors felt that they could recommend the payment of dividends on the original capital at the rate of 11 per cent. per annum, and on the new ordinary capital at the rate of 8 per cent. After paying these dividends, they would have left a balance of £3659; and this position was a vast improvement upon the one which he had to lay before the shareholders this time last year. They had then to trench upon their reserve to the extent of about £900. On this occasion, instead of doing that, they increased the reserve by £140 or £145. The next matter he had to refer to was the retirement of himself and Mr. Corbet Woodall; and when the time came, they would throw themselves upon the shareholders' generosity to reinstate them, and the same with Mr. Nicol, the retiring Auditor, who also offered himself. The dividends, he remarked, would be payable on Sept. 1.

Mr. J. MALCOLM seconded the motion, which was at once unanimously carried.

Mr. CORBET WOODALL proposed that dividends at the rate of 11 per cent. per annum on the original capital, and 8 per cent. per annum on the new ordinary capital, less income tax, be declared. He remarked that, after what the Chairman had said, in drawing a comparison between the condition of things in this and the corresponding half year, he was quite sure it would be satisfactory to the shareholders to know that the dividend had not only been declared but had been earned in the half year. It was also satisfactory to note that, while only this time last year they were nearly £1000 short of the dividend, yet the policy of the Directors within a few months after that time in recommending a reduction in the price of gas, had been justified by the balance-sheet which had been laid before them that day. There was one other point which he should like to bring before the shareholders. It was this—that while the reduction in the price of gas did justify an increased rate of dividend to be paid to the shareholders, it must be borne in mind that the divisible profits had now to provide not only the dividend, but also the reserve fund; and as new capital would shortly have to be raised (it was already overspent), if there was to be a reserve fund corresponding with the additional capital, it must be taken out of the profits that were otherwise divisible as dividends. He was sure that the shareholders would agree with him that while a large dividend was a good thing, so also was a good reserve fund as a matter of security for the value of the property. He considered that having works in a thoroughly good condition, and a reserve fund corresponding with the capital, was equally as valuable as a high dividend.

Mr. D. FORD GODDARD said he should have much pleasure in seconding the motion, the more so because, after having carefully examined the balance-sheet, he believed that the dividend had been earned in a thoroughly honest and substantial way. It seemed to him that all the essentials for earning a dividend in a company were present in the way in which this Company had been worked, as shown by the balance-sheet. There were one or two points which it was necessary to keep to the front, and which the Directors, as he gathered, had kept to the front—such as not unduly increasing the capital account. There was nothing which was so killing to a financial transaction as overburdening it with too heavy a capital. It did not appear to him that the Company was too heavily overburdened in this respect, as its capital per ton of coal was rather below than over the average of the London Suburban Companies. No doubt it would be necessary to increase the capital before long; seeing that the capital account, as Mr. Woodall pointed out, was already slightly overdrawn. He had, however, no doubt that the Directors would see that not more capital was raised than the transactions of the Company would bear. Another point which he noticed, and which was very satisfactory, was with respect to the maintenance of the works. Perhaps there was no greater temptation under the present Act or Acts under which gas companies worked in regard to the sliding scale than, with a view of increasing the dividend, to reduce the price of gas rather more than was perhaps wise or desirable; and to do so by letting down the works—or, in other words, "starving" the works—and not maintaining them at their full and proper value. The balance-sheet before them showed clearly that the works had been thoroughly well maintained; and what had been spent on repairs and maintenance had not been too much, but sufficient to keep them in good order. The Act offered vast temptations to spend too little on the works; but he did not think the shareholders in a Company like theirs would find fault with the Directors for laying out money in this department. Another point which gave him satisfaction was the fact that the general expenses seemed to be decreasing in proportion to the work done—not very largely, but still a little; and these little decreases gave them an indication as to the way the work was done. He noticed that the total expenditure on manufacture, distribution, and management of the works was a trifle less. It did not amount to much—perhaps 5d. per ton of coal carbonized. This was not large; but when they came to work it out to the amount of coal used, it meant a saving of something like £500, which was really to the

good. It was necessary that these small items should be constantly watched; so that they should not increase as they were apt to do. In regard to the residual products, these were also satisfactory. Gas companies owed more to these residuals than perhaps they gave credit for. It had been a serious loss to gas companies, the heavy fall in the price of residuals in late years. They welcomed the slight increase which was shown this year as a forecast of better times in this respect. He saw that there was about 6d. per ton increase in the residuals this year over last half-year's working. Considering all these points, and that the working of the Company seemed generally so satisfactory, they should have no hesitation whatever in accepting the dividend on that occasion. He had much pleasure in seconding the motion.

The motion was agreed to.
Sir H. E. CARTWRIGHT proposed the re-election of the Chairman (who was one of the Directors retiring by rotation). In doing so, he alluded to the great confidence the shareholders had in the concern, which, he said, was proved by the fact that hardly a share went into the market which was not sought after and acquired by someone interested in the Company.

The Rev. A. WILSON briefly seconded the motion, which was cordially confirmed by the shareholders.

The CHAIRMAN, in acknowledging the continued confidence reposed in him, remarked that this was the fifteenth year he had had the honour of being on the Board.

Mr. J. WARREN moved the re-election of Mr. Corbet Woodall, who also retired. He need only say that, from his practical knowledge of gas matters, Mr. Woodall was a very valuable colleague of the Directors.

Mr. J. B. DOE, J.P., seconded the motion, and it was carried.
Mr. WOODALL having returned thanks,

On the motion of Mr. GOULD, seconded by Mr. A. RICHARDS, the retiring Auditor (Mr. A. Nicol) was re-elected.

Mr. Nicol thanked the shareholders for his re-election; and took the opportunity of calling attention to the lectures on cooking by gas which had been delivered in the South Metropolitan Gas Company's district. He thought this was an excellent plan of increasing the consumption of gas; and, as a shareholder, suggested that they should do likewise.

Mr. A. G. HOUNSHAM, in a few appropriate words, proposed a vote of thanks to the Chairman and Directors.

Mr. KILSBY seconded the motion; and it was agreed to.

The CHAIRMAN having acknowledged the vote,
A similar compliment was paid to the Engineer, Secretary, and Officers of the Company, on the motion of Mr. HALL, seconded by Mr. GOULD.

The ENGINEER (Mr. W. H. H. Broadberry), in reply, mentioned that that was about the 29th half-yearly meeting at which he had stood before the shareholders to acknowledge their vote of thanks; and, speaking of the progress of the undertaking, he remarked that in 1874 the make was about 85 million cubic feet of gas in the twelve months; and last year it was 275 millions.

The SECRETARY remarked that Mr. Broadberry somewhat hesitated when giving the number of times he had stood before the shareholders. As for himself, he believed this was his 68th half-yearly meeting. He entered the Company's service in 1851; and hoped to still enjoy the confidence of the Directors for some time to come. He heartily thanked the shareholders for the vote they had passed.

The proceedings then terminated.

HASTINGS AND ST. LEONARDS GAS COMPANY.

The report of the Directors of this Company for the half year ending June 30 last, which is to be submitted to the shareholders at the ordinary general meeting to be held on the 6th prox., testifies to the satisfactory condition of the Company's business. During the half year the increase in the quantity of gas manufactured was at the rate of 7.21 per cent. over the corresponding period of 1887; and notwithstanding the reduction in the price of gas which came into operation on the 1st of January last, the gas-rental shows an increase. This, to some extent, has been due to the additional consumption caused by the exceptionally dull and inclement weather which prevailed for so long a period. As anticipated would be the case, the value of the residual products has improved still further. The extensions at the works, including the re-arrangement of and additions to the purifying and exhausting plant, and the fitting up of a portion of one of the retort-houses, are being proceeded with under the direction of the Engineer (Mr. C. E. Botley, Assoc. M. Inst. C.E.), so as to be ready for the winter's requirements. The £10,000 of additional capital sanctioned at the last meeting has been issued, and realized a premium of £6834 15s. The Corporation of Hastings have appointed a Gas Examiner, according to the Act of Parliament, who has reported satisfactorily on the quality and purity of the gas supplied by the Company. The accounts accompanying the report show a profit balance of £8880 13s. 2d. for the half year, which with the balance brought forward amounts to £22,991 3s. 6d. to be dealt with by the shareholders; and it is proposed to pay a dividend at the rate of 11½ per cent. per annum on the £25 shares, and 8½ per cent. per annum on the £20 shares, and to carry forward the remainder.

SUTTON GAS COMPANY.—The Directors of this Company report an increased sale of gas to the extent of nearly 2 million cubic feet in the six months ending June 30 last, as compared with the corresponding period of the previous year. This is attributable to the exceptionally dark and cold weather which prevailed throughout the past half year. The Company are about to erect new offices, to meet increasing requirements. Dividends at the rates of 10 and 7 per cent. per annum are recommended.

THE LONDON COAL AND WINE DUES ACCOUNTS.—The annual accounts of the Chamberlain of the City of London relating to the coal and wine dues have just been published. The gross amount of duty on coals brought into the Port of London was £176,367; brought by railway conveyance, £220,045; by inland navigation, £418; and by road traffic, £586—total coal duty, £397,418; wine duty in the Port of London, £9573; grand total, £406,991. Of this £328,798 was paid into the Bank to the credit of the Metropolitan Board of Works, to the account of the Thames Embankment and the Metropolis Improvement Fund. The City's duty on coals was £176,630.

CHESTERFIELD WATER AND GAS COMPANY.—The half-yearly meeting of this Company was held last Friday—Mr. R. T. Gratton presiding. The accounts showed that the receipts from the sale of water in the six months ending June 30 last had been £3154, and from gas £4490; the total income, including £484 for coke and other residuals, having been £8136. The cost of the manufacture and distribution of gas had been £1616. The total expenditure had been £5591, leaving a balance of £4545 to be carried to the net revenue account. After paying the interest on mortgages and calls in advance, there was a net profit for the six months of £4151, which is £479 in excess of the amount for the corresponding half of last year. A dividend at the rate of 5 per cent. per annum on both ordinary and preference shares and stock was declared; and there will be a balance of £252 to be carried forward.

LANCASTER CORPORATION GAS SUPPLY.

STATISTICS OF THE GAS DEPARTMENT FOR THE YEAR ENDING JUNE 30.

The Gas Engineer of the Lancaster Corporation (Mr. C. Armitage, F.C.S.) has favoured us with a copy of the report he has lately presented to the Gas Committee on the work of the gas undertaking during the twelve months ending June 30 last. It shows that the receipts amounted to £16,284 15s. 9d., and the expenditure to £9910 18s. 3d.; leaving a gross profit of £6373 17s. 6d. After deducting interest on stock and mortgages, addition to the sinking fund, &c., £4629 8s. 10d., there was left at the close of the financial year a net balance of £1744 8s. 8d. This is an increase of £393 11s. 7d. over the previous year's surplus profit, notwithstanding the reduction of 3d. per 1000 cubic feet made from July 1, 1887. The sale of gas to private consumers produced £9845 19s. 9d.; and the principal item of expenditure was, of course, for coal—£5729 15s. The receipts for residual products amounted to £3873 15s. 4d.; being equal to 67.70 per cent. of the total cost of coals. In other words, coal and cannel cost an average of 12s. 9d. per ton, and the products realized 8s. 7d. per ton; leaving the net cost of coal 4s. 2d. per ton. The quantity of gas made was 89,150,000 cubic feet (an increase of 11,541,000 cubic feet, or 14.81 per cent., as compared with the year 1886-7); the quantity sold and used was 86,214,562 cubic feet—leaving 3,29 per cent. unaccounted for. The amount expended on capital account up to June 30, 1883, was £101,124 18s.; and nothing whatever has been added to this account since. The reserve fund now amounts to £680 0s. 7d., and is on loan to the Water Department, at 3½ per cent. per annum; the interest being added yearly. The sinking fund now amounts to £3592 7s. 7d. During the past year, renewals and extensions were made, and charged to the renewal account, to the amount of £530 6s. 5d.; leaving a balance of £240 14s. 10d. on that account. The total amount received for gas was £11,171 3s. 10d., less the cost of lighting, extinguishing, cleaning, and repairing the public lamps, £343 8s. 3d.; making £10,827 15s. 7d., which is equal to 2s. 6.35d. per 1000 cubic feet of gas sold. This sum may be apportioned as follows:—Cost of gas, 1s. 0.99d.; interest and sinking fund, 1s. 0.47d.; profit, 4.89d. New mains cost £470 5s. 10d.—equal to 1.31d. This is charged to the revenue account, but could legitimately be charged to capital account; thereby reducing the net cost of gas to 11.68d. per 1000 cubic feet of gas sold. This cost, Mr. Armitage thinks, will bear favourable comparison with any gas undertaking. He closes his report as follows:—"If a further reduction in the price of gas be now made, I would recommend that the gross price be 2s. 6d. per 1000 cubic feet, and to allow a discount of 10 per cent. for prompt payment (or, say, if the account be paid before the expiration of 28 days from the date of delivery); making the net price 2s. 3d. This reduction would cause a decrease of £1087 in the gas-rental, providing the consumption of gas should remain stationary during the coming year, which is very improbable. An increase in consumption may be expected, in consequence of the reduction in price—all previous reductions having had a similar effect; and, in my opinion, this will be no exception to the rule, as the demand for coal gas is becoming more popular, and the consumption is increasing every year."

Appended to the report are the following statistics:—

	Cubic Feet.
Gas made as per station meter	82,150,000
„ sold to private consumers	77,922,500
„ sold for public lighting	7,694,862
„ used on works and offices	597,200
	86,214,562
Unaccounted for	2,935,438
or 3.29 per cent.	
Capital employed—	
Stock capital	£82,500
Loan „	20,400
	£102,900, or £11 9s. 5d. per ton of coal, or
	£1 4s. 0d. per 1000 feet of gas sold.
Coals carbonized—	
Common	5025 tons=56 per cent.
Cannel	3944 „ =44 „
	8969 tons.
Illuminating power required by Act.	14 candles
Illuminating power supplied	20 „
Gas made	89,150,000 cub. ft.
„ per ton of coal	9.939 „
Gas sold	85,617,362 „
„ per ton	9.545 „
„ per cent. on make	96.03 per cent.
Used at works and offices	597,200 cub. ft.
„ per cent. on make	0.66 per cent.
Gas unaccounted for	2,935,438 cub. ft.
„ per cent. on make	3.29 per cent.
Coke made	5,890 tons.
Coke used for fuel (including boilers)	1,523 „
„ per cent. on make	26.12 per cent.
Tar made—575 tons (195 gallons per ton)	112,125 gallons.
„ per ton of coals	12.5 „
Liquor made—1336 tons (218 gallons per ton)	291,248 gallons.
„ per ton of coals	32.47 „
Net proceeds of coke and other residuals per cent. on cost of coal	67.60 per cent.

At the Meeting of the Town Council last Wednesday—the MAYOR (Alderman Blades) in the chair—the report and accounts above referred to were under consideration.

Alderman HATCH, in moving the confirmation of the minutes of the Gas Committee, remarked that as this was the annual meeting, at which the condition of the gas undertaking came under review, he would say a few words in reference to the various matters mentioned in the minutes. Coming to the Gas Engineer's report, he said it would be within the recollection of the Council that twelve months ago the price of gas was reduced to 2s. 6d. per 1000 cubic feet all round. The Committee had every reason to congratulate themselves upon the results of the resolution the Council came to on that occasion. There had been a considerable increase in the make and consumption of gas during the past twelve months, and they had realized a larger profit than they did the year before. In weighing matters over, the Committee thought they could not do better with the surplus they had in hand than place it to the renewal fund; and they asked the Council to confirm the resolution that the sum of £1700 odd be added to that fund. They were now engaged in a very expensive work—viz., in putting down new purifiers. The whole of the ironwork was already on the ground, the foundations were laid, and they were ready to carry it to completion. He was proud to say that they had in Mr. Armitage a very efficient Manager; and but for his efficiency they would perhaps not be in the good position they now occupied. They paid him a fair salary, and they did not interfere with him continually in suggesting this and suggesting the other thing in matters they knew very little about; and while they congratulated themselves upon having a good Manager, Mr. Armitage might congratulate himself likewise upon having good masters. He proposed the confirmation of the minutes; and he hoped the time was not far

distant when they would be enabled to enter into the question of abolishing the meter-rents, and not only that, but be able to effect a further reduction in the price of gas to 2s. per 1000 cubic feet. For the present, however, they must satisfy themselves with a reduction of the price to 2s. 3d.

Mr. WATSON seconded the motion.

The Mayor asked if anyone had an amendment to propose; remarking that the matters referred to by Alderman Hatch were both very good and very numerous.

No one answered for the moment; but just as the Mayor had indicated that the minutes were passed,

Mr. BELL rose and claimed to be heard.

After some conversation on the point, his Worship allowed this.

Mr. BELL said he considered it must be very satisfactory to all of them to have so excellent a report on the result of the working of the gas undertaking, which reflected great credit on their Gas Manager. Last year they granted a reduction which cost them £1000; and notwithstanding this, they had in the present year a profit of £400 over that of last year. It must also be gratifying to the older members of the Corporation, who were bold enough some six or seven years ago, and in the face of a great deal of outside opposition, to purchase the gas-works, to find that it had been a capital speculation for the town ever since, instead of the loss which some people predicted it would be. With regard to the proposals made by the Chairman of the Committee, he was sorry he was not altogether in accord with him. He (Mr. Bell) would like to have seen the meter-rents abolished, because in his opinion it would act as a greater stimulus to the increased use of gas than a reduction in the price. He believed there were a good many cottagers who were not now using gas, and who looked at the expense of having a meter being put into their houses and then having to pay for the meter; whereas if it could be put in free of cost, and they had only to pay for the gas consumed, many would be inclined to use gas who now did without it. Another objection he had was as to the reduction in the price of gas to those who lived outside the limits of the borough. These outsiders had no liability in respect to any risks connected with the gas-works; and if the electric light or anything else should supersede gas, every fraction of the loss would fall upon the ratepayers. It was not right, just, or proper to the ratepayers that outsiders should have gas at the same price as those resident in Lancaster, seeing that the latter were liable for the whole of the risk. Although he was not one to advocate the employment of any part of the gas surplus in reducing the rates of the town by one farthing, yet he thought the Committee might have seen their way to reduce the price of gas supplied for the public lamps. This would have been a public benefit. Alderman Hatch told them distinctly last year, when the price was reduced to 2s. 6d. per 1000 cubic feet, that next year, if they had a surplus, they would not only make a reduction in price, but it was their intention also to improve the quality of the gas to the extent of two candles, which would cost £1000. He thought they all knew that the gas in Lancaster was very cheap, and would compare favourably in this respect with that supplied in any other town. But he should like to draw the attention of the Council to the renewal fund. This fund now stood at something like £240; and to this it was proposed to add £1744, the balance this year. But it was a fact that every farthing of this fund, if not already spent, would go—the great proportion in providing new purifiers, and the other towards new mains; so that the renewal fund would only stand at £200, whereas a few years ago it was £1500. It was all very well to "go with the stream" in reducing the price of gas, and that sort of thing; but supposing the price of residuals went down, what would they do then? Most of their profits during the past year had really been made out of an increase in the price of residuals—an increase in the price of chemicals. Supposing next year they went down, what would be the result? Why, they would have to increase the price of gas. But his principal objection was to reducing the price of gas to outsiders, especially when it happened that they did not share any of the risks which might fall on the ratepayers.

Mr. HARRIS asked what the Committee proposed to do with regard to those consumers who had their own meters.

Mr. BAILEY said the question of reducing meter-rents had been taken into full consideration by the Committee, but they found they were not in a position to deal with them at the present time. They decided, however, that during the coming year a scheme would be propounded whereby they expected to carry out to a considerable extent what Mr. Bell had put forth in regard to the abolition of meter-rents. As to the increased cost of residuals, the Manager informed them that the percentage of increase was not greater appreciably than in the previous year; and therefore their profits had not been provided out of the additional amount obtained from residuals, as stated by Mr. Bell. The chief profit had been made from the augmented consumption of gas; so that although they had had a reduction during the past year of 3d. per 1000 cubic feet, there had nevertheless been an increase of something like £400 more than in the preceding year. If it was the same next year, they hoped to be able to abolish the meter-rents, and have something in addition to put to the renewal fund.

Mr. MOLYNEUX wished to congratulate the Gas Manager and the Gas Committee also on the highly successful results of the year's working of the Gas Department, which had demonstrated to a good many people that what was thought to be a bad "spec" was an exceedingly good one. He agreed with the remarks of Mr. Bell as to their not supplying gas at the reduced rates to the out-townships; but he could not help being a little amused at that gentleman's remarks, when, after saying he was opposed to any portion of the gas profits being applied to the reduction of the rates, he very ingeniously went on to argue that the cost of lighting the public lamps should be taken out of the gas profits. He (Mr. Molyneux) took it that if there was a reduction in the price of gas supplied to the public lamps, it would result in so much being taken off the rates on that account. It might be a roundabout way of doing it; but it amounted to the same thing in the end.

Mr. WATSON said with regard to the question of supplying gas to the out-townships at a reduced price, they would cease to be out-townships soon; and he did not see that the Council could do otherwise than let these places have gas at the same price as they paid in the borough.

Mr. KITCHEN, while expressing satisfaction with the report, considered with Mr. Bell that the ratepayers of Lancaster were responsible for the working expenses, for the purchase money, and for all risks connected with the gas undertaking, whilst those residing outside the borough had no such responsibilities attached to them; and this made all the difference between raising the price of a commodity and reducing it. He proposed, as an amendment, that the words "to residents within the borough" be added to the resolution of the Gas Committee recommending a reduction in the price of gas.

Mr. MOLYNEUX seconded the amendment.

Alderman PRESTON considered that the question of a reduction in the price of gas had been set up as against the meter question; and for his own part he would be glad if the meter-rents could be done away with altogether. In considering the matter in Committee, there was a strong desire to reduce the price of gas, and hopes were held out that at some

future day the meter question would have the attention of the Committee. If they went on reducing the price of gas (say) by 3d. per 1000 cubic feet every year, as they had been doing, they would get it to such a figure that they would be unable to abolish the meter-rents, from which they now derived about £500 a year. What they all wanted to do, he hoped, was to induce poor people to take gas, and use it for other than simply illuminating purposes, instead of, as now, remaining without it because they had meter-rent to pay. They had to pay for the meter in the summer months, when it was not in use, just the same as in the winter time. It might be said that it made little difference whether they had it "in meal or in malt;" but bearing in mind the great number of people who would be gas consumers were it not that they had an objection to pay meter-rent, it would be policy on their part to abolish this charge altogether. The difficulty seemed to be how to deal with those who had their own gas-meters. This was a matter which they would have to discuss with the Gas Manager; and seeing that he had shown such practical knowledge on everything connected with the supply of gas, this question also would not doubt receive a satisfactory solution at his hands.

The Mayor said it was quite evident that the amendment was aimed at the Lancaster Waggon Works; and he asked if it would not be wise to extend the reduced price to them, seeing that they were one of the largest consumers of gas.

Alderman HATCH, in reply, said some of his remarks had been anticipated by previous speakers. The amount received from meter-rents was £511 per annum, but a great difficulty in abolishing these rents presented itself in regard to those who had their own meters. These were the largest meters; and their owners generally were the largest consumers the Gas Department had. Their Manager had suggested a scheme which it was thought might be a way out of the difficulty. He had calculated that the life of a meter was 15 years. In other words, if a meter was worth £15 when new, it was worth £1 less for each year it was used. This was probably the basis on which the question of abolishing the meter-rents would have to be considered. The Mayor had just touched on the question of supplying outsiders with gas at the reduced price, and at what those who were opposed to it were aiming at. He (Alderman Hatch) was fully convinced, as an old tradesman, that it would be the most suicidal policy on their part if they said they would only supply Lancaster at the reduced price, and not take in the outsiders. They must remember that the Gas Department was a commercial concern only. If a customer came into any of their shops, they did not ask him if he lived in Lancaster, or whether he came from one of the out-townships. Nor, if they found he did so, would they charge him any more than if he had lived in Lancaster. No; they asked him just the same price, and they charged just the same for his goods as they did anybody else. Hence he maintained that the outside customers were really a benefit to them; and they ought to increase their number in every possible way, and encourage them to consume as much gas as they could. Mr. Bell had referred to a remark he (Alderman Hatch) made last year as to increasing the illuminating power of the gas. He might inform him that they had done so, and that they were using considerably more candle this year than they had done before. The Manager had endeavoured to improve the illuminating power of the gas, and the Committee considered he had been successful in so doing.

Mr. KITCHEN said he was astonished to hear the Mayor say the remarks in reference to the reduction in the price of gas to outsiders were aimed at the Waggon Works. He did not consider they were aimed at any particular place.

The amendment was then put, and lost by 7 votes to 12; the motion for the confirmation of the minutes being subsequently carried.

EDINBURGH AND LEITH GAS COMMISSION.

At the Meeting of the Edinburgh and Leith Gas Commission on Monday last week—the Lord Provost (Sir J. Clark) in the chair—the Clerk (Mr. Jack) read the decision of Mr. G. Livesey, C.E., the Arbitrator, upon the questions submitted to him, as to what implements were to be specially paid for by the Commissioners, in terms of the Act of Parliament, and what sum was to be paid for the stock of coal which the Companies held at the time of the transfer. Mr. Livesey's award (the substance of which was given in the JOURNAL last Tuesday) was as follows:—"I, George Livesey, of London, C.E., having been appointed sole Arbitrator to determine not only the price to be paid by the Edinburgh and Leith Corporations' Gas Commissioners for the items or articles referred to in section 20 of the Act, but, secondly, whether any items or articles fall or do not fall to be valued and paid for; and, having heard the representatives of the parties who have requested a decision on the second point before proceeding with the valuation, I hereby declare that no item or article is to be valued and paid for which was used or required for the efficient working of the respective undertakings at their maximum production of last winter; and I also declare that only those stores of materials referred to in section 20 of the said Act, and all implements, meters, and pipes in store or in hand—whether new or unused or not—which are in excess of the quantities of materials, implements, meters, and pipes which were required at the aforesaid period of maximum working, are to be valued and paid for, as provided in the said Act." On the recommendation of the Works Committee, it was resolved to appoint Mr. Dewar, the Statutory Clerk of the Leith Company, Superintendent Surveyor for the Commission. The Committee reported that they had authorized Mr. R. Mitchell to take charge of the mains and services south of Queen Street, and Mr. F. T. C. Linton those north of that thoroughfare. The Clerk read a letter by Mr. Blair (the Agent of the Edinburgh Company), accompanying a statement showing the total amount payable by the Commissioners to the Company for capital expenditure and gas supplied to the consumers since the last accounts were rendered, to be £2776 12s. 6d. Annexed to the statement were details of the other items, duly certified by Mr. Mitchell. For convenience, he added to the statement a note of the amount expended in connection with the gasholder tank at Meadowflat, and which sum is, by arrangement, also payable by the Commissioners. The letter was remitted to the Works and Finance Committees. The Lord Provost moved the appointment of Mr. Wodrow Thomson, of the Edinburgh Gas Company, as Auditor of the Commission. Mr. Smith Clark thought the best plan would be to have an entirely fresh mind introduced into the concern. Mr. Colston said this was exactly the view he himself had taken, and in that respect he would suggest the name of Mr. Molleson. Mr. Smith Clark said this was "jumping out of the frying-pan into the fire." It was quite evident that in discussing matters of this kind in public they were treading upon delicate ground. He thought the appointment was one of very grave importance, and therefore suggested that the matter should be remitted to the Finance Committee for consideration and report. After some conversation, a vote was taken, when 11 were in favour of the appointment, and 4 for reference to the Committee. In view of the large vote in favour of Mr. Thomson, he was declared to be elected. The Finance Committee were empowered to obtain a loan to the amount of £25,000 or £30,000 to pay for stores.

THE EXAMINATIONS IN "GAS MANUFACTURE."

In the JOURNAL a fortnight ago (p. 294) we gave a list of the successful candidates at the examinations in "Gas Manufacture" held by the City and Guilds of London Institute in May last. It will doubtless be interesting to many of our readers—especially those who contemplate submitting themselves for examination—to give the papers set in the two grades, in order that they may form an idea of the questions put by the Examiners (Messrs. R. Morton, T. Newbigging, and C. Hunt). We may mention that there were 45 candidates examined, of whom 24 failed to satisfy the Examiners. The following were the questions; the time allowed for each paper being three hours:—

Ordinary Grade.

1. Give a sectional sketch of a hydraulic main and dip-pipe. Explain the use of this arrangement. 2. Describe the exhauster, either rotary or reciprocating, and state the reasons for using it. 3. What useful purpose is served by the bye-pass mains and valves in connection with the apparatus of a gas-works? 4. Explain the difference between a "single-lift" gasholder and a "telescopic" gasholder. 5. Exclusive of the crown, what are the cubical contents of a gasholder 100 feet in diameter by 20 feet deep? 6. What are the disadvantages of charging retorts with coal in a wet condition? 7. A station meter registers 50,000 cubic feet at a temperature of 50° Fahr. What would this amount to corrected to 60° Fahr.? 8. What are the simple tests generally used to discover the presence of (a) sulphuretted hydrogen, (b) ammonia, and (c) carbonic acid in coal gas? 9. Describe what is meant by the term "8-oz. liquor." 10. A main from which there is no consumption is supplied with gas from the works at 10-10ths pressure. It rises 100 feet, and afterwards descends 50 feet. What would be the pressure recorded at these two levels?

Honours Grade.

1. In an ordinary retort-setting, what are the principal conditions to be observed with the object of securing the highest efficiency with the greatest economy of fuel? 2. What relation should the fall in works' mains have to the flow of gas passing through them? Give reasons. 3. What is the effect of the exhauster upon the temperature of the gas as between the inlet and outlet? Give explanations. 4. Under what varying conditions do the purifiers raise or lower the temperature of the gas passing through them? 5. A hydraulic main has twelve ordinary dips, 6 inches in diameter, working with a 1½-inch seal. What must the surface area of the liquor be to enable it to withstand a back pressure of 40 inches and nothing more? 6. Of a ton of average quality bituminous coal, carbonized in the ordinary way, what proportion, by weight, would be recovered in the solid, what in the liquid, and what in the gaseous form? Answer in general terms. 7. Find the value of a ton of coal, in pounds of sperm, which yields 10,240 cubic feet of gas, having an illuminating power equal to 16½ sperm candles. 8. At what temperature and barometric pressure is gas said to be at its "standard volume"? Why is it desirable that it should be reduced to such volume on its measurement by the station meter? 9. What number of stokers do you consider should do the work of carbonizing 150 tons of coal per 24 hours, each man attending to his own firing, wheeling his own coal from an adjacent store, and removing his surplus coke to the outside of the retort-house? 10. Name the crude products of the first distillation of coal tar, and state their principal uses.

It may not perhaps be out of place to mention here that the first prizeman in the Honours Grade (Mr. W. R. Herring) is draughtsman and an assistant to Mr. C. E. Botley, Assoc. M. Inst. C.E., Engineer and Manager of the Hastings Gas-Works; while the latter gentleman's son (Mr. C. F. Botley), who is in the locomotive shop at the Great Western Railway works at Swindon, carried off the first prize in the Ordinary Grade. Mr. Botley is to be congratulated on the success achieved by his son and assistant; the more so in view of the fact that a former assistant (Mr. F. G. Dexter) took the first prize while he was with him, and has come off with high honours at South Kensington.

KILMARNOCK CORPORATION GAS SUPPLY.
ANNUAL REPORT.

The decision of the Kilmarnock Town Council to reduce the price of gas to the consumers to the extent of 5d. per 1000 cubic feet—from 3s. 11½d. to 3s. 6½d.—has already been mentioned in the "Notes" of our Glasgow Correspondent; and we now proceed to summarize the report and financial statement for the year ending June 14, 1888, which were presented to the last meeting of the Town Council by the Gas Committee. In the financial part of their report, they state that the gross revenue amounts to £12,060 11s. 6d.; and the gross expenditure to £8411 10s. 2d.—leaving a surplus of £3649 1s. 4d. Out of the latter the following sums have been provided:—Sinking fund for payment of mortgage debentures, £2000; gasholder extension, part payment, £650; accounts for gas and meter rents irrecoverable (less old arrears recovered), £61 6s. 11d.—making a total of £2711 6s. 11d.; and leaving a balance of £937 14s. 4d. Adding to this the balance at the credit of profit and loss account at June 14, 1887 (£8675 6s. 4d.), gives a sum of £9613 0s. 8d. to be carried to the next accounts. Of this sum, however, £7459 has been expended in maintenance of the works.

Speaking in reference to the works, &c., the Committee state that the gas manufactured, as per station meter, shows an increase for the year of 2,212,900 cubic feet, while as regards the amount of gas sold there was an increase of 1,770,650 feet. The leakage or unaccounted-for gas was at the rate of 10½ per cent., as compared with 10 per cent. in the year 1886-7. On the wages account there was a decrease of £61 18s. 8d. Notwithstanding the fact of there being such a large increase in the production of gas, there was a decrease in the coal account, amounting to £144 3s. 7d. Owing to the increased value of the bye-products, the revenue from the chemical works during the past year was £317 greater than that of the preceding year.

Under the head of expenditure, there was an outlay for coals of £3284 8s. 8d., which, with the amount spent for lime, retorts, and dross, was brought up to £3530 8s. 4d. For pipes and meters there was expended £325 11s. 9d.; for repairs, £201 13s. 7d.; for salaries, £566 2s.; for wages, £1603 1s. 2d.; for income-tax, rates, and other charges, £698 0s. 1d.; and for interest on mortgage debentures, £1315 15s. 11d. Collectively, these (with various minor items) make up a total expenditure of £8411 10s. 2d.

As regards revenue, the gas sold produced £10,694 14s. 11d.; meter-rental, £255 1s. 11d.; and tar, &c., £859 19s. 10d.—the total revenue amounting to £12,060 11s. 6d. It will thus be seen that the excess of revenue over expenditure, carried to profit and loss account, amounts to £3649 1s. 4d. The balance on June 14, 1887, was £8675 6s. 4d.; the arrears recovered during the year amounted to £1 4s. 11d.; and with the profit, there was a grand total of £12,325 12s. 7d.

In the shape of liabilities, there are the mortgage debentures amounting to £33,025; deposits from gas consumers, £23 10s. 6d.; sundry accounts unpaid, £168 8s. 9d.; and profit and loss account, £9613 0s. 8d.;—making in all, £42,829 19s. 11d. Then as assets, there are the gas-works and plant valued at £36,436 1s. 1d.; stock of materials on hand, £433 7s. 3d.; various outstanding accounts—for gas, meter-rents, tar,

&c.—amounting to £514 13s. 1d.; cash on deposit in bank, £3500; and cash on current account, £1938 7s. 9d. These, with the cash in hand, collectively make up a total of £42,829 19s. 11d.

The total quantity of gas manufactured during the year was 60,192,600 cubic feet; and the total quantity of coal carbonized was 6177 tons. The gas produced per ton of coal was 9726 cubic feet.

It is gratifying to know that the Gas Committee have been so efficiently served by Mr. J. Fairweather, the Manager, that they have recommended an increase to his salary amounting to £40 per annum, and that their recommendation has been approved of by the Town Council.

PARTICK, HILLHEAD, AND MARYHILL GAS COMPANY
LIMITED.

The annual report of the Directors of this Company, with the balance-sheet for the year ending June 30 last, has just been issued to the shareholders, who will doubtless be gratified that the Company's business, under Mr. Levi Monk's management, continues to exhibit a progressive improvement. In view of the probability of the accounts showing a surplus of revenue available for dividend, the Directors state that they considered it proper to take the opinion of the Court of Session on the question of the right of the preference shareholders to arrears of dividend for the years ending June 30, 1886 and 1887. A special case was accordingly entered into, between the Company on the one hand, and two of the preference shareholders on the other hand, which was heard before the Judges of the First Division of the Court of Session in May last, with the result that the Court unanimously found (1) that the preference shareholders were entitled to the arrears of their dividend for those two years, but (2) that they were not entitled to interest on the arrears. This decision is appealable to the House of Lords; but, in accordance with the legal advice which they have received, the Directors recommend that the case should not be carried further. The net profit for the year, after payment of all debenture interest, and providing for interest on the reserve and depreciation funds, amounts to £10,445; out of which the Directors have carried to the depreciation fund £3000; leaving a balance of £7445. They recommend that this amount should be disposed of in the following way:—To extinguish the balance at the debit of the suspense account, £1942; in payment of cumulative dividends at the rate of 5½ per cent. (less income-tax) to the preference shareholders for the years ending June 30, 1886 and 1887, in terms of the decision of the Court of Session, £3300; in payment of dividend at 5½ per cent. (less income-tax) on the preference shares for the year ending June 30 last, £1650. This will leave about £553 to be carried forward. The Directors remark that the works have been, as usual, maintained in a thoroughly efficient condition out of revenue. The quantity of gas made during the year largely exceeds that of the previous year; and to meet the additional requirements of new consumers, the Directors have found it necessary to contract for an additional gasholder, which will be ready for use in the coming winter. The revenue account shows the total expenditure to have been £23,112, and the income £36,358; leaving a balance of £13,246 to be carried to the profit and loss account. The general balance-sheet shows the capital and liabilities to amount to £202,788. Up to the present, the outlay for the construction of works and additions during the past year amounts to £78,100. The works in progress are valued at £2506. For pipes and cost of laying there has been an outlay of £81,874 17s. 5d.; and for meters, £19,699 4s. 6d. On the gas-stove department there has been expended £1429 13s. The stores on hand at June 30 are set down as valued at £2934 0s. 9d. Various other items, including the cash at bankers, in the suspense account, &c., bring up the property and assets to the value of £202,788—the amount above named.

SOUTH STAFFORDSHIRE WATER COMPANY.

The Half-Yearly General Meeting of this Company was held last Thursday, at the Queen's Hotel, Birmingham—Mr. F. JAMES in the chair.

The notice convening the meeting having been read, the report of the Directors, which was given in the JOURNAL for the 14th inst. (p. 307) was presented.

The CHAIRMAN, in moving the adoption of the report and accounts, said it was satisfactory to know that the water of the Company was being laid on to 1500 additional houses. This made a total of 65,641 houses now supplied by them, out of about 110,000 houses in the district. There were probably 15,000 or 20,000 houses that would sooner or later be connected with the mains. The gross amount of water-rates for the half year ending June 30 last was £33,973, as against £32,707 in the corresponding period of 1887. The expenditure on capital account during the half year was £5000; this being the cost of 4½ miles of mains. There was due to bankers and others £5594; but in the revenue account there was a balance of £12,000 in the bank. With regard to the profit and loss account, the half-year's water-rates were £33,973, as against £32,707; and the amount for service-laying—£293—was pretty much the same as last year. On the opposite side of the account, the engine charges were a little in excess of the first half of 1887; but this was accounted for by the additional quantity of water pumped. The maintenance of works was considerably in excess, owing to the repair of one of the reservoirs. In the first instance it was decided to take any risk of damage that might arise through the mining operations in the district; but it was a question whether the Directors ought not to begin to set aside something as a maintenance fund against accidents that might occur. If there were no extra charges under this head during the present half year, the Board would probably put by something as the nucleus of a reserve fund. The rates—an ever-increasing item—had risen from £2391 to £2618; and the balance carried down was £13,130, against £13,274 in 1887. An exceptional charge on the debtor side was that of £1574 for law expenses, which were usually about £74. The increase was due to the promotion of the Company's Bill to equalize their charges. If the application had been successful, the entire cost would have come out of capital; but as it had failed, the expenses had to be borne by the revenue. Until very recently the Directors had not full knowledge as to what these expenses would be. They found, however, they were in excess of what they expected; the total parliamentary charges not being less than £3500. Had there been a local inquiry, the cost would then have been very much less; and he thought there would have been a better appreciation of the result. The Directors proposed to wipe off £1500 in the half year just ended, and spread the remainder over the next two half years. Speaking of the Bill, he might say the Directors expected reasonable and legitimate opposition; but they did not anticipate some of the opposition which was brought forward. The Bill entered the House of Lords on the 12th of March; and the Directors voluntarily made the concession of substituting 1s. 6d. and 1s. 10d. per quarter for 2s. 2d. per quarter in regard to certain houses in their schedule of rates—an alteration which meant an adverse sum of £1200 a year to the Company. In this form the Bill passed the Upper House; and the Directors were hopeful that they would not be subjected to the same amount of opposition before the Committee of the House of Commons. Some of the opponents withdrew; but three of the Local Authorities continued strenuously to oppose—viz., the Corporations

of Walsall and West Bromwich, and the Local Board of Rowley Regis. The Bill did not get into the Commons Committee until the 9th of July, which delay meant additional expense; and then there was a great amount of opposition—one of the grounds being the quantity and quality of the water. He here read a portion of the evidence given before the Committee on the question of the purity of the water, and remarked that no water company could avoid the water occasionally appearing "dirty," as it was sometimes called. The greatest opposition came from the Walsall Corporation, who set out in the first instance that the Company wanted to increase the rates in Walsall by something like £1000 a year. Their own evidence showed the increase only to be £320, or something like 5d. per house. But the Corporation did not tell the whole truth. They said nothing about the advantage of the £1700 a year they obtained by a fluke as to the meaning of the words "annual value." The Town Clerk said they wanted the Company to keep to the bargain of 1863. He (the Chairman) wished they could; for it meant £5000 a year more to the Company, as everybody thought "annual value" meant annual rent, and the Company charged accordingly. The Town Clerk argued that they agreed to "annual value" as defined by law. He (the Chairman) saw no such words in the agreement. Of course, they were bound by the law; and if the Corporation had thought that "annual value" meant annual rent, less rates and other charges, they would not have accepted the position of paying upon annual rent for so long a period. In their last report the Corporation were misleading the water consumers by stating that "annual value" meant rateable value. The Directors did not intend it to mean this. Another thing said against the Company was that they charged whatever they could get. In answer to this he would say that he did not know a single case where an incorrect charge had been pointed out to the officials and the mistake had not at once been rectified. In no instance was proof brought forward of a charge being in excess of the rental of the premises as given by the owner or occupier. The Directors did not want litigation; but they were not going to be driven to the rate-book to determine what was the meaning of "annual value." If they took it from the rate-book, they might have a case where "annual value" meant to them nothing at all. In conclusion, he expressed regret that the Bill had not passed, and added that the Directors were obliged to submit, and would submit with good grace. They did not wish to be in opposition to anybody; but they had a right to ask for just, and even generous treatment, considering they had saved the district thousands of pounds. If the Bill had passed, there would have been an annual saving equal to a capitalized sum of upwards of £3000; and the Company's customers would have been more satisfied than they were under the present arrangement.

Mr. TOWNSEND seconded the motion, which was agreed to.

Dividends for the half year, of 5 per cent. per annum on the preference and ordinary stock, and 4 per cent. per annum on the Dudley preference stock, were then declared; and the proceedings closed with a vote of thanks to the Directors.

SOUTH ESSEX WATER COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held at the Guildhall Tavern last Friday, Mr. W. CRACROFT FOOKS in the chair.

The SECRETARY (Mr. C. J. FOX) read the report of the Directors, which stated that the accounts for the half year ending June 30 last showed a net profit of £2037; being an increase of £218 on the profit of the preceding six months, and of £553 on that of the corresponding period of last year. During the half year 265 new services had been added, representing an addition of £285 to the annual revenue according to the present rating. After providing for interest, &c., the Directors recommended a dividend of 5 per cent. for the six months upon the preference stock, and one at the rate of 10 per cent. per annum upon the ordinary stock.

The CHAIRMAN, in moving the adoption of the report, said there were several reasons why it was not more satisfactory—the principal one being the lowering of rentals throughout the Company's district. But this was a temporary contingency which might be trusted to rectify itself; for while a depreciation in rents existed at present, it might result in a rise at any future time. The decrease in coal consumption, cost of repairs, and working expenses at Grays, noticed in previous reports, continued; and he fully anticipated a further decrease when the construction of the Aveley reservoir was accomplished. This was a project which had long been in contemplation; and, in view of the outlay on this head, the Directors proposed to issue further capital. The Company had lately been subjected to an adverse agitation in the Brentwood district; but he had no hesitation in saying that the outcry against them proceeded on a false basis, and that it would soon cease. As to the dividend, he hoped it would not merely be maintained, but prove to be progressive.

Mr. J. C. AMOS seconded the motion. He entered into details showing the advantages that would accrue to the Company from the construction of the Aveley reservoir; and spoke hopefully of their prospects.

After a few remarks from Mr. GODFREY, J.P., with reference to the Brentwood difficulty,

Mr. C. C. LEWIS, Coroner for South Essex, stated that personally he had no grievance against the Company, because he had been fairly met by the Directors. He knew, however, that owners of cottages at Brentwood did not at present receive enough out of them to pay the water-rates; and he suggested, as a *modus vivendi*, a conference between the Directors and the water consumers of the district.

Mr. C. C. S. FOOKS, jun., replying, on behalf of the Directors, to the various statements made during the discussion, pointed out, in regard to the water-rates being demanded in advance, that Mr. Forrest Fulton's Act practically compelled every water company to collect in advance, particularly in regard to small properties, which constituted the majority in this Company's district. There was an impression that at Brentwood and in the higher districts the supply was cut off at night. On the contrary, the supply was constant; only the pressure was reduced.

After some further discussion, the report was adopted, and the meeting closed with the usual vote of thanks to the Chairman.

PROPOSED ADOPTION OF GAS FOR PUBLIC LIGHTING AT RAWDON.—Up to the present time the township of Rawdon has not had the benefit of public lighting; and an agitation has been going on for some time with a view to secure the adoption of gas-lamps in the streets. The opinion of the members of the Local Board is divided on the question; and it was resolved to submit it to a ratepayer's meeting. This was done last Thursday, when Mr. T. Arton (Chairman of the Local Board) explained that it had been calculated that to light up a portion of the township which he indicated, placing the lamps 70 yards apart, 53 lamps would be required; but for a more extended area 104 lamps would be necessary. It was calculated that the lamps would cost about £2 10s. each, and probably about £1 each for gas and maintenance. It seemed to him that if they adopted this lighting scheme it would mean the addition of 4d. or 6d. in the pound to the rates. After some discussion, the project was rejected by 65 votes to 42. A poll is to be taken on the question.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

Considering their experience of the office they hold, the Gas Commissioners of Edinburgh and Leith are "putting their house in order" as speedily as is consistent with decorum. At nearly every one of their frequent meetings important appointments have been made, and other business (mostly of a formal nature) has been transacted, which affords a means of estimating how they are likely to carry on their undertaking. It must be a satisfaction to all who are interested that they have done so well in what they have already accomplished. To take the matter of appointments, there can be but one opinion—that the Commissioners have, in every instance, done the best they could in the interests of their constituents. It should not be lost sight of that gentlemen in their position are, on the occasion of making appointments, subjected to severe pressure on behalf of particular candidates, which makes it difficult for them to keep in view what should be their first consideration—the selection of the best man. The Commissioners have not escaped from this ordeal; indeed, it is freely stated that one of their own number had an eye to the "fleshpots" of office under the Commissioners, but was restrained from putting forward his "claims" by the knowledge that his colleagues were resolved to manage the gas supply for the benefit of the community, and not for the purpose of finding posts for all their needy friends. The appointment of Auditor at Monday's meeting brought out what had every appearance of being "interested" nominations; but they received scant support, and the Commissioners gave the post to the only man to whom they could with decency have offered it. Except on a score of personal friendship, one cannot conceive a reason for any Commissioner bringing forward an outsider when it was known that Mr. Wodrow Thomson was willing to undertake the duties. Mr. Demar's appointment to the post of Superintendent Surveyor was almost a matter of course; his claims, on account of his former status and his abilities, making it next to an impossibility to pass him over. All the principal appointments have now been made, with the exception of that of Engineer; and, in connection with this, it will be observed that the Commissioners on Monday "districted" the area of supply—dividing it as nearly as possible equally between the Managers of the two gas-works. Under this temporary arrangement, things may go on quite smoothly for a while, until the Commissioners are able to make up their mind on the subject. I presume the Commissioners are able to delay this matter because of the circumstance that—gas engineering being so much of a specialty—there are no outside applications for the post, and that consequently nothing can be lost to anyone by a little delay.

Mr. G. Livesey's award on the points which were in dispute between the Edinburgh and Leith Gas Commissioners and the Gas Companies was given promptly; Mr. Livesey having, as I anticipated a fortnight ago, no difficulty in the matter. His decision, whatever its effect may be, is founded on an exceedingly fair reading of the Act of Parliament. The expectation was that he would decide what description of implements did, and what did not, fall under the expressions "in use" and "in store or in hand." Instead of doing this, he adopted a course which enabled him to avoid giving, by precedent, a legal interpretation to the above words, and by which, also, the parties may quite as easily determine what is or is not to be paid for.

What underlay the stubborn resistance of the Companies was the desire, not to be paid for goods that were actually in use, but for such goods as meters returned owing to the caprice of customers, and which were actually "in store or on hand." The award is not inimical to this view, because if the Companies possess any such implements in excess of their maximum requirements, they will receive value for them. It is announced, through the channel of the Commissioners, that the Committee will save about £5000 by Mr. Livesey's method of settling the question. How much the Companies have gained—that is to say, how much more than £5000 the Commissioners expected to save—has not yet been ascertained.

I sometimes think that gas companies are subjected to more stupid treatment than any other of the quasi-public bodies that have extensive dealings with the community; though for what reason I can never satisfy myself. The question of way-leave for gas-mains has of late been exciting some interest in Fifeshire; and it was under consideration in the Pittenweem Town Council at a special meeting last Friday night. The local Gas Company propose to relay their mains, and are prepared, under an agreement entered into in 1845, to compensate the Police Commissioners for any damage they may do to the thoroughfares by their work. This appears not to have been good enough for the Commissioners; and they made a monstrously absurd demand that, instead of paying for surface damage, the Company should make an abatement of 25 per cent. upon their charge for the public lighting. Of course, the Company refused to agree to the proposal; and a letter to this effect was read at the meeting of the Council. The foolishness of the proposition comes out in this—that had the Company acceded to it, they would have escaped from the provisions of the agreement of 1845. They might then, with impunity, have done any amount of damage to the streets, and could not have been called upon to make it good. If the Commissioners wish for a reduction in the charge for public lighting, it should be made a matter of straightforward negotiation, and not be mixed up with other matters, particularly with those which, as in this instance, are already covered by perfectly safe agreements.

At the meeting on Monday of the Forfar Gas Corporation, the annual accounts were submitted by Mr. Craik. He said they showed that the consumption of gas had fallen short of the estimates by a million cubic feet, which was equivalent to £275 reduction in the revenue. Residual products exhibited an increase of £73; while, to meet the decrease, there was a corresponding saving on the other side of the account—viz., a reduction of £443 on the estimates for coal. In regard to the estimates, they showed that the price of gas could be reduced by 3d. per 1000 cubic feet. None of the Commissioners, he thought, would take credit for this reduction, because it was simply due to the lower price of coal. He moved that the estimates be approved, and that the price of gas be reduced to 4s. 4d. per 1000 cubic feet. The motion was unanimously carried.

The Gas Commissioners of the Aberdeen Town Council, in considering the question of the complaints furnished to them in writing by the "Agitation Committee," with reference to alleged overcharges in the gas accounts, have, it is said, found that of the 120 cases stated, some are not borne out by the books in the gas office; and a Committee has been appointed to thoroughly examine into the matter, and to report.

The Cupar Town Council seem in a fair way towards settling their difference with the local Gas Company in regard to the public lighting. The proposal of the Company is that the charges for gas should be regulated by the period in which the different classes of lamps are lit; the charges ranging from 8s. 6d. to 21s. 6d. per lamp. At present the prices range from 5s. 9d. to 18s.; and the increase, being so large, was resented—the Town Council threatening to charge way-leave for the use of the streets, if the increase was enforced. After negotiation, the parties have, so far, agreed on a basis of settlement in the following terms:—(1) That from and after Sept. 1, the lighting, extinguishing, cleaning, maintenance, and renewal of

the street lamps and lamp-posts be undertaken by the Company; (2) that the price to be paid by the Police Commissioners to the Company in respect of this undertaking be 7s. 6d. per lamp—the number of lamps to remain as at present; (3) that the burners used be Bray's "special;" (4) that this agreement subsist till Sept. 1, 1892, the Directors being unable to contract for a longer period, in respect that the contract of copartnership expires on May 1, 1893; (5) that the condition proposed by the Police Commissioners to reserve the right to charge a rent for the use of the streets by the Gas Company for laying their pipes, &c., cannot be entertained; (6) that a formal agreement embodying this arrangement be entered into, if required, by either party.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

A statement has been made public this week to the effect that the Glasgow Corporation Gas Committee are prepared to recommend the Town Council to purchase the works and goodwill of the Partick, Hillhead, and Maryhill Gas Company, Limited, for the sum of £170,000. I am not aware how such a sum has been fixed upon as the value of the undertaking which is such a powerful competitor throughout the western and north-western suburbs of the city, nor am I aware that any overtures have been made to the Glasgow Gas Trust for the sale of the works. It is not likely, however, that any purchase of the undertaking can be made in the meantime, however willing the two parties may be to come to an understanding on the subject. There is a possibility, however, that when the Glasgow Boundaries Extension Scheme is next promoted in Parliament, it may contain the necessary clauses providing for the purchase of the Partick Gas-Works. The prices of that Company's ordinary and preference shares are keeping very firm.

At the monthly meeting of the Greenock Police Board last Tuesday—Provost Shankland in the chair—a discussion took place as to whether there should be a reduction of 5d. or of 2½d. per 1000 cubic feet in the price of gas. The estimate for the current year, on the basis of the present rates, placed the revenue at £96,800; and the expenditure, including £5500 for interest and £8000 for the sinking fund, at £33,680—showing a surplus of £3120. Mr. McOnie, Convener of the Gas Committee, proposed that the reduction be 2½d. per 1000 cubic feet. This was seconded by Bailie Shearer; while Mr. J. Lang moved, and Mr. McInnes seconded, that the reduction be 5d. Mr. Mitchell moved that a Committee of Inquiry be appointed, with a view to a reduction. After some discussion, the Committee's proposition to reduce the rate by 2½d. per 1000 feet was carried by 14 votes to 8. The price is now 3s. 6½d. per 1000 cubic feet.

At the meeting of the Stirling Town Council on Monday, Treasurer Gray, the Convener of the Lighting Committee, reported that he had received a verbal offer from the Gas Company as to a proposed new arrangement for the public lighting. It was to the following effect:—That for lamps kept alight from sunset till one a.m., the charge would be 17s. 6d. each; for lamps kept alight from sunset till sunrise, 34s. each; the period of lighting to be from Aug. 15 till May 15, excepting moonlight nights; but if the lamps were required to be lighted on moonlight nights, the charge would be from 4s. to 4s. 6d. extra for each lamp. The charges mentioned were for No. 3 burners; but if No. 2 burners were used the charges of 17s. 6d., 34s., and 48s. would be reduced, respectively, to 1s. 6d., 3s., and 3s. 6d. The Gas Company would undertake to provide and maintain the lamps and posts, and to light and extinguish the lamps, and do everything in connection therewith, as at present, but without making any extra charge therefor. If the charge for gas to private consumers was afterwards increased or reduced, the Company would make an increase or a reduction on the charge for the three classes of lamps, respectively, of 3d., 7d., and 10d. per lamp for every 1d. per 1000 cubic feet of increase or decrease. The Lighting Committee had agreed to recommend the acceptance of the Company's offer. At the close of Treasurer Gray's statement, some discussion took place, and eventually the minutes were approved of, and further arrangements as to the lighting of the streets and the bargain with the Gas Company were left with the Committee.

Owing to the visit of the Queen to Glasgow and the West of Scotland this week, the local pig-iron market has been much unsettled; the holiday spirit having taken almost complete possession of the members of the iron "ring." Generally, the prices of warrants had been decidedly firm. Yesterday up to 40s. 6d. cash was paid for Scotch iron; business being done also in Cleveland markets at 33s. 10d. cash, and in hematite at 44s. 1d. cash. Some of the leading special brands have likewise advanced in price 6d. or 1s. per ton.

The local coal trade continues to show improvement from week to week; and prices are firming up in almost every department.

THE SOUTH LINCOLNSHIRE FEN WATER SCHEME.—The Long Sutton Local Board of Health had under consideration, on Saturday, the 18th inst., the Lincolnshire Fen water scheme, which proposes to supply water from a boring at Tongue End, near Spalding, to the towns and villages between Spalding, Holbeach, Long Sutton, and Sutton Bridge, and also to Crowland. Mr. Ffolkes, the Engineer to the new Company, attended the meeting at the request of the Board, and explained the scheme; pointing out that the Board could, if they thought proper, have the water in bulk, and then supply it to the inhabitants of the town and neighbourhood, which they would be enabled to do at a profit. He stated that the water which had been secured was excellent for drinking purposes, and also for use in boilers, breweries, &c. It was also calculated that the project would be of great benefit to agriculturists, and would save considerable expense and inconvenience which they were now put to in carting water for their stock and other purposes. It was further stated that no charge would be made for water used in extinguishing fires. A resolution was passed expressing the hope that the Company would speedily furnish a supply to the district.

THE PUBLIC LIGHTING OF YORK TOWN.—The adjourned meeting of the Lighting Inspectors of York Town took place on Friday, the 10th inst. The patentee of the Stringfellow lamp again attended, and stated his willingness to remove his lamps if they did not give satisfaction, immediately on receiving notice from the Board. Two members expressed their belief that arrangements might be made with the Gas Company; and it was resolved that a deputation should meet the Directors, and report the result at an adjourned meeting—the basis of reopening negotiations with the Directors being that they should waive their claim for £5 11s. 11d. The adjourned meeting of the Inspectors was held on the following Monday, when the deputation, who waited on the Directors the same evening, stated that they were willing to forego their claim, and to send in a tender; but would not again supply gas by meter. The deputation had, on behalf of the Inspectors, withdrawn the statement in their letter, "and declined any further correspondence on the subject," which appeared to have been a misunderstanding on both sides. The Directors offered to send the Inspectors a tender as soon as they had time to frame an estimate; and the Inspectors adjourned to await the receipt of the tender.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Aug. 25.

Sulphate of Ammonia.—The market, though apparently dull, preserves its steady tone; and prices are, if anything, a little firmer. At Hull, the principal business has been done at £11 8s. 9d.; although in some cases £11 7s. 6d. has been quoted. At Liverpool, there is a lack of supplies; and the parity of about £11 10s. is being accorded. The Leith quotation is £11 7s. 6d. to £11 8s. 9d. The lateness of the season, the unfavourable weather, and the consequent indifference of buyers, have been the cause of the great stagnation during August; and this being so contrary to precedent, it is just possible that we may see the revival later than usual, and that September may occupy the place usually usurped by August. The production will soon begin to increase again; but circumstances may contribute to fully maintain values. The nitrate market, especially for future delivery, continues very strong.

LONDON, Aug. 25.

Tar Products.—With the exception of anthracene, most of the products are dull and little inquired for. Pitch is remarkably weak; buyers declaring that they will not pay higher prices for it. Very little business has taken place during the week. Prices may be taken as follows:—Tar, according to position, 17s. 6d. to 22s. 6d. per ton. Benzol, 90 per cent., 2s. 10d. per gallon; 50 per cent., 2s. 4½d. per gallon. Toluol, 1s. 8d. per gallon. Solvent naphtha, 1s. 2d. per gallon. Crude naphtha, 30 per cent., 1s. per gallon. Light oil, 3½d. per gallon. Creosote, 1½d. per gallon. Pitch, 12s. to 13s. 6d. per ton. Carbolic acid (crude), 3s. 4d. per gallon. Cresylic acid, 9d. per gallon. Tar salts, 15s. per ton. Anthracene, 30 per cent., "A" quality, 1s. 6d. per unit; "B" quality, 1s. 3d.

Ammonia Products.—Sulphate of ammonia continues flat, and although considerable shipments have been made to new ports, they have been more than counterbalanced by the absence of demand from the usual channel. The price is nominally the same. Sulphate of ammonia, £11 5s. to £11 7s. 6d. per ton, less discount. Gas liquor (5° Twaddell), 8s. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 1½d. per lb. Carbonate of ammonia, 3½d. per lb. Muriate of ammonia, brown, £18 per ton; white, £27. Sal ammoniac, £30 per ton.

[From the *Chemical Trade Journal*, Aug. 25.]

Sulphate of Ammonia.—At some of the ports sulphate of ammonia has experienced a further fall; but, strange to say, so good has been the demand at Liverpool, on account of Spanish and other orders, that the price at this port now equals that at Hull or Leith. This is quite unprecedented, especially as Beckton value is now only £11 7s. 6d. Hull and Leith are quoted at £11 7s. 6d. to £11 8s. 9d.; while London outside makes are value for £11 12s. 6d. The present state of the market is most abnormal; and it is difficult to account for it, except by the most unsatisfactory state of the weather and of the crops. Still the nitrate market keeps very firm.

Tar Products.—From several quarters we hear that benzols are a bit firmer, though the actual price has not sensibly advanced, at least so far as sellers are concerned. If quantities were required through second hand, there is no doubt an advance would be required, as there is but little free to offer; 2s. 4d. and 2s. 11d. were spoken of on Manchester "Change" last Tuesday, for 50 and 90 per cent. respectively, but we could not hear of any actual business at these prices. Crude carbolic acid remains in much the same condition as last week; while anthracene is, if anything, firmer, especially for "B" quality and qualities intermediate between good "A" and "B." Pitch remains at 13s. to 13s. 6d. at the port of shipment; but we understand it is being offered on the Continent at lower rates than these.

SALE OF SHARES.—At the Mart, Tokenhouse Yard, on Tuesday last, 15 fully-paid £10 shares in the Bromley (Kent) Gas Company were sold for £20 10s. each.

THE SEWAGE OF CAPE TOWN.—The Municipality of Cape Town have had considerable difficulty in dealing with the sewage of the city; and although the cost of the sewage disposal works must be of enormous magnitude, nothing yet appears to have been done to permanently remove the difficulties which at present exist. Numerous proposals have been considered; but finally the authorities have retained the services of Mr. E. Pritchard, M.Inst. C.E., of London and Birmingham, to make a personal inspection of the district, and prepare a comprehensive report thereon; and he has just left England for the Cape for this purpose.

THE NORTHERN COAL TRADE.—There has been increased animation in the coal trade of the North during the past few days, and the price has become decidedly firmer. Steam coal is about 7s. 6d. per ton; but one or two of the best collieries ask 7s. 9d. In the gas coal trade, the advance which we named last week has been obtained in one or two instances; and there seems a probability that it will become more general where contracts do not intervene. In the case of another colliery, the price has been fixed at 7s. 6d. per ton, less 5 per cent., so that it is evident the upward movement is becoming more common. A strike at the Murton and South Hetton Collieries is keeping some 2000 tons of gas coal daily out of the market; and this is giving owners of other collieries more chance of obtaining the higher price. House coal is very dull in demand, and weak in price.

SEVENOAKS GAS COMPANY.—At the half-yearly meeting of this Company held last Thursday, the Directors reported a steady increase in the consumption of gas, and a marked improvement in the value of residual products. The gross revenue for the half year was £4904 9s. 5d., as against £4388 18s. 5d. for the same period of last year. The total expenditure was £2866 6s., as compared with £2795 3s. 8d. last year. The amount available for dividend was £2133 10s. 9d.; and the Directors recommended the payment of 10 per cent. per annum on the original capital, and 7 per cent. per annum on the additional capital (both less income-tax). The price of gas has been reduced 2d. per 1000 cubic feet throughout the whole district supplied by the Company, which, it is hoped, will tend to still further encourage its use. The report was adopted; and the dividends recommended therein were declared.

THE WATER SUPPLY OF LIVERSEDGE.—At the last meeting of the Liversedge Local Board, Mr. J. Hurst gave notice that on the next occasion he intends to move that the Board enter into negotiations with the Corporation of Wakefield and the Local Board of Heckmondwike, with the view of obtaining the lowest price at which they would supply Liversedge with water under an agreement for a number of years; and also that the Board obtain Counsel's opinion as to the best course to take to get free from Bradford, whether by Provisional Order, by opposition to Bradford in the event of their going to Parliament for powers to construct new works, or by themselves promoting a Bill in Parliament for that purpose. A similar resolution was adopted by the Local Board last year; but on appeal to the ratepayers on the question of going to Parliament, the Board were defeated—from a misconception in the public mind, it is said, as to the meaning of a new proposal from the Bradford Corporation to supply the township on a fresh basis.

WORKING WATER AND GAS COMPANY.—In their report for the half year ended June 30 last, the Directors of this Company recommended an interim dividend at the rate of 3½ per cent. per annum.

THE PUBLIC LIGHTING AT FLEETWOOD.—On Monday evening last week a meeting of the ratepayers of Fleetwood was held to consider the subject of the price charged for gas in the town, and also the best means of improving the public lighting. Mr. T. Seed (Chairman of the Improvement Commissioners) presided. The first resolution submitted was to the effect that the price of gas ought to be greatly reduced; and this was carried unanimously. A Committee was then formed to make inquiries as to the methods of lighting adopted in other places, and the cost thereof, and to report to a subsequent meeting. A communication was read from the Public Streets Lighting Company offering to light the whole of the streets of Fleetwood with petroleum oil lamps, as now in use at East Moulsey and elsewhere. They also offered to supply, by way of experiment, some of the Company's lamps. A communication was also read from Messrs. Chamberlain and Hookam, Limited, with reference to the illumination by the electric light at Leamington, and inviting a deputation from Fleetwood to meet them at that place, and gather opinions as to this method of lighting both houses and streets. These communications were left to be dealt with by the Committee.

THE COST OF THE PROPOSED ELECTRIC LIGHTING AT CHELTENHAM.—Referring to a statement which appeared in the *Engineer*, to the effect that the Cheltenham authorities propose to light part of the town with 36 electric lamps in substitution for 170 gas-lamps, and that the cost of the electric light was to be £444, Mr. Denny Lane has written to that publication to point out that there is an error. He says: "The present cost of the 170 gas-lamps is £444, or £2 12s. 3d. per lamp, and the Committee suggest that the contractors who now supply 70 lamps to the Corporation of Bath at £18 17s. 6d. per lamp, should be asked to supply 36 lamps to Cheltenham at the same rate per lamp, which would amount to £679 10s., and not £444. I must remark that it is highly improbable that 36 lamps could be supplied at as low a rate as 70, since I believe there would be little difference in the skilled labour and attendance for either installation, which would have to be divided over only half the number of lamps at Cheltenham. I may add that it seems unfair to gas companies that corporations should have the power of contracting with them for only three years, while at Bath the contract for electricity extends to seven."

PROPOSED ELECTRIC LIGHTING AT RICHMOND.—At the meeting of the Richmond Select Vestry on the 14th inst., the Clerk read a letter from the Secretary of the Richmond Gas Company (Mr. E. B. Blott), acquainting the Vestry with the resolution come to by the Company to reduce the charge for the public lamps from £3 10s. to £3 6s. 8d. per lamp per annum, as from the 24th of June last. Notwithstanding this concession, the Vestry on the same occasion referred to the Parliamentary Bills Committee an offer from Mr. R. F. Coles, on behalf of the proposed Richmond Electric Lighting Company, Limited, to the following effect:—That in consideration of their transferring, or delegating to him, on behalf of the Company, the Provisional Order and powers held by the Vestry from the Board of Trade for electric lighting within their area, and giving him any necessary assistance to have their Order altered or substituted for similar powers under the new Act, and further guaranteeing him entire co-operation and support in the matter of electric lighting in their district, the Company would either pay him a royalty of 1s. per light per annum (street lamps by special contract), or if preferred would undertake to give a fixed sum—say, £150 per annum—for consideration of the transfer. He undertook to satisfy the Vestry as to the *bona fides* of the undertaking; and mentioned that he had orders in hand for some 200 lights, and only desired the sanction of the Vestry before commencing the erection of a central station.

CONSTANT v. INTERMITTENT WATER SUPPLY AT SHREWSBURY.—The Water Engineer of the Shrewsbury Corporation (Mr. W. Chapple Eddowes) has lately presented to the Water Committee a report giving the results of some trials of the constant as against the intermittent service on a portion of the district of supply. The tests extended over six days on each system; the number of houses being 600, and the population served about 3000. On the intermittent system the total consumption was 488,700 gallons; being an average of 81,450 gallons per day, and 27.75 gallons per head per day. On the constant system the total was 879,850 gallons; being a daily average of 146,641 gallons, and a consumption of 48.88 gallons per head per day. "This shows," Mr. Eddowes says, "an increase of 65,191 gallons on a constant supply of water. Over the whole borough, the consumption, based on the above increase per 3000, would equal 651,910 gallons per day above the average consumption per day for the year. To give a constant supply under the present circumstances, 651,910 gallons would have to be pumped in addition to the average quantity per day, simply to run to waste. The cost for fuel alone to raise this additional quantity would be not less than £500 per annum. This would be a very extravagant sum to pay for pumping water to run to waste," owing to the defective condition of the fittings in the houses, to which he had previously called the attention of the Committee. The great leakage which has been going on in the city has led to a trial of Deacon's meters; and the Borough Surveyor has reported favourably thereon.

IMPROVED STREET LIGHTING IN ST. JAMES'S.—The report for the parish of St. James, Westminster, for the twelve months ending March 25 last, which has just been published, states that the demand for better lighting in different parts of the parish engaged the attention of the Vestry on many occasions during the year. On March 25, 1887, there were in the various thoroughfares of the parish 771 public lamps, 744 of which were ordinary street lamps—458 burning candle and 286 ordinary gas. In March, 1888, the number of lamps was 778; and the contract sum paid to The Gaslight and Coke Company for lighting, extinguishing, cleaning, and maintenance was £2 7s. 7d. per lamp yearly—the gas burned being 2½ cubic feet of candle and 3 cubic feet of common gas per hour. The total cost of street lighting was £2325 10s. 6d. for the year, against £2433 12s. 9d. in the previous twelve months. In February last the Vestry took into consideration the question of improved lighting. Taking advantage of a large reduction in the price of gas, they determined to increase the consumption in the street lamps generally, and thus practically place all streets on the same basis as regards lighting. Two years previously, the consumption of gas in the Regent Street lamps had been increased from 2½ to 4 cubic feet of candle gas per lamp per hour; and this improvement was so marked that this rate of consumption has been adopted for the streets generally. The number of street lamps has been altered to 582. The increased cost is only £371, from which a small sum saved in respect to the refuge lamps is deducted—leaving the net increase only £347. The light in the street lamps has been increased 60 per cent.; and the extra cost to the ratepayers was less than half a farthing in the pound. The Vestry do not appear inclined to remain satisfied with this improvement, seeing that there are even now defective and obsolete lamps in some of the leading thoroughfares, such as in Piccadilly, where heavily-metalled old-fashioned lamps still exist to obscure a fair proportion of the light. Many lamps of this description will require to be replaced at no very distant date.

BELFAST WATER SUPPLY.—It is satisfactory to learn that all danger of the recurrence of a short water supply in Belfast has been removed. The immense culvert of seven miles in length, connecting Stonyford with the Lagmore reservoir, the construction of which was entrusted to Messrs. Fitzpatrick Bros., of Belfast, has been completed, so that the present town supply can be supplemented at any moment should necessity arise. The Water Commissioners laid a section of the pipes; and on the 11th inst. Messrs. Fitzpatrick announced the completion of their portion of the contract, on which the utility of the Commissioners' work depends.

HARTLEPOOL GAS AND WATER COMPANY.—The report of the Directors of this Company has been issued to the shareholders, together with the balance-sheet for the year ending June 30 last. The latter shows a considerable increase in the consumption of both gas and water during the past year; and there is every prospect of a further increase during the ensuing year. There is also a slight improvement in the value of residuals. The balance available for division is £11,154 14s. 9d., out of which the Directors recommend the payment of a dividend for the past half year at the rate of 6 per cent. per annum upon the whole of the paid-up capital of the Company, less income-tax; leaving a balance of about £2976 to be carried to the next accounts. The new offices have been completed, and meet the contemplated requirements. The new pumping-engine at the water-works, capable of raising 150,000 gallons of water per hour, has also been finished, and is working satisfactorily. Sulphate of ammonia works are in course of erection, and will be ready to commence operations this autumn.

CANTERBURY GAS AND WATER COMPANY.—The Directors of this Company, in the report which they will present at the forthcoming half-yearly meeting of shareholders, state that a year's experience has shown the correctness of the calculations they made when the reduction in the price of gas was determined on. The large gasholder erected from the plans of Mr. H. E. Jones, M. Inst. C.E., has been fully tested, and is now in satisfactory working order. This new and valuable portion of the gas plant has been erected at a very moderate cost—the total expenditure on the work, including the Engineer's commission, being £4899 18s. 5d.; and this sum has been duly paid out of the loan capital recently raised. In the Water Department no capital expenditure has been required during the half year beyond a small outlay on the extension of mains to new property; and the works are all in efficient order and good repair. The balance standing to the credit of the profit and loss account is £5908 11s. 2d.; and the Directors therefore recommend that the usual dividend after the rate of 8 per cent. per annum for the half year be declared and paid free of income-tax, and the balance carried forward.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST. (For Stock Market Intelligence, see ante, p. 370.)

Issue.	Share	When ex-Dividend.	Dividend of Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.					£ s. d.
GAS COMPANIES.								
590,000	10	12 Apr.	10½	Alliance & Dublin 10 p. c.	10	18-19	..	5 10 6
100,000	10		7½	Do. 7 p. c.	10	13-14	..	5 7 1
300,000	100	2 July	5	Australian (Sydney) 5% Deb.	100	110-112	..	4 9 3
100,000	20	30 May	10	Bahia, Limited	20	23-25	..	8 0 0
200,000	5	11 May	7½	Bombay, Limited	5	7-7½	..	5 0 0
40,000	5		7½	Do. New	4	5-5½	..	5 9 1
380,000	Stock.	15 Feb.	11½	Brentford Consolidated . . .	100	225-230	..	5 2 2
110,000			8½	Do. New	100	165-170	..	5 2 11
220,000	20	14 Mar.	10½	Brighton & Hove, Original .	20	44-46	+1	4 11 8
320,000	20	12 Apr.	11½	British	20	45-47	..	4 15 9
50,000	10	14 Mar.	11	Bromley, Ordinary 10 p. c.	10	20-22	..	5 0 0
89,000	10		8	Do. 7 p. c.	10	13½-14½	..	5 10 4
328,750	10	30 May	8	Buenos Ayres (New) Limited	10	13½-14½	..	5 10 4
200,000	100	2 July	6	Do. 6 p. c. Deb.	100	108-110	+1½	5 9 1
150,000	20	10 Aug.	7	Cagliari, Limited	20	25-27*	..	5 3 8
550,000	Stock.	12 Apr.	13½	Commercial, Old Stock . . .	100	266-271	..	4 19 8
130,000			10½	Do. New do.	100	208-213	+1	4 18 7
121,234		28 June	4½	Do. 4½ p. c. Deb. do.	100	120-125	..	3 12 0
557,320	20	14 June	12	Continental Union, Limited	20	45-46	..	5 4 4
242,680	20	"	12	Do. New '69 & '72	14	204-204½	..	5 10 0
200,000	20	"	9	Do. 7 p. c. Pref.	20	35-37	..	4 17 3
75,000	Stock.	28 Mar.	10	Crystal Palace District . . .	100	205-215	..	4 13 0
234,060	10	27 July	13	European, Limited	10	254-264	..	4 18 1
120,000	10	"	13	Do. New	7½	18½-19½	..	5 0 0
354,060	10	"	13	Do. do.	5	124-135	..	4 16 3
5,468,350	Stock.	15 Feb.	13½	Gaslight & Coke, A Ordinary	100	257-262	+2	4 19 3
100,000	"	"	4	Do. B, 4 p. c. max.	100	100-105	..	3 16 3
665,000	"	"	10	Do. C, D, & E, 10 p. c. Pf.	100	263-268	..	3 14 7
30,000	"	"	5	Do. F, 5 p. c. Prf.	100	127-132	..	3 15 9
60,000	"	"	7½	Do. G, 7½ p. c. do.	100	185-190	..	3 18 11
1,300,000	"	"	7	Do. H, 7 p. c. max.	100	170-175	..	4 0 0
463,000	"	"	10	Do. J, 10 p. c. Prf.	100	261-266	..	3 15 2
1,061,150	"	14 June	4	Do. 4 p. c. Deb. Stk.	100	120-123	..	3 5 0
294,350	"	"	4½	Do. 4½ p. c. do.	100	125-130	..	3 9 3
650,000	"	"	6	Do. 6 p. c. do.	100	175-178	..	3 8 5
3,600,000	Stock.	11 May.	10	Imperial Continental . . .	100	206-249	..	4 15 8
75,000	5	14 June	6	Malta & Mediterranean, Ltd	5	5-5½	..	6 9 1
560,000	100	3 Apr.	5	Met. of Melbourne, 5 p. c. Deb.	100	414-416	..	4 6 2
541,920	20	14 June	6	Monte Video, Limited . . .	20	20-21	..	5 14 3
150,000	5	30 Mar.	10	Oriental, Limited	5	9½-9½	..	5 2 7
60,000	5	28 Mar.	7	Ottoman, Limited	5	6-7	..	5 0 0
420,000	100	2 May	6	People's Gas of Chicago—	100	104-109	..	5 10 1
500,000	100	1 June	6	1st Mtg. Bds.	100	95-100	..	6 0 0
100,000	10	26 Apr.	10	2nd Do.	10	16-17	..	5 17 8
500,000	Stock.	29 Feb.	15½	San Paulo, Limited	100	315-320	..	4 16 10
1,350,000	"	"	12	South Metropolitan, A Stock	100	247-252	+3	4 15 3
141,500	"	"	13	Do. B do.	100	250-260	..	5 0 0
550,000	"	28 June	5	Do. C do.	100	135-140	..	3 11 5
60,000	5	29 Feb.	11	Do. 5 p. c. Deb. Stk.	5	11-13	..	4 4 0
60,000	5		11	Tottenham & Edm'ton, Orig.	5	11-13	..	4 4 0
WATER COMPANIES.								
717,467	Stock.	28 June	9	Chelsea, Ordinary	100	254-259	+1	3 9 6
1,720,560	Stock.	12 Apr.	7	East London, Ordinary . . .	100	197-202	..	3 9 4
700,000	50	11 June	9	Grand Junction	50	124-128	..	3 10 4
708,000	Stock.	10 Aug.	10½	Kent	100	269-271*	..	3 16 7
1,043,800	100	28 June	9	Lambeth, 10 p. c. max.	100	258-263	..	3 8 5
406,200	100	"	7½	Do. 7½ p. c. max.	100	204-209	+4	3 11 9
200,000	Stock.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	118-122	+1½	3 5 7
500,000	100	27 July	12½	New River, New Shares . . .	100	347-352	..	3 8 10
1,000,000	Stock.	"	4	Do. 4 p. c. Deb. Stk.	100	123-127	..	3 3 0
902,300	Stock.	14 June	6	S'hwk & V'xhall, 10 p. c. max.	100	162-167	+1	3 11 10
126,500	100	"	6	Do. 7½ p. c. do.	100	157-162	..	3 14 1
1,155,066	Stock.	14 June	10	West Middlesex	100	264-269	..	3 14 4

* Ex div

† Next dividend will be at this rate.

Acts of Parliament regulating their undertaking. Over and over again, however, it has been shown by the Superior Courts that these conditions do not bind the passenger if they are unjust and oppressive. Again, contract or no contract, the Legislature absolves by special enactment incoming tenants from liability for the arrears of their predecessors; and it is not a great stretch to imagine that it might be moved to relieve outgoing tenants from the debts of their successors. The incident has an unpleasant look; and it is to be regretted that the Company come out of it under such a harsh aspect. We would not absolve a consumer from the duty of applying for a supply of gas in his own name, nor from duly giving notice of his intention to terminate a tenancy. The temptation to do as Mrs. Darbyshire says she did—to transfer the use of the meter to the incoming tenant, for his convenience, and to avoid an interregnum of darkness and the expense of reconnecting the supply—is, however, very great; and some forbearance is due to those who yield to it, to the sacrifice of strict legal forms. The question as to whether any notice was really given by the Darbyshires, and acted upon by the Company, remains unsettled. They swore that it was so; and against these asseverations there is nothing but the denial, unsupported in any way, of Mr. Arthur Dove for the Company. Surely, if the Company did send a man as asserted, some entry in a book would record the fact; and this could have been called for. The whole case has an unfinished as well as the hard look already remarked; and by no possible way of examining it can satisfaction be drawn from it.

A LOCAL BOARD CONVERTED INTO A GAS COMPANY.

STUDENTS of precedents in Gas Legislation should procure a copy of the Nelson Local Board Act of the past session, in which they will find a remarkable compact between the Board and one of their neighbours, the Brierfield Local Board. It is enacted that, as between the two Boards, the Nelson Local Board, who own the gas-works supplying the two districts, are not to make a greater yearly profit out of their undertaking than 10 per cent. upon not more than £65,000, and 7 per cent. upon the remainder up to £100,000; such capital being actually expended at the time for gas-works purposes. No deduction is to be made for any part of this amount which may be repaid by the operation of the sinking-fund; but the Brierfield Board district is not to be called upon to find, or to be debited with, any such sinking-fund payments. The term profit is not to include any allowance for depreciation; and section 35 of the Gas-Works Clauses Act, 1847, is amended by substituting the name of the Brierfield Local Board for the two gas ratepayers who are empowered under that section to move the Court to inquire into the condition of the undertaking in which they are interested. This means that the one Local Board will be served with gas by the other Local Board precisely as though the latter were a Gas Company working under the powers and provisions of the 1847 Act. The owners of the works are to charge a price for gas in the neighbouring district that will enable them to earn not more than 10 per cent. and 7 per cent. profits upon their original and additional capitals; and the Local Board which represent these foreign consumers are empowered to look after the supplying Board, just as though the latter were a Gas Company. This is another and a very striking example of the movement in favour of putting gas-supplying local authorities upon the footing of Gas Companies; and it deserves to be borne in mind. It is remarkable how these precedents seem to be slipped into Bills year after year without notice to anybody except the parties immediately concerned; and yet they are serious enough to give a colour to the whole course of legislation of the order in which they fall. It was the Oldham Corporation; now it is the Nelson Local Board. Who shall say what is to be the next example of the modern tendency to invest gas-owning local authorities with the attributes of Gas Companies?

PRIOR to leaving Manchester in order to take up his appointment of Engineer and Manager of the Nottingham Corporation Gas Department, Mr. W. R. Chester entertained to a farewell supper the members of the Mutual Aid Society, as well as the foremen, and others connected with the Bradford Road Gas-Works of the Manchester Corporation. The gathering was presided over by the Chairman of Mr. Chester's own Sub-Committee (Mr. John Hinchliffe), supported by Mr. Chesters-Thompson, Mr. Charles Nickson (Superintendent of the Gas Department), the Rev. A. Schofield, and Mr. Harrison. All these gentlemen addressed the gathering; and high appreciation was expressed of Mr. Chester's services and character, and regret that he was leaving Manchester.

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(FOR STOCK AND SHARE LIST, see p. 432.)

LIMITED business has again been the rule on the Stock Exchange, as might be expected; but the tone was better than in the preceding week. The slight degree of anxiety then produced by Continental affairs has apparently passed off, to the benefit of the Foreign Market; and the principal departments in general have had a favourable tendency. The Money Market remains about the same. Gas securities have been moderately active, considering the time of year; and all descriptions have been very firm. Important changes will be noted in the quotations; Gaslight and Coke, Brentford, and South Metropolitan being now quoted *ex div.* In all three cases, the variations show more or less of an advance in prices. Gaslight "A" was in good demand, and was done as high as 263 *cum div.* and 258 *ex div.*; but the latest marks were rather easier. South Metropolitans were almost untouched; a solitary deal in the "B" being all the business done. Confirming the opinion we expressed some little time ago, that the first half of 1888 would prove a good one for many Gas Companies (Metropolitan and others), two recent items of intelligence are of interest. The Directors of the Commercial Company announce that they will recommend an increase of $\frac{1}{2}$ per cent. in the next dividend; making 13 $\frac{3}{4}$ on the old stock, and 10 $\frac{3}{4}$ on the new. This is the full statutory rate permissible with the present price of their gas. We believe the Company have had a very successful half year, and will be able to carry forward a considerable balance after paying the dividend. The other item is furnished by the accounts of the Crystal Palace Gas Company, who appear to have earned their dividend and about £3000 more. They announce a further reduction in price to 2s. 8d. per 1000 cubic feet—the policy of which we are somewhat at a loss to understand. They are not expected to be able to undersell the big Company; they cannot increase their dividend; and they are giving away something that would be valuable hereafter, if they ever change their condition. Of the Foreign undertakings, Continental Union has been in best demand, and shows a slight improvement. Water has been quiet, but is very firm. The only change is a rise of 2 in Chelsea.

The daily operations were: Monday was about the busiest day of the week, especially for Gaslight "A," which rose 2, and Continental Union. In Water, New River debentures were done at 126 $\frac{1}{2}$. Tuesday was quiet; but prices were excellent. Commercial new and Chicago advanced 2 each; and Continental Union, $\frac{1}{2}$. Chelsea Water also rose 2. On Wednesday, hardly anything was touched but Gaslight "A," which was very firm. Quotations were made *ex div.*, the details of which will be found in the list at page 432. Gaslight "A," however, was quoted 1 higher; but on Thursday it was put back to 253-57. Water was quite stagnant. On Friday, Gas was extremely inactive, and presented nothing to notice. Water, however, did more business. Saturday was quiet as usual; and Gas transactions were very moderate, but at good prices. Commercial rose, on the announcement of the dividend—the old stock improving 2; the new, 1; and debentures, 3. Water was an absolute blank.

ELECTRIC LIGHTING MEMORANDA.

A MUNICIPAL ELECTRIC LIGHTING STATION FOR PARIS—THE TROUBLES OF THE PILSEN-JOEL COMPANY—RULES FOR THE ELECTRICAL FITTING OF HOUSES—A GERMAN ESTIMATE OF THE COST OF ELECTRIC LIGHTS.

IT is reported that the Municipality of Paris are really about to make a beginning in respect of electric lighting. As contractors have not come forward to compete for the concessions for lighting different parts of the capital by electricity, according to the scheme mentioned several times in this column, the Municipal Council have determined to make a start on their own account, in the district of the Halles Centrales. The details of this venture have been "studied" since March; and at last the Lighting Committee have plucked up courage to recommend the Council to proceed with the scheme. The plans have been drawn up by the City Engineers; and the total estimate for the work amounts to £40,000. When the tenders are received, they are to be examined by a Special Commission to be appointed by decree of the Prefect of the Seine. Thus in Republican France the popular governing assembly is not allowed to go too far. They are permitted to talk as much as they please, and even to instruct their scientific advisers to make plans; but the last word rests with the representative of the central power, just as it did in the darkest days of the defunct Empire. The price at which the Council think they will be able to supply current to their subscribers in the Halles district is 1s. 3d. per Board of Trade unit, which is equivalent to gas at 12s. 6d. per 1000 cubic feet. Before selling electricity by meter, however, the meter must be found; and accordingly the Council have opened a prize competition for electric meters—offering £800 altogether in prizes. Of this amount £400 is to go to the designer of a really perfect and satisfactory meter; and the rest, in sums of £80, is to be divided among the five next best. The prospect of this reward should stimulate makers of those instruments which Dr. Hopkinson told a House of Commons Committee were perfect in 1882, but which nobody believes in to-day, to bring out something really workable. The competing instruments will be examined by a Special Commission of nine members, who will adjudicate upon them, and award the prizes.

There is trouble in store for the Pilsen-Joel Company. Last

June a Committee of four of the principal shareholders, of whom Mr. J. E. A. Gwynne was one and Mr. Fyfe another, was appointed by the Company in general meeting to advise with the Directors as to the best means of disposing of the Company's business. Very recently Mr. Gwynne made an offer, which was accepted by the Board, to buy the concern right out for £4550, with a view to the formation of another Company to carry it on; and the shareholders have been invited to exchange their shares for shares of the new Company. Suddenly, however, Mr. Fyfe appears upon the scene, denouncing the transaction between Mr. Gwynne and the Board as fraudulent, and applies to the Court for an interim injunction to restrain these parties from carrying their agreement into effect. In this he has succeeded; and the matter will come before the Chancery Division in due course. As our contemporary *Money* remarks, these Electric Light Companies cannot keep out of Court. What their shareholders and promoters have spent in lawyers' fees and Court charges must amount to an enormous sum. If they cannot find money enough for embarking in legitimate enterprises, they can always rake enough together for litigation.

The London Electric Supply Corporation have issued a code of rules to be observed by electrical fitters in connection with the wiring of houses intended to be supplied with current by the Corporation. There is nothing like beginning as one means to go on; and if the Corporation should in the fulness of time succeed in making anything like a business, it will be useful to have a good body of regulations to fall back upon when fitters try to scamp their work. It would have been a good thing for gas consumers if gas companies in general had been entrusted with the power of inspection over internal fittings; so that they could have insisted upon the use of pipes of proper dimensions and strength. These rules for electrical fittings appear to be reasonable enough. The instructions respecting the size and method of insulating and protecting internal conductors seem well conceived for the objects desired, which are to ensure good work, and to avoid fires. Finally, the Corporation reserve the right of refusal to supply current to any installation before testing and satisfying themselves respecting the insulation resistance of the circuits. All this sounds very respectable; and it only now remains to put the rules in operation.

Papers on the cost of distributing electricity for lighting purposes from a central station have recently been published in the *Electrical Review* by Mr. W. Fritsche, of the firm of Fritsche and Pischon, of Berlin. In these papers the data relating to the consumption of current for different times of the year, and also those relating to the working expenses of an electric lighting station, are very carefully computed and plotted graphically in a series of diagrams that look as if they ought to be useful. Reckoning upon the basis of an average year of 1433·72 lighting hours, the author states that with 16-candle incandescent lamps, paid for at the rate of 4 pfennige (0·04 shilling) per hour, a station such as he has in his mind ought to pay 11·23 per cent. profit after allowing 4 per cent. interest on the cost of the plant, and providing for depreciation of machinery. This is rather under a halfpenny per lamp per hour, which is a price that several English electricians have already talked about as a satisfactory one for electrical undertakers. Mr. Fritsche, like most other Continental Engineers, works out his calculations with great precision to two or three places of decimals, which gives his results a look of extreme exactitude. This is quite illusory, however, because when one investigates these computations, they are found to rest upon several estimated factors which must be more or less variable, and any alteration in which would play havoc not only with the decimals, but also with the whole numbers of the result. Therefore Mr. Fritsche's precision is really of no more value than a very much rougher estimate, which might point to the same result without attempting to go so deeply into the data of lighting hours and working expenses. It has been abundantly asserted that incandescent electric lighting ought to be supplied at a profit from a central lighting station at a charge of one halfpenny per hour for a 16-candle incandescent lamp. This is equivalent to gas at about 8s. 4d. per 1000 cubic feet, and is probably the best that electricians can do at the present time. It leaves out of account, of course, the practical difficulty of carrying on a lighting business on a rental basis instead of on the meter system. Mr. Fritsche does not mention the use of consumers' meters, from which we judge that he does not think any device of this kind that has come under his notice worth serious consideration.

GAS LIGHTING AND PICTURE GALLERIES.

THE action of light upon painting is a subject which has exercised the minds of painters and their patrons since the time of the *Renaissance*; but it has been until comparatively late years mixed up with other considerations affecting the permanence of works of art in colours, such as the durability of varnishes. The effect of light in discharging the tints of pigments seems to have first become prominent as a question of distinct interest and importance in connection with the work of Sir Joshua Reynolds, who was an inveterate experimentalist in the matter of colours; and, to the sorrow and loss of posterity, sometimes confided the fruits of his genius as a painter to fleeting mixtures, the originally brilliant tones of which have vanished with time. Since this unfortunate experience, which has been repeated more or less in the case of other masters, painters have been very shy of unknown chemical mixtures of pigments, and have been cautious respecting the preparation of their canvases and the purity of the media with which their pictures are finished. The essentially British art of painting

in water colours, which is of modern growth, has always been specially liable to the kind of troubles referred to, on account of the thinness of the washes of colour laid on the paper, the variations of composition met with in the paper itself, and the absence of any protecting varnish from the finished pictures. Fears for the permanence of the colours have consequently oppressed the owners of collections of this class of pictures; and they have even suffered in value, in the commercial sense, from the prevalence of the idea that they do not constitute such a safe investment as oil paintings, which are known to improve with age. Many years ago the nation became possessed of a magnificent gallery of water colours, which has since been shown at South Kensington not only by day, but also by artificial light; and ever since there has been entertained in some quarters a rooted opinion, frequently expressed in Parliament and in the writings of art critics, that this constant exposure to light would, in the end, spoil the pictures. These observations had their effect upon the responsible authorities; and in April, 1886, the Lords of the Committee of Council on Education requested Dr. Russell, F.R.S., and Captain Abney, R.E., F.R.S., in order to settle the question by an exhaustive series of experiments upon the action of light on water-colour drawings. When this action was publicly heard of, the Royal Society of Painters in Water Colours very naturally formed the opinion that the advice of a water colour painter ought to be taken in respect of the conduct of these experiments, and made a representation to this effect, which was immediately attended to by their Lordships of the Committee of Council. Nine distinguished artists were accordingly added to the Experimental Committee in an advisory capacity; and they materially assisted Dr. Russell and Captain Abney collectively and individually. The result of the investigation thus set on foot has been published as a Blue Book, which contains a mass of most valuable information upon the different matters taken into cognizance by the Committee. Much of the contents of the book will be particularly interesting to students of water-colour painting, from the remarks upon the selection of colours by eminent living artists; while students of the science of light will find a great deal in it to instruct them respecting the modern theory of colour. With these portions of the book, however, we have here nothing to do. Our interest in the inquiry is confined to the practical aspect of the question of lighting; seeing that the subject of the suitability of gas for illuminating picture galleries is a matter of interest in other places than South Kensington, and this report constitutes the most authoritative treatment of the question that has yet been given to the world.

The first part of the report gives a comparison of sunlight with the lights of the electric arc and of a gas-flame, which were the artificial sources of light selected for investigation, as they are both used at South Kensington. It is remarked, upon the appearance of colours by these different means of lighting, that "no matter what the source of light may be—whether the yellowish-white light of gas, the purer white of the electric arc light, or of the sun, or the bluer white light from the sky—the comparative measures of the brightness of the different colours reflected from the two surfaces (white and coloured surfaces experimented upon with the spectrum) will always be the same To see what will be the colour of a pigment by gas light, the rays of the spectrum of gas light must be reduced in the proper proportion found for the particular pigment, and be again recombined; and this will give the colour of the pigment seen by gas light." Diagrams are given showing the three lights compared in various ways; and the effect of that portion of the total energy of the light which does not appear as visible luminosity is discussed. It is concluded that all lights are identical in effect, though they differ in intensity and in composition as shown by these spectra; consequently it is possible to deduce the effect of one from observations made upon any other which may be most convenient for experimental purposes.

In determining the question of the effect produced on pictures or anything else by the means adopted for lighting, it is, of course, necessary to ascertain its actual or relative intensity. Accordingly, in this case General Festing measured with the Preece photometer for diffused light the amount of illumination of some of the walls of the South Kensington picture galleries lighted by gas and other means. He found that, in the rooms illuminated by gas, the intensity of the light actually falling on the pictures ranged from 1·81 to 2·32 candles at 1 foot distance. The room lighted with incandescent electric lamps received light equal to that of 1·72 candles at 1 foot distance; and those lighted with electric arc lamps showed an intensity of illumination comparable to that of from 2·26 to 3·12 candles at 1 foot distance. It is remarked that the incandescent electric lamps and the gas gave light nearly of the same composition; so that the mean illumination of the pictures lighted by these sources may be taken, on the average, as equal to the light of 2 candles at 1 foot distance. This, it may be observed, is a very fair degree of intensity for artificial lighting. The mean daylight illumination in the same rooms is taken as about 6 candles at 1 foot distance all the year round. Taking the difference in the composition of daylight and gaslight into account, it is calculated that one hour's exposure to mean daylight is equal in effect to 45 hours of gaslight. As it is estimated that 100 years of exposure to this degree of daylight would have been required to produce the fading effect observed on certain experimental tints prepared for the purpose by the Committee and exposed to direct sunlight for many months, allowing for the duration of darkness, it would have taken at least 2000 years' continuous illumination to have produced the same result in gas light or in the light from the incandescent electric lamps. With the arc lights, giving an

average illumination of $2\frac{1}{2}$ candles at 1 foot distance, the Committee calculate, on similar data, that the same result would have been obtained in not less than 200 years. After this rate owners and custodians of private and public picture galleries need not fear the effects of any reasonable amount of artificial lights, especially if they eschew the electric arc in any shape.

Of course, to complete the information conveyed in the preceding paragraph, it is necessary to know the standard of fading taken into the calculations of the Committee; and this is only to be obtained by following all their observations upon the various experimental tints employed in their experiments, for which reference must be made to the voluminous tables given in the Blue Book. A question which many people will be apt to ask—as to whether the products of combustion of gas have any effect upon colours exposed to them, in addition to the light of the flames—has been anticipated by the Committee, who instituted an interesting experiment to settle it. An ordinary gas-jet, consuming 2 cubic feet of gas per hour, was kept burning day and night for three weeks in a cupboard 6 ft. 6 in. long, 2 ft. 6 in. wide, and 5 ft. 6 in. high. At the top of the cupboard was fastened a board, on which strips of different colours were pinned. The temperature to which the colours in this gas-stove were exposed was 82° Fahr.; and the cupboard window was consequently bedewed with moisture. “Yet, under these trying conditions, hardly any change occurred. Crimson lake was slightly bleached, madder lake became a little redder; and Antwerp blue and Prussian blue a shade greener.” Generally the Committee conclude that mineral colours are far more stable than vegetable colours; and that artists have a wide choice of pigments which may be regarded as permanent under all ordinary conditions of lighting, especially if moisture as well as fresh oxygen are excluded as completely as possible. The experiments go to show that the rays which produce by far the greatest change in a pigment are the blue and violet components of white light, and that these, for equal illumination, predominate in light from the sky; whilst (quoting from the report) they are less in sunlight and in diffused cloud light, “and are present in comparatively small proportion in the artificial lights usually employed in lighting a room or gallery. The experiments have also shown that about a century of exposure would have to be given to water-colour drawings in galleries lighted as are those at South Kensington before any very marked deterioration would be visible in them, if painted with any but the most fugitive colours; and that when the illumination is of the same quality as that of gaslight, or of the electric glow light rendered normally incandescent, and of the same intensity as that employed in these galleries, an exposure to be reckoned by thousands of years would have to be given to produce the same results. We have here not taken into account the action, if any, which might arise from the products of combustion when gas is the illuminant, and which our experiments so far have shown to have but a trifling effect.”

It will be gathered from this expression of opinion, which is entirely satisfactory so far as it goes, that while the Committee do not explicitly condemn the use of electric arc lamps for lighting picture galleries containing water colour paintings, they do not think them so harmless as gas or incandescent electric lamps; and also that they have not quite made up their minds respecting the actual effects of the products of combustion of coal gas. As this latter is a matter that efficient ventilation is competent to place out of consideration, it need not trouble owners of gas-lighted picture galleries where this prime requisite is provided. It may be remarked, among the many incidental points of interest ascertained or verified by the labours of the Committee, that the illuminating power of direct sunlight on a surface held normally to the direction of the beam on May 21 near midday was found to be equivalent to 5480 candles at a distance of 1 foot. With this extract we must terminate our notice of this work of Dr. Russell and Captain Abney; only adding by way of comment that, in thoroughness of execution and lucidity of explanation, it redounds to the credit of these accomplished experimentalists. If their work is defective at all, it is in the very obvious point that they could not determine the probability of fading in actual pictures by experiments with specially prepared tints which may not be of the same pigments as were employed by the older masters of water colour painting, in the permanence of whose works the nation is most particularly interested. This aspect of the question has been made the most of in a letter of Mr. J. C. Robinson, published in *The Times*, who advocates the framing of all such paintings *in vacuo* for the benefit of posterity; this being the device recommended by the Committee for protecting paintings in fugitive colours from the bleaching effect of oxygen and moisture. This is a matter for custodians of picture galleries to look carefully into.

The Secretary of the Commercial Gas Company (Mr. H. D. Ellis) informs us that, at a Board-meeting held last Friday, it was resolved that the dividends to be recommended for the past half year shall be at the rates of $13\frac{1}{4}$ per cent. on the old stock, and $10\frac{1}{2}$ per cent. on the new stock of the Company.

The Salford Town Council held a special meeting last Friday, to consider the position of affairs with regard to the Town Clerk. It was stated that £777 was due from Mr. Graves to the Corporation, £25 of which was received for attendance in London to produce certain Corporation books and documents at the trial of the late Gas Engineer. The Council dismissed Mr. Graves from office; and authorized steps to be taken for the recovery of the amount due.

Notes.

A NEW AIR PYROMETER.

At the meeting of the Iron and Steel Institute in Edinburgh last month, Professor Wiborgh, of the School of Mines, Stockholm, gave an interesting description of a new air pyrometer, specially designed for ascertaining very high degrees of heat. He claimed for it that, as compared with measurers of temperature of the same sort that have hitherto been used, it is of simpler construction, and can be handled by an ordinary workman. It gives as great a result for a certain difference of temperature, whether the temperature itself is high or low. The determinations of temperature can be made very rapidly, but yet with great nicety. The ball of the thermometer is not exposed to any difference of pressure outwardly or inwardly, other than during those moments when the observations of temperature are made. Lastly, the pyrometer, without further attention, is ready at any moment for readings of temperature; all these being qualities which should go far towards fulfilling the purpose for which it has been constructed—viz., of being a practical pyrometer for industrial purposes.

SOFTENING WATER BY LIME AND SODA.

Herr Otto Binder has devised the following method for determining the quantities of lime and soda required for softening water:—To 200 c.c. of water placed in a 300 c.c. flask are added 50 to 75 c.c. of saturated lime water containing a known proportion of lime. This is determined with a sulphuric acid containing, per litre, 1.85 grammes of sulphuric acid; 1 c.c. of the acid representing about 1 c.c. of lime water. It is prepared by diluting 46.43 c.c. of normal acid to 1 litre. The sample, mixed with lime water, is heated (the mouth of the flask being loosely stoppered with a perforated cork holding a thermometer) to the temperature designed for the softening of the water on the large scale; therefore to about 50° to 80° . When the contents are cold, the flask is filled to the mark with distilled water free from carbon dioxide; and 250 c.c. are filtered through a dry folded filter. In the filtrate the excess of caustic lime is titrated back; the quantity used for 1 litre being found by calculation. In most cases a considerably larger quantity of lime is required than that which corresponds to the temporary hardness. For the determination of the soda to be added, 250 to 300 c.c. of water is evaporated in a platinum dish to dryness with 5 c.c. of a normal soda solution. The residue is dissolved in water, filtered, washed, and the undecomposed sodium carbonate determined volumetrically with acid and methyl orange. The difference shows the proportion of soda needed for the decomposition of the chloride, sulphates, and nitrates. About 10 grammes of soda per cubic metre should be used beyond the quantity thus determined.

THE VALUE OF OIL AS FUEL.

In the course of a lecture delivered by Dr. Charles B. Dudley before the Franklin Institute, he made a comparison between the fuel values of petroleum and of different varieties of coal. For this purpose the composition of the oil was assumed to be 85 per cent. of carbon (by weight) and 14 per cent. of hydrogen. Anthracite coal was supposed to contain 90 per cent. of carbon; and bituminous coal was credited with containing 85 per cent. of carbon and 5 per cent. of hydrogen. Calculated upon this basis, 1 lb. of the oil was shown to be theoretically equal to 1.61 lbs. of the anthracite, and to 1.37 lbs. of the bituminous coal. Mr. Urquhart compares oil with coal as 1 to 1.756; and this valuation is confirmed by experiments at Detroit and upon the New York elevated railroad, all of which go to show that in round numbers 1 lb. of oil is capable of doing the work in the boiler furnace of $1\frac{3}{4}$ lbs. of the very best coal. Considering that oil is generally bought by the gallon or barrel, and coal by the ton—which, however, he takes at only 2000 lbs.—Dr. Dudley publishes in the *Journal of the Franklin Institute* some tables in which the relative values of the two kinds of fuel are balanced, both with reference to fuel account alone and also taking all ascertained economies into the computation. Upon the simple fuel basis, it appears that oil costing \$1 per barrel of 42 gallons is equal in value to coal at \$3.73 per ton of 2000 lbs. With all ascertained economies considered, \$1 worth of oil—42 gallons—is equal to \$3.26 worth of coal. Although oil is very convenient for steam raising, for many reasons it is not much used for this purpose in the United States, simply because at present prices it is more costly to obtain a stated amount of heat from oil than from coal. Even in Pennsylvania, with oil at 30c. per barrel, it cost nearly 50 per cent. more to move a train 100 miles by means of oil than when burning coal. Another potent reason why oil cannot replace coal for steam-raising purposes is that there is not enough of it, even in Pennsylvania. The only region where petroleum can supply the place of coal to advantage is that wherein the Russian product can be distributed at a low price, because the yield of the Baku wells is so large that an extensive consumption of the product for fuel would not affect the price, as in America.

BURNING GAS UNDER STEAM-BOILERS.

Natural gas is utilized for steam raising at Toledo, Ohio, and other places, in accordance with more or less well-imagined arrangements; the latest, and perhaps the best, being described and illustrated in a recent issue of the *Scientific American*. The boiler, a tubular one, is set in the usual manner. A set of grate bars are disposed over the ash-pit; their inner ends being inclined upward, and resting against the back furnace wall. Upon the top of the bars is laid a sheet of iron, which is also turned up at the back, so as to cover about three parts of the height of the inclined

portion of the bars. Upon this sheet of iron is placed a layer of fire-clay; and on this is laid, longitudinally with the fire-bars, a series of fire-clay pipes 6 inches diameter, and placed close enough to touch. Over the inner ends of these pipes is built a fire-brick wall, which leaves a space of about 20 inches between it and the back furnace wall; the tops of the two walls being covered by an iron plate. The supply of fuel gas is from the front, where a rising pipe brings the gas to a horizontal cross pipe ranged to a level with, and opposite the ends of the 6-inch fire-clay pipes already mentioned. This cross pipe is perforated with holes directly opposite to the centres of the fire-clay pipes. In operation, air enters the furnace underneath the fire-bars, and passes to the back, where it rises in front of the back furnace wall, and is then compelled to return to the front through the fire-clay pipes, where it supports the combustion of the gas. As the whole heat of the flame of the gas passes back over the top of the fire-clay pipes, they get intensely hot; and this combustion is therefore kept up with practically red-hot air. The arrangement is described as being very simple and highly effective, and is said to be coming into extensive use.

Communicated Articles.

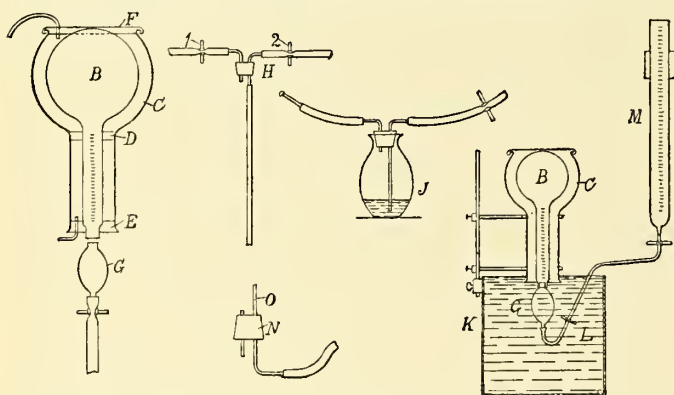
GAS ANALYSIS.

By WILLIAM G. HICKS, Assistant Engineer of the Ramsgate Corporation Gas-Works.

I feel sure that no excuse is needed for writing on the subject of gas analysis. Everyone connected with gas engineering is fully aware of the importance of practical chemistry in investigating the processes involved in the manufacture of coal gas. The description of the apparatus used by me will therefore I hope be of interest to readers of the JOURNAL.

Description of the Gas-Bottle and Apparatus Attached.

The bottle B holds a litre of gas at 60° Fahr. and 30 inches bar. It is graduated on the neck from zero to 25 per cent., or 250 c.c. Each per cent. is divided into five parts; each part being equal to 2 c.c. In order to protect it as much as possible from external influences, the bottle is surrounded by a glass casing C, which is kept in position by india-rubber pieces D E, and made air and



water tight by a sheet india-rubber cap, stretched over the top at F. It is provided with a flask stopper G; a filling-tube H, with india-rubber tubes and pinch-cocks; and tubes N, fitted in an india-rubber cork for regulating the water-line—the longer tube O reaching to the zero mark when placed in the neck of the bottle. There are also two vessels J, to draw off the reagent, &c.; and a burette, divided into cubic centimetres, for titration, and for letting the reagent into the flask stopper.

Manipulation of the Apparatus.

To fill the bottle with gas, place the tubes H in the neck, and connect to the gas-main with the tube which reaches to the bottom of the bottle. Then allow the gas to pass in until all the air is driven out, after which place the pinch-cocks on the two tubes 1 and 2. If it is required to draw a sample of gas from flues, an aspirator should be connected to the short tube. Having filled the bottle, place it on the stand attached to the trough K, with the neck under water, and proceed to regulate the water-line in the following manner:—Remove the tubes H from the neck of the bottle, and replace them by the tubes N. The tube O should have a piece of india-rubber tubing fitted on, long enough to rise above the water in the trough K. Adjust the bottle so that the water on the outside is level with the zero mark; then remove the pinch-cock previously placed on the india-rubber tube, and the water will rise within the neck to the top of the tube O (which should be level with the zero mark), and the gas will pass out through the india-rubber tube O—thus equalizing the pressure and adjusting the water-line. The bottle should be allowed to stand in the room where the testing is to be carried out a short time before the above adjustment is made, for the purpose of equalizing the temperature. This being accomplished, remove the tubes N, and place the flask stopper G in the neck with the pinch-cock L removed, so that the water can pass freely into it, after which replace the pinch-cock, and proceed to absorb the gases to be tested for, thus: Suck off into the flask J nearly all the water contained in the neck and stopper; then allow a measured quantity of standard absorbent to be drawn up into the flask out of the burette M, taking care that no air passes

in. This absorbent should be slightly in excess of the gas tested for; and a little distilled water should be passed in afterwards, so as to carry it all into the bottle. Shake up thoroughly; and when absorption is complete, draw off the solution into a clean flask J. Place the neck in water; remove the stopper, and allow the water to rise in the neck; lower the bottle until the water-lines are equal, and read off the absorption. Afterwards put the solution used aside in a clean bottle, to be finally titrated with a standard solution and an indicator as described below.

Methods of Using the Apparatus for Testing.

Ammonia.—Pass an excess of solution of sulphuric acid into the bottle, 1 c.c. of which will absorb 1 c.c. of ammonia; titrate with solution of potash, one cubic centimetre of which is equivalent to 1 c.c. of sulphuric acid solution. Say that 5 c.c. of sulphuric acid were used in the bottle, and 2 c.c. of ammonia solution were required to neutralize this in titrating, then the sulphuric acid has absorbed 3 c.c. of ammonia from the litre of gas treated. Then, as there are 1000 c.c. in a litre, this equals 0.3 per cent. Compare this with the reduction in volume previously noted, and if they correspond the test is accurate.

Sulphuretted Hydrogen.—A standard solution of acetate of lead is used, 1 c.c. of which will absorb 1 c.c. of sulphuretted hydrogen. This is let in in the same way as the sulphuric acid, but not in excess. A piece of acetate of lead paper should be passed up into the bottle, and the lead solution added until all the sulphuretted hydrogen is absorbed, which is shown by the lead paper remaining white; the amount of solution used being noted. If 10 c.c. has been used, this equals 1 per cent. of sulphuretted hydrogen, and can be converted into grains per 100 as described below. This latter test will spoil the sample of gas, as it is next to impossible to prevent air being admitted when the lead paper is passed up into the bottle. Therefore a new sample should be taken for further examination. Of course, if it is not wished to test in the way described, it can be done by absorption, only using acetate of lead solution (which need not be standard), and reading off absorption after equalizing the water-lines.

Carbon Dioxide.—A standard solution of barium hydrate is used for this test, 1 c.c. of which will absorb 1 c.c. of carbonic acid. This is titrated with a standard solution of hydrochloric acid, 1 c.c. of which is equal to 1 c.c. of barium hydrate solution. Phenol phthalein is used as the indicator.

The three foregoing constituents being the principal ones, the following are only tested for by absorption. The first three may also be found in this way, in which case standard solutions are not required; but I think the methods described are the best.

Hydrocarbons.—Naphtha is used as the absorbent; the water-line being equalized, after washing out, with a solution of potash.

Benzene.—This may be tested for by absorbing with fuming nitric acid, and washing out with potash solution.

Oxygen.—Concentrated solution of pyrogallie acid and potash are used; and the bottle washed with distilled water.

Carbon Monoxide.—By means of cuprous chloride, &c.

Corrections for temperature and pressure may be made as follows:—Suppose, for example, that we find 3 c.c. of ammonia at 64° Fahr. and 29.6 inches bar., then as the tabular number given in (the late) Mr. Hartley's table of corrections is to 1000 (the contents of the bottle in cubic centimetres at 60° Fahr. and 30 inches bar.), so is 3 c.c. to the corrected amount—viz., as 976:1000::3=3.072; or as 10 c.c.=1 per cent., then 3.072 c.c. equals 0.3072 per cent. of ammonia. Then, to convert to grains per 100 cubic feet of gas: As 1 per cent. is to 0.3072, so is the weight of a cubic foot of ammonia to the grains per 100 cubic feet—viz., as 1:0.3072::316.77=97.311 grains of ammonia in 100 cubic feet of gas. This amount is not taken from an actual test, but only assumed by way of example.

Weight of Gases in Grains and Grammes.

Name.	Weight of 1 cub. ft. in grains, at 60° and 30 in. bar.	Weight of 1 c.c. in grammes, at 60° and 30 in. bar.
Hydrogen	37.09	0.0008389
Ammonia	316.77	0.0071390
Carbonic oxide	519.18	0.0117153
Oxygen	593.59	0.0133895
Sulphuretted hydrogen	630.69	0.0142587
Sulphuric acid	820.92	0.0184110
Bisulphide of carbon	1417.41	0.0318445

It may be mentioned that the bottle above described answers admirably for analysis of chimney or furnace gases. In a further communication, I will give a description of a modification of Harcourt's colour test, which I have used with great success, and which I think is more simple and accurate than any gas burette or bottle can be for testing for ammonia, sulphuretted hydrogen, carbonic acid, and bisulphide of carbon in coal gas.

The bottle, &c., referred to can be obtained from Messrs. Townson and Mercer, of London, and costs about £2 5s. The standard solutions and absorbents may also be had through the same firm.

THE BOSTON WATER-METER TESTS.

By INSPECTOR.

The use of water-meters has long been a recognized system with most American Water Companies; and valuable information has been added to water-works literature from time to time by the

many mechanical experts engaged in the distribution of water. Very large numbers of meters are employed in America, not only for trade purposes, but for domestic supplies; and although numerous tests had been made by nearly all the Companies, yet the Boston Water Board deemed it necessary to appoint a Commission of experts to thoroughly test and report on the principal meters in the market—not with a view of remodelling the whole service into a supply by meter, as some manufacturers affirm, but rather to decide which meter would prove to be most accurate, durable, and economical, and to supplement the information the department had already obtained by impartial and reliable means under their own immediate supervision and control. The report of the Commission has now been received. There were 35 machines entered for competition or test; and 26 were tested as nearly as possible under the conditions prevailing in actual working, with the same length and size of service-pipe as generally used under ordinary pressures. When, however, examinations were being made under different heads, the meters were attached to pipes connected to large tanks fixed at different altitudes throughout the building. A steam-pump was provided to work a pressure of 200 lbs. per square inch; and all meters manufactured to stand it were put under that pressure.

The meters were first tested for accuracy of registration and measurement, before being subjected to any work; and afterwards put on a durability test—that is, the meter is allowed to work for a term in which it will pass as much water as, in ordinary circumstances, would flow through it in a year. They were next submitted to an intermittent test—that is, the meter stands idle for various lengths of time, and is restarted under circumstances arranged similarly to ordinary usage. Finally, after these tests were made, and each meter had done its fair share of work, it was tried for accuracy, and was then taken to pieces, every detail carefully examined, and its defects noted. All the arrangements for carrying out the tests were most elaborate. The measurement of water by weighing was adopted; and to ensure perfect correctness, an electrical device was employed to stop the flow of water as the scale tipped with the required weight. Gauges were fixed on the inlet and outlet of each meter; and careful tests were made with back pressures varying up to 50 feet, which were carried out by the use of tanks fixed on different floors of the building. A full description of the arrangements employed for the conduct of these tests was given in the JOURNAL for July 5, 1887 (p. 27).

First Accuracy Test.

	Error of Meter.				No. of Experiments.	Retardation.		
	Minimum per cent.	Maximum per cent.	Average per cent.	Range of per cent.		Friction per cent.	Flow decreased per cent.	Time increased per cent.
<i>Note.</i> —The minus before figures of percentage indicates registration of less water than was actually passed. The absence of a sign indicates the contrary.								
Ball and Pitt's	-1.2	1.1	0.3	2.3	37	44.4	23.9	31.4
Balance Valve	-1.9	6.8	2.8	8.7	36	47.1	12.3	14.6
Crown	-0.2	2.2	1.3	2.4	36	41.2	14.6	17.1
Desper	-2.6	0.0	-1.1	2.6	27	71.1	38.9	64.0
Duplex	-2.9	1.4	-0.3	4.3	37	47.8	21.9	28.9
Eagle	-3.6	6.7	3.7	10.3	30	61.1	34.4	52.6
Empire	-2.2	1.3	-0.7	3.5	36	33.3	11.0	12.8
Equitable	1.0	2.9	2.0	1.9	37	67.9	38.7	64.0
Frost	-0.3	3.6	1.1	3.9	37	52.9	29.7	43.2
Hersey	0.9	3.0	1.5	2.1	37	53.0	23.9	31.8
Hood, No. 1	0.0	2.1	1.0	2.1	37	61.1	28.4	40.1
Johnson	-5.0	13.7	-1.1	18.7	37	75.0	48.4	92.8
Shedd	-0.8	0.8	0.0	1.6	36	34.4	34.2	51.6
Spooner	-3.8	3.0	0.5	6.8	37	52.2	27.1	37.6
Standard	-6.8	6.2	3.0	13.0	36	80.0	54.8	122.1
Star, No. 8	-0.4	2.6	0.4	3.0	37	36.7	16.8	20.3
Star, No. 9	-7.3	2.7	-1.0	10.0	27	43.2	13.6	16.1
Terry	-2.7	1.3	-0.6	4.0	37	52.9	28.4	39.8
Thompson	3.6	14.2	6.8	10.6	37	41.2	14.8	17.4
Tremont	0.9	14.2	5.2	13.3	37	61.5	30.3	43.3
Tuerk	-1.0	0.7	-0.3	2.5	35	23.3	7.2	7.8
B. W. W.	-1.8	9.5	3.8	7.7	37	52.9	20.8	26.2
Worthington improved	-0.1	4.9	2.4	5.0	36	36.8	10.3	11.6
Union Rotary	-2.9	1.3	-1.2	4.2	37	25.0	8.2	8.5

Second Accuracy Test.

Ball and Pitt's . . .	- 8.1	-10.4	- 9.2	2.3	8	59.3	27.1	37.1
Balance Valve . . .	- 1.0	- 5.8	- 3.8	4.8	8	42.9	16.8	20.5
Crown	- 0.8	- 3.6	- 2.0	2.8	8	38.1	10.3	11.6
Duplex	- 4.7	- 3.2	- 1.1	7.9	8	47.8	20.6	26.7
Empire	- 1.9	- 6.3	- 3.3	4.4	8	28.2	6.8	7.5
Equitable	- 0.3	- 1.9	- 1.1	1.6	8	60.9	34.8	53.7
Frost	- 0.3	- 1.8	- 0.5	2.1	8	50.0	23.9	31.1
Hersey	- 1.5	- 6.0	- 4.0	4.5	8	50.0	18.7	23.5
Hood, No. 1	- 2.6	- 4.8	- 3.9	2.2	8	56.5	26.5	36.0
Shedd	- 1.4	- 1.8	- 1.7	0.4	8	50.0	8.4	9.3
Star, No. 8	- 2.3	- 1.2	- 1.2	3.5	8	36.8	12.3	14.1
Terry	-24.4	-43.7	-33.7	19.3	8	43.4	14.2	16.8
B. W. W.	- 2.1	- 7.6	- 3.1	9.7	8	50.0	20.6	26.6
Worthington improv.	- 1.9	- 9.5	- 2.7	11.4	8	41.2	14.2	16.8
Union Rotary . . .	-20.3	- 8.8	-12.8	11.5	6	25.0	7.1	7.6

Several of the meters failed to stand the durability test; being altogether too weak, and of light construction. Therefore in the second test for accuracy, only fifteen meters are included. There

are failures enumerated; and some meters are mentioned as having merit, but cannot be approved owing to complicated mechanical arrangements.

The meters that have the approval of the Water Board are commented upon as follows: "The remaining meters tested by the Commission seem to classify themselves into three groups—The 'Crown,' 'Hersey,' and 'Shedd' rotary meters; the 'Union Duplex,' 'B.W.W.,' and 'Worthington' improved horizontal acting, double-piston meters, the 'Frost,' 'Hood' No. 1, and 'Star' vertical acting, slow-moving, single-piston meters; and while, perhaps, no one of them can be unreservedly recommended or considered as a perfect meter, it is believed that, with certain modifications that have suggested themselves during the tests here reported, all of them may be looked upon as reliable within specified limitations for general use."

In regard to each of the first six meters thus classified together, the same remarks apply. The range of error was considerable, with a general tendency to over-register more, or under-register less with a small than with a large discharge of water, but the effect of wear upon the error was very slight. All had rubber bunters to receive the blows at the ends of the piston strokes; and these, by their battered condition, showed that they had seen hard service. If they are not renewed before being completely worn out, it would appear as though the meter might be seriously damaged by the action of the pistons. As the force of these blows would greatly depend upon the head of water, it would seem advisable to limit the use of meters of this class to places where the pressure was not very great—say, not exceeding 50 or 60 lbs.

The range of error does not differ much; but the effects of continued wear are more apparent in the "Star" than in the "Frost," and more in the "Hood" than in either of the others. The friction developed in all these meters is considerable; but the motion is so free from violence that they could be safely used with pressures that would be fatal to more rapidly-moving pistons.

DEATH OF DR. CLAUSIUS.—Dr. Clausius, Professor of Natural Philosophy at the University of Bonn, died on the 24th ult., aged 67. The name of the deceased gentleman will long be memorable as the demonstrator, if not the originator, of the mechanical theory of heat.

SOUTH WEST OF ENGLAND DISTRICT ASSOCIATION OF GAS MANAGERS.—The programme for the usual autumn meeting of the Association has just been issued by the Honorary Secretary, Mr. Norton H. Humphrys, of Salisbury. The members are invited to assemble at Weston-super-Mare on Tuesday next, the 11th inst., when the proceedings will include a visit to the Weston-super-Mare Gas-Works, a meeting at the Queen's Hotel, and afterwards the usual social dinner. So far as may be judged from the number of applications for membership to be considered at this meeting, the Association is in a flourishing condition. The President will open the meeting, after the usual routine business (such as election of officers for ensuing year, &c.), with a few remarks. A paper on "The Hydraulic Main, and Retort-Bench Bracings" will be read by Mr. John J. Jervis, of New Swindon; Mr. William Davis, of Poole, will discourse on "A Remedy for Naphthalene"; and Mr. A. Thomas, of Cowes, will describe his "Improved Pressure-Gauge." These three papers, with the usual discussions, will no doubt fully occupy the time that is allotted for the meeting.

PRESENTATION TO MR. L. T. WRIGHT BY THE NOTTINGHAM GAS COMMITTEE.—On his retirement from the position of Engineer and Manager of the Nottingham Corporation Gas Department, the Gas Committee presented to Mr. Lewis T. Wright a handsomely illuminated address, containing an extract from the minutes of their meeting on the occasion when Mr. Wright's resignation of office was accepted. The address, which was surrounded by a beautifully executed design and surmounted by the borough arms, was signed by the Chairman and Vice Chairman of the Committee, Messrs. Barber and Ford, and the Town Clerk, Mr. S. G. Johnson. It was worded as follows:—"At a meeting of the Gas Committee of the Town Council of Nottingham, held on the 14th day of June, 1888, Mr. Lewis Thompson Wright signified to the Committee his desire to resign the office of General Manager and Engineer of the Gas Undertaking of the Corporation, in consequence of his having received the appointment of Engineer and Manager to the Buenos Ayres (New) Gas Company in the Argentine Republic. On the motion of the Vice Chairman of the Committee, Mr. Alderman John Parr Ford, seconded by Mr. Councillor Richard Fitzhugh, J.P., it was resolved that the Committee accept with great regret the resignation of Mr. Lewis Thompson Wright, and desire to convey to him the thanks of the Committee for the successful way in which he has conducted the works of the Gas Undertaking during the five years he has held his present appointment. The Committee desire to place upon record their high sense of the great value of Mr. Wright's services as Manager of their Gas Undertaking, both in the manufacture of gas and of residual products, and generally as a man of business affairs. The Committee also desire to state that they have found Mr. Wright to be a pleasant official to work with, well versed in all matters pertaining to the construction and maintenance of gas-works, the manufacture and distribution of gas, the manufacture of sulphate of ammonia, and the distillation of coal tar; and that he has shown himself to be a gentleman of the highest integrity, of excellent judgment, and thoroughly upright in all his conduct."

Technical Record.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

THE QUARTERLY MEETING AT DONCASTER.

As briefly reported in the JOURNAL last Tuesday, the Seventy-fifth Quarterly Meeting of the Manchester District Institution of Gas Engineers was held at Doncaster on the 25th ult.; and beautiful weather, a meeting at which there was expounded a theory as novel as it is daring and important, and a delightful drive through pleasant scenery to a romantic and interesting ruin, were the characteristics of the gathering. Doncaster is on the very verge of the eastern border of the Institution's operations; but nevertheless it was altogether a highly successful meeting, and the proceedings combined a due admixture of business and pleasure. The Lancashire members assembled in rather moderate numbers; the holidays and the distance from home being rather against a strong muster. Compartments were reserved for them in a through carriage attached to the 10 a.m. express from London Road Station, Manchester; and the journey was made pleasantly and in good time. There were several additions to the party before Doncaster was reached; and the final result was a fairly average attendance. At the station, the members were met by Mr. Robert Bridge, the Engineer and Manager of the Doncaster Corporation Gas-Works, and were conducted to the Elephant Hotel, where luncheon was prepared. Immediately this was over, an adjournment was made to the Council Chamber of the Town Hall, which was placed at the service of the Institution by the Mayor (Alderman Wainwright) for the ordinary business meeting. The President, Mr. T. Duxbury (Darwen) was in the chair; and the business occupied something less than a couple of hours. It began with the reading by the Honorary Secretary (Mr. Harrison Veevers, of Dukinfield) of the minutes of the last meeting—the pleasant gathering held in May in Northwich, the centre of the Cheshire salt district. The record was pronounced correct; and then two new members were added to the roll—viz., Mr. Tom Settle, Manager of the Gas-Works, New Mill, near Huddersfield, who was nominated by Mr. J. Booth (Southport), and seconded by Mr. W. W. Hutchinson (Barnsley); and Mr. William Drewry, Manager of the Gas-Works, Cleethorpes, who was proposed by Mr. Thomas Newbigging (Manchester), and seconded by Mr. Harrison Veevers. Some slight discussion followed, as to the wisdom of making a departure from the printed programme. According to this, Mr. Newbigging was down to read a paper on "Gasholders without Upper Guide-Framing," which in its turn was to be followed by the long postponed discussion on Mr. J. Dalgliesh's paper on "Oil and other Illuminants, and their Effect on the Consumption of Gas." The President invited an expression of opinion as to the wisdom of reversing the order of the two; and explained that Mr. Dalgliesh was unfortunately unable to attend the meeting, but had sent an addition to his paper, which he wished to have read to the meeting. Mr. Veevers explained that the reason for putting Mr. Newbigging's paper first was that it was a definite subject, which would occupy a definite amount of time; while the discussion on the deferred paper might or might not last for hours. No disrespect was, of course, intended to Mr. Dalgliesh; the sole idea being to simplify the proceedings of the afternoon. The vote was largely in favour of keeping to the order of things as arranged; though Mr. Newbigging remarked that, had Mr. Dalgliesh himself been present, he should certainly have insisted upon the discussion of his paper being taken before any other paper was read. However, as that gentleman was absent, and as it might be the desire of some of them to see his supplemental paper in print before they discussed it, he would not press the matter. Without further preface, Mr. Newbigging proceeded to read his paper, which appeared last week, pp. 373-4; explaining the invention by which Mr. W. Gadd, of Manchester, proposes to dispense with the upper guide-framing of gasholders, while imparting to them, as he contends, greater rigidity. The action of the patent was experimentally illustrated by means of a couple of models—one of a single-lift, and the other of a three-lift holder. An informal conversation followed, in which a number of questions were asked and answered. A report is given below. The formal discussion, however, was adjourned till a future meeting; but thanks were voted to Mr. Newbigging for his paper, on the motion of Mr. W. Carr, seconded by Mr. W. W. Hutchinson. It was now within about a quarter of an hour of the time for adjournment; and the discussion of Mr. Dalgliesh's paper was again postponed. His supplementary observations were appended to our report last week (p. 374). Thanks were voted to the Mayor, at the instance of the President, seconded by Mr. C. E. Jones (Chesterfield), for allowing the use of the Council Chamber for the meeting; and the resolution was acknowledged, on his Worship's behalf, by Mr. Alderman Spencer. And so the meeting came to an end.

Conisbro' Castle, an interesting ruin associated with the early history of the country and with romance in the pages of Sir Walter Scott's "Ivanhoe," was the next object of attention. It is situated about five miles from Doncaster; and wagonettes were provided to convey the party to it. The drive was through pleasant scenery, past fields of waving corn, and gardens gay with flowers. The Keep of the Castle is in an excellent state of preservation; and most of the visitors climbed the narrow stairway (carried through the thickness of the wall from storey to storey) until they reached the top, and enjoyed the view. The castle itself is interesting, alike from its antiquity and the singular character of its design; while the view, which embraces a consider-

able stretch of the valley of the Don and the country round about, well repaid the climb. The drive back to Doncaster was accomplished just in time for tea; and then followed a little convivial gathering, at which several toasts were drunk. One of these was that of "Kindred Institutions," in connection with which the new North of Ireland Association of Gas Managers was especially mentioned, with good wishes for its future success.

GASHOLDERS WITHOUT UPPER GUIDE-FRAMING.

After Mr. Newbigging had read the paper given last week, Mr. Gadd (as intimated above) proceeded to illustrate by means of models—one of a single-lift, and the other of a three-lift holder—the action of the invention. In the single-lift holder the guides were placed at an angle of only 60°.

Mr. NEWBIGGING remarked that the invention was so simple that anybody could understand it. There had been a good deal of difficulty in preparing a model of a three-lift telescopic holder, because the cups between each lift could not be made the necessary depth to stand the pressure; so they had had to overcome the difficulty as best they could.

As a test, weights equal to four times the weight of the bell were placed on the one side of the single-lift holder.

Mr. W. CARR (Halifax) pointed out that, under this test, the holder went down with a jerky motion, instead of steadily.

Mr. GADD explained that the model was roughly made, and that this partly accounted for the want of steadiness; while a little water which had found its way into the pipe was also against the success of the experiment. The weights were afterwards distributed, so as to more adequately represent the pressure which would be exerted by snow; and the jerking was then less perceptible.

Mr. W. W. HUTCHINSON (Barnsley) suggested that when the gas-holder was very nearly full, it would be unstable, and might easily be blown over.

Mr. GADD contended that the holder was always in a condition of stability, unless, as was improbable, the wind lifted it bodily out of the tank.

Mr. D. CLARKE (Ashton-under-Lyne) thought that the plates and rollers would have to be stronger than in a holder of the ordinary kind.

Mr. GADD admitted that the details of the structure certainly might require a little modification.

Mr. NEWBIGGING said he thought the vertical support ought to be stronger, and that it should take the shape of a girder of triangular form. In connection with the model of the telescopic holder, he explained that two of the series of guide-rails had been placed one way, and (unintentionally) the third the opposite way; the result being that, after turning in one direction, while the two upper lifts were being raised, the holder turned in the contrary direction during the filling of the third lift. Referring to the pressure exerted with a view to overturn the model, he said that in so small a model a very little push with the hand represented an abnormal wind pressure; but, to his mind, a holder on this principle would be perfectly rigid under even an extraordinary pressure, owing to the locking action of the rails and rollers.

Mr. ISAAC CARR (Widnes) asked if the suggested triangular girder would be from the top to the bottom of each lift.

Mr. NEWBIGGING said it would not, only in the inner lift. His idea was that, if more strength was needed, it should take the form of a girder.

Mr. I. CARR maintained that it would not strengthen the structure, because the whole strain would come against the bottom sheet.

Mr. NEWBIGGING pointed out that in the outer lift of a telescopic holder, the additional strength, if any were required, would be furnished by the guide-rails.

Mr. GADD added that the question of strengthening the holder internally was a matter for experiment, and one in which they would be guided by experience.

Mr. NEWBIGGING said the inherent weakness of the ordinary gasholder consisted in the want of a positive bottom bearing; and they had this in the present invention.

Mr. GADD pointed out that the pressure was centred on one point at the top; the roller at the bottom was one leg of the lever at which the pressure was being exerted. The roller on the opposite side was resisting that pressure; and this leg of the lever was twice as long as the other. The power was diminished by having a short lever actuating; and the force was always exerted downwards to the rollers. The only thing he could possibly conceive as tending to danger was that, if there was a hurricane sufficiently strong, the plates might be stripped away; but in this respect there would be no difference between his arrangement and an ordinary holder.

Mr. I. CARR considered that very great care would require to be taken in getting the guides an equal distance apart.

Mr. GADD said he was glad that matter had been noticed. It was a point which had occupied a great deal of his attention in working the question out. Although it was highly desirable that something like accuracy should be exercised, still he had, apart from that, made provision for any slight inequalities. This provision was in moveable centres to the rollers or slides; and this would allow for slight inequalities. He had made experiments with a number of rollers arranged in a plane; and where they had been fixed at slightly diverging angles even, he had been able to keep the apparatus square and run it up and down.

Mr. HUTCHINSON asked what would be the effect of a small stone or piece of wood getting into the grooves? It might be possible,

he feared, for two or three small stones to do a great deal of mischief.

Mr. GADD said it would be difficult, if not impossible, to lodge stones in a groove the angle of which was 45° ; and wood would simply rise to the surface of the water.

The PRESIDENT said the principle of constructing a gasholder explained by Mr. Newbigging was so novel and so contrary to the received notions of what is and ought to be done, that they could not attempt to discuss the paper adequately that day. They had better, therefore, defer the discussion until the next meeting; before which the members could read the paper and consider the matter carefully. But as they had Mr. Gadd present, he should have pleasure in hearing anything he might wish to say; and advantage might also be taken of the opportunity to put to him any questions which they might wish to ask.

Mr. W. CARR said he should like to make a remark or two, and put some questions; and it would perhaps facilitate Mr. Gadd's reply if he did it in a formal way, because it was confusing to anyone to have questions put from three or four sides of the table at once, and to be expected to answer them all satisfactorily. Like every other member of the Institution, he came there quite at sea as to what kind of principle they were going to have explained; and he was both surprised and pleased at the plan submitted to them by Mr. Newbigging. At the same time there were one or two points—he did not know whether or not they would be looked upon as objections—that he wished to draw attention to. Of course, it was very easy for them to sit there and say: "It is a very good thing, and we like it;" but the point was this—Would they adopt this plan when they came to put up a new gasholder? Personally, he should not like to say that he thoroughly agreed with anything he saw there, unless he felt so much in accord with it as to recommend its adoption at his own works. One of the most important objections which occurred to him was this—that when the first lift was filled, and the second half filled, the rollers would be midway up the third lift; so that if any wind pressure then came, the whole of the strain would be upon the guides supporting the sheets of the third lift. The locking power was perfectly easy to understand when the idea of the screw motion was grasped, because any vertical or horizontal pressure would be resisted by the whole screw when once it was fairly in the thread. So it would be in this case. But the strain must be taken somewhere; and it would have to be taken by the guides and the sheets midway between the coping and the bottom of the third lift, which he took to be the weakest point. He thought the chances were that distortion would be caused if the pressure were very great at any particular point of the holder, because there was nothing to take it but the guides or the sheeting. If this happened, distortion might take place, with the effect, he was afraid, of upsetting the gasholder. To his mind, this was the weakest part of the construction. In the single-lift holder this objection would not obtain at all, as the guides had a perfectly rigid backing from top to bottom; and the pressure might come at any point from top to bottom, and had a perfectly rigid system to transfer itself to. But it was not so when one lift was working inside another, especially at the point when one lift was getting half way up, and having nothing but the sheeting to resist it. He mentioned this because Mr. Newbigging had said in his paper that no additional weight would be required. Consequently, if there was no extra weight, they would have only the ordinary thickness of sheeting, and nothing else, to resist the strain. Another point he should inquire into would be that of the rollers. The rollers would have to be in working order; and Mr. Gadd had only complicated matters by saying he would have some with a horizontal sliding motion. In an ordinary way, a certain amount of deposit took place on the rollers; and the time came when the rollers did not revolve. In vertical slides this did not matter very much, if the slide was true, and the roller a good fit. It simply went up and down, and formed a rigid face; and he believed that in nine out of every ten slides the rollers simply formed a bearing, which slid up and down the guide-rails in the tank. This was a consideration which would have to be carefully taken into account by anyone adopting this plan. There was a third point. Mr. Newbigging said that the ordinary method of counterbalancing small holders would be dispensed with by increasing the length of the roller-path, which could be done by placing the guide-rails in the tank at a less angle. He (Mr. Carr) did not understand how that would dispense with the counterbalance. He believed even with a single-lift holder much greater strength would be required in the lower curb, because if the strain was to be received by the lower curb, a much stronger curb would be required than now. As a rule, the bottom curb was made too weak; and it would be necessary that it should be strong in this case. These were a few points which occurred to his mind; and they were questions which would have to be answered before anyone could put any of these holders to work. If they could be satisfactorily answered, he did not see why they should not adopt the plan, and dispense with guide-framing. There seemed to be a great deal in it; and if they could save 50 per cent. of the cost, he did not think they would be justified in going on as now.

Mr. C. E. JONES (Chesterfield) asked of what material it was proposed to make the rollers and the internal guide-framing? This was not stated in the paper; and it would be well to know it. He should also like to ask whether any time had been really taken up in testing the machine, which was of a very novel, daring character, and conferred upon the author a considerable amount of praise for his ingenuity and boldness in departing from the old lines. Had

any experiments been made with different waters, and their action upon the rollers and the guide-framing? It appeared to him that if they used cast iron, they would have to fill the tanks with distilled water, because with some water the grooves and guides would certainly in time become filled with corrosion, which would largely increase the friction, and throw more strain upon the sheeting. The weak place in the holder when above ground would be towards the bottom plate—the point of greatest leverage; and this would have to be very materially strengthened, which would add largely to the weight of the structure. It was a most extraordinary invention, and very beautiful in its action, as worked before them. The idea of making a gasholder into a screw, and guiding it from the bottom roller, entitled the author to their highest admiration; and the excellent manner in which Mr. Newbigging had put it before them deserved their thanks.

Mr. GADD, in reply, said he had not made any experiments with materials or water; for the simple reason that the rollers and other parts of the structure were placed in similar positions to those they occupied in ordinary gasholders. If water would destroy the new rollers, it would destroy the old ones. He could not see where any new principle came in as to this. The rollers and guides upon his system would not last for ever, any more than they would on the old plan. No doubt a certain amount of corrosion would take place; but he failed to see that there was any difference in the conditions, with regard to the water attacking the details of the structure, between this and the details of construction of ordinary gasholders. Mr. Carr had very properly brought forward several questions which, he said, required to be answered. They ought to be answered; and he (Mr. Gadd) would try to answer them. He would first of all take the last objection which Mr. Carr made—namely, that the rollers would set fast, and cease to revolve. Perhaps this would be so; but the fact was that he only put in the rollers in deference to received opinion. For his own part, he should prefer to make the guides without rollers at all. The single-lift model had been worked without any rollers at all—simply with solid sliding-pieces (solid pieces of metal cut at an angle). It required nothing more; and if he were a practical gasholder constructor, erecting a holder on his plan, he would advise that anything like revolving rollers should be dispensed with, because he could understand that rollers immersed in water which contained material tending to disintegration, would set fast. Rollers were put on the model, and in the diagram, simply in deference to present ideas as to the mode of construction. Another important consideration to which Mr. Carr had referred was that of the position of the second lift. There was no doubt that when the holder was in the position described by Mr. Carr, it would be in its most vulnerable condition; but he should certainly think that, with proper construction, it would be sufficiently strong for any possible purpose, and would resist any pressure that could be brought against it. In the first place, he should never expect or dream of putting pressure upon the sheeting; he should not think of doing so in an ordinary gasholder. The pressure must be taken up by the framing of the holder. He took an ordinary holder to be something like an umbrella. There were the ribs; and there was also the canvas which covered it. The sheeting was only like the canvas of the umbrella; and it was in the mechanical construction of the frame which carried the sheeting that strength was obtained for resisting the strain. Consequently there should be a frame—a rigid frame—underneath the sheeting of each of the lifts. This frame was provided by the angular guides; though these, of course, could be strengthened, because it was not necessary to have rollers to each of them. Each was attached to a fairly rigid ring top and bottom; and there should be a fairly rigid frame. The sheeting was only to keep in the gas. This was his idea, from the engineering point of view; and to his mind it was very simple. If the present mode of putting sheets on was not suitable to this plan, it must be abandoned; because there was no reason why every present idea should be slavishly followed, and Mr. Carr, with his ingenuity, would not be slow to adopt some new method to suit the new ideas. He was glad that Mr. Carr put his finger upon this objection; because it was very desirable that the thing should be tested at this and every point. What he (Mr. Gadd) wished to point out was that this was a weakness of a constructive character, which any constructive engineer would find means to overcome. It was not necessary to increase the weight; because, as they knew, weight could be added without increasing strength. It was a question of form, and of so constructing the holder as to meet the strain which would come upon it. Gas engineers were quite able to meet all these cases. The question to ask with regard to this proposal was, Was it progress? If it was progress—if it simplified the matter, and made it cheaper, then it was natural they should desire to follow it. As to the æsthetic question which Mr. Newbigging had referred to, this occurred to him at the beginning, but afterwards the simplicity of the structure without framing commended itself to him. After all, a simple structure was a grand thing; and a three-lift gasholder on his plan would have something of the simplicity of the pyramids of Egypt. (Laughter.) He was not at all sure that there was not something æsthetic about it after all. At all events, if there was the element of cheapness, the æstheticism might have to go to the wall. With reference to the counterbalance, what Mr. Newbigging meant was this: That, if they had a flat angle of an inclined plane, there was more of the weight of the holder on the rails, and less on the gas. [Mr. Carr dissented.] Mr. Carr shook his head; but the proposition was capable of demonstration. The steeper the angle, the less of the weight of the holder

would be taken off the gas; the flatter the angle, the more of the weight of the holder would be sustained by the rails and taken off the gas. In taking a wheelbarrow up a plank, the steeper the incline the greater would be the power required to be exercised at any given time. The flatter the angle and the larger the path, the less force would have to be exerted.

Mr. NEWBIGGING remarked that, in resisting a strain, this method of guiding a holder had many advantages over the old system; because, as he had already mentioned, whenever any force was exerted, the whole of the guide-framing came into action, back and front and sides—one-half of the rollers being in tension and the other half in compression.

Mr. GADD said that Mr. Carr thought the rigidity of the bottom curb would want to be much increased. If they would consider the thing in reverse—that was to say, if the flanges of the rollers or solid sliding-pieces were put outside instead of inside, they would place the ring, instead of in compression on the strain, in tension. So they could practically work with a very flexible ring indeed. What he meant was that if the flange were put on the outside of the rollers of the outside lift, instead of inside, any pressure at the top would cause the stud to pull at the roller and the roller flange, so that the strain would be put upon the rollers in tension, tending to pull them away from the tank instead of pressing them in. As it was now, there was a compression both of the roller towards the tank and of the ring itself. If necessary, both methods could be adopted; and they could have two grooved rollers with a flange between. He did not, therefore, think it really necessary that the bottom curb should be strengthened to any material extent; but if it were, it seemed a comparatively small matter as against the great gain of taking away the guide-framing.

The PRESIDENT said nothing but benefit could follow from the conversational manner in which they had discussed the matter; but the formal discussion would be postponed till the next meeting.

Mr. W. CARR then rose and said he had considerable pleasure in moving that their thanks be given to Mr. Newbigging for his paper. He had done them very great honour indeed in submitting it first to the Institution. It showed the warm interest which he took in the Institution, and the good feeling he had towards it, that he should honour them by bringing the idea before them, before submitting it through another source. He should have been very sorry if he had not been present at the meeting; though he had no idea that they were going to listen to a paper descriptive of such a weighty departure in gas-works engineering. He did not see why they should not have gone on discussing it as hard as they could, and then discuss it again at another time. For his own part he had not attempted to discuss it; the remarks he made he put more in the form of questions. As to the æsthetic question, he thought that this might be left out of consideration. People already talked of a thing being "as ugly as a gasometer;" and their views were not likely to be altered. As to the question of counterbalancing, both Mr. Gadd and Mr. Newbigging were at fault; and he thought it would appear plain to them when they came to think of it. He had very much pleasure in moving the resolution he had mentioned, and to add to it his own warm feeling of regard for Mr. Newbigging.

Mr. W. W. HUTCHINSON seconded the motion. He agreed with Mr. Carr that great honour was done them by Mr. Newbigging putting this matter before them at a time when it was one of the great questions of the day. While he thought the gas profession had somewhat redeemed the name it had for the ugliness of its gasholders, and had of late years made them more presentable, they were likely to revert to the simple grandeur of the pyramids. In considering this invention, they would, however, have to think of their neighbours. They could not disregard what might, to uninformed minds, appear to be the dangerous nature of the structure.

The PRESIDENT said he had very great pleasure in putting the motion. Mr. Newbigging, he considered, was entitled to their best thanks.

The resolution was unanimously carried.

Mr. NEWBIGGING, in responding, thanked the members for their hearty and unanimous vote, and said he had been much struck with this invention, and very willingly undertook the duty of writing a paper upon it. He wrote it without communicating with Mr. Gadd; but when he came to consider the matter of the counterbalancing, he could not make up his mind upon the question whether they could dispense with the counterbalance weights by placing the guides at various angles. Accordingly, he called on Mr. Gadd, and discussed the question with him at length—he (Mr. Newbigging) taking the view held by Mr. Carr, and Mr. Gadd successfully combating his arguments.

SPIRAL FRAMED GASHOLDERS.—We have received a letter from Mr. W. F. Mason, of Manchester (who is associated with Mr. Gadd in the invention brought so prominently before the gas profession through the paper read by Mr. Newbigging before the Manchester District Institution of Gas Engineers last Saturday week), in which he says: "It may be of interest for the readers of your JOURNAL to know that a member of one of the largest firms in the country has been to see the model of the 'Manchester Patent Gasholder,' and on behalf of his firm offered to purchase the British patent for £20,000. This I declined; as I place a much higher value on the invention. I may say that we are protected in every country in the world where gas is used."

THE "METEOR" GAS-LAMP.

WESTPHAL'S PATENT.

We have recently had an opportunity of seeing some specimens of a new high-power gas-lamp (the invention of Herr C. Westphal, of Berlin), exhibited at the offices of Messrs. Henry Greene and Sons, 155, Cannon Street, E.C., who have been appointed Sole Consignees for Great Britain, Ireland, and the Colonies. This is the lamp, we are informed, which was alluded to at a meeting of the Commissioners of Sewers of the City of London (when the question of lighting a part of the City with the electric light came up for discussion) as being likely to rival the electric arc light in intensity. This naturally was reported in the public press, with the result that representatives of two of the London Gas Companies have seen the lamps, and are now engaged in testing them, with a view to introducing them as a rival to the electric light.

The lamp itself is of very simple construction—entirely free from intricate workmanship. The principal parts are of cast-iron; and the lamp cannot, therefore, get out of order. No sheet iron, nor any kind of stamped or spun metal, is used in its manufacture, except for ornamentation; and this may either be of brass, copper, iron, or other metal, or, if highly ornate decoration is desired, it can be of Doulton-ware, faience, or other art pottery.

The burner is, however, the special feature of the lamp. It consists of two concentric rings; the space between forming the passage for the gas from the gas chamber to the point of ignition. This circular space is perfectly open; and it thus allows the gas to pass forward without check or interruption. The flame burns at a distance of about $\frac{1}{2}$ inch from the orifice of the burner, which tends to keep it cool, and prevent the deposit of carbon, so often complained of when drilled burners are used. If any dirt should by chance accumulate, it can be easily removed by passing the blade of a pen knife, or a piece of watch-spring round the inside of the orifice—an operation only occupying a few seconds, and one that cannot possibly injure the burner. This cannot, we believe, be accomplished with any other high-power gas-burner. The flame is quite different from that of any of the high-power burners hitherto introduced, inasmuch as it burns from the circumference to the centre, instead of from the centre to the circumference. Consequently there is no dark disc in the middle; but the whole of the flame is (to quote the patentee's words) "one mass of intense white meteoric brilliancy." Another point greatly in favour of this lamp, is the small size of the body compared with that of the flame, so that the walls, and even part of the ceiling of the apartment in which the lamp is fixed, are well illuminated and free from shadow. It is thus admirably adapted for lighting picture galleries, libraries, museums, &c.

Like all other high-power gas-burners, the "Meteor" lamp readily lends itself to, and is easily adapted and fixed in connection with any of the ordinary appliances of ventilation. The principal point to be remembered is the necessity for carrying the horizontal ventilating-pipes into a chimney or flue in which there is a good up-draught. It is not, however, considered advisable to carry them into the open air, as the ascensional force of the products of combustion given off by the lamp when first lighted would not be sufficient to overcome the weight of the outside atmosphere, especially in winter time.

In the competition between gas and electricity for illuminating purposes, gas engineers must make the best use of their speciality—that is, get the utmost possible duty out of the gas employed; and the "Meteor" lamp marks another step in the direction of "proving that gas can hold the field against all competitors"—to quote the words of the report recently presented to the shareholders of the South Metropolitan Gas Company, where the Directors were referring to the exhibitions inaugurated by the Company in various parts of their district, and at which, we understand, specimens of the lamp now under notice were shown.

A GATHERING OF GERMAN GAS ENGINEERS AT LUDWIGSBURG.

In the last volume of the JOURNAL (pp. 513 and 599), we briefly noticed, from the accounts published in the *Journal für Gasbeleuchtung*, the proceedings at the conferences of German gas engineers which took place at Förste and Elbing. We now give an abstract report (translated from the fuller one which appeared in the above-named periodical) of the twenty-fifth assembly of the Mid-Rhenish Association, which was held at Ludwigsburg, in Württemberg, under the presidency of Herr Eituer, of Heidelberg.

After the preliminary formalities had been disposed of, the President opened the business by giving an account of the progress of the Society in the preceding year. In the course of his remarks, he stated that the correspondence had been very voluminous, especially with the Central Association; among the subject-matters being the decision of the Railway Commission to exclude gas undertakings from the benefits of the exceptional rates for coke, the recent vexatious orders concerning the conveyance of spent purifying material, and the experiments made with wet and dry gas-meters. Reference was then made by the President to his visit to Berlin, in response to an invitation from the Committee of the Central Association to attend their meeting. Profiting by his presence in that city, he attended the conference of gentlemen specially interested in the ammonia industry which was then being held there. One important resolution passed was that the Committee of the German Association of Gas and Water Engineers should be instructed to make an appeal to the various gas-works for a subsidy of 1 pfennig per ton of coal carbonized for a term of three years, on the understanding that the proceeds should

be employed in enhancing the value of sulphate of ammonia. The financial position and numerical strength of the Association were then considered by the members; and it was decided to hold the next meeting at Ludwigshafen—a proposition which was most cordially acquiesced in by Herr Lux, the well-known gas engineer of that city.

The first question discussed was that of Sunday labour in gas-works; the subject being introduced by Herr E. Buchholtz, of Offenburg, in special connection with the demands made in this respect by the Factory Inspector of the Grand Duchy of Baden. In the course of his address, he said: The Inspector of Factories (Herr Worrishofer) issued a decree in June last that, in order to "save the health and freshness of the workmen," to quote his own words, in future the operatives engaged in night work should have every third Sunday a complete rest of 36 hours, from six o'clock on Saturday evening till six o'clock on Monday morning. It is within the knowledge of everyone present that the interests of the workmen have not been overlooked by our industry, and that if gentlemen high in authority like the Inspector, instead of being carried away by their questionable zeal on behalf of so-called over-burdened working men would take the trouble to ascertain the real facts of the case, by conferring with the Directors of the large works, such edicts would become an impossibility. They would no doubt find that our night workmen are granted a fully adequate rest, as compared with those engaged in other industries; and that with their sentimental legislation they argue upon wrong premisses, and, instead of benefiting the working men, they really do them harm. Furthermore, they would no doubt find that they actually demand what is practically impossible, and what the workmen, who are well satisfied with their lot, do not think of asking for, not to mention the necessarily higher working expenses caused by the measure. These considerations have not weighed with the Inspector, who has taken his information from the official reports only, and now persists in making his arbitrary measure law. I maintain that our workmen have had that rest which is necessary for them, and consistent with the absolute requirements of our industry. The men who have been under my control for the last 25 years are, without exception, cheerful and happy, and would certainly not derive any benefit from a lengthened enforced rest; and moreover, I am not aware that the Inspector is able to adduce the warrant of existing laws for his obstinacy in enforcing his innovations. I am therefore of opinion that he should be respectfully informed that his order is devoid of legal status, and that, for the reasons adduced, it is impossible to enforce it.

The President, in thanking the speaker for his address, fully endorsed his remarks, and stated it as his conviction that to carry out the order of the Inspector would not be to the benefit of the public, and still less to that of the *employés*.

After some discussion, the following resolution was carried unanimously:—"The Mid-Rhenish Association of Gas Engineers, after having considered and discussed fully the proposals of the Inspector of Factories, dated June, 1886, concerning the Sunday relief of workmen in gas-works, expresses its opinion to the effect—that the putting in force of these proposals would not tend to promote the interests of the employers and still less those of the operatives engaged in this industry."

Herr Lux, of Ludwigshafen, was then called upon to give his promised description of the new works of the South Metropolitan Gas Company at East Greenwich. As this was, in the main, based upon what has from time to time appeared in the *JOURNAL*, it need not be reproduced here. Herr Lux was very cordially thanked for his exhaustive report.

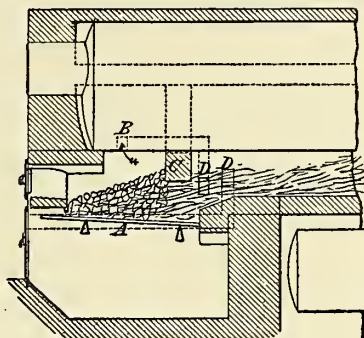
The next matter was the reading of the following paper by Herr Seiler, of Mannheim, on

WILSMANN'S SMOKE-CONSUMING FURNACE.

You are all aware, that the question of the consumption of smoke has gradually pushed itself into notoriety in proportion with industrial progress. At first the police authorities did what they could to assist private individuals who complained by calling upon manufacturers and mill-owners either to abolish, or at least to allay the smoke nuisance from steam-boiler and other chimneys. At last some Governments took up the matter, and sought by legal pressure to provide a remedy; but with only indifferent success. Much has been written upon the question, and to a great measure by people who have no idea of the difficulties which stand in the way of the solution of this problem. Inventors were not wanting who laboured hard to perfect and introduce systems which they contended would be certain to supply the long-sought remedy. But failures in almost all the so-called "smoke-consuming furnaces" produced (furnaces which were either based upon a faulty principle, or were impracticable in their application) have necessarily induced distrust whenever something new in this direction was introduced, and interfered with the more extended application of systems, the efficacy of which had been fairly established in practice. Whilst in the gas industry the generator and shaft furnaces were in general use, the smoke-consuming contrivances for steam-boilers which have been brought into notice have had but an indifferent success, chiefly because the arrangements were, as a rule, found to be very expensive, and out of proportion with existing estimates; though on the other hand, it must be admitted that not only has the consumption of smoke aimed at been attained, but also in many cases a considerable saving in coals realized.

It became therefore a necessity to find out a simple and cheap setting which fulfilled all the conditions of being smoke consuming and economical in the consumption of coals, and which at the

same time was easily and quickly applicable to small works, and equally suitable for coal, wood, or peat furnaces. This long-felt want has been supplied by Herr Wilsmann, Director of Mines at Hagan (Westphalia), by the invention of an exceedingly simple contrivance which he calls a "dike furnace," which can be applied with equal facility in settings for ordinary purposes or for steam-boilers. The arrangement (which is represented in the accompanying illustration as adapted to steam-boilers) consists mainly of a contrivance by which the front part of the fireplace in an ordinary grate-setting is converted into a gas generator. For this purpose there is placed above the grate A, and in immediate proximity to the fire-bridge, a fireproof dike or bank provided with a partition wall C. The effect of this arrangement is that both gas and smoke are prevented from escaping into the flue at the back, if care is taken to pile the fuel against the dam. The gas and smoke generated from the coal which is piled on the grate are consequently forced to pass through the glowing fuel, where they are effectually absorbed.



The gases generated from fresh coal on the top of the burning mass, and which eventually would completely fill the space in front, are directed by the channel B into the flue at the back; and since these gases require a secondary supply of air for their entire combustion, this is provided through the air-tubes DD; the quantity being regulated by dampers.

In employing this system of firing, the chief result obtained consists in the complete combustion of the smoke and gas generated (consequently, a most profitable and thorough employment of the fuel used) and the avoidance of many repairs necessary under the old systems, since in charging the furnaces a cooling of the boilers is entirely avoided. The coals used as fuel are burnt at the beginning of the heating of the boiler, for a space of three-quarters of an hour, in exactly the same manner as in an ordinary furnace arranged after the old pattern, with this difference, however, that the glowing mass of coal is gradually being piled up against the partition until the front section of the furnace is practically closed against the space at the back. During the combustion of the coal, the carburated hydrogen which is being generated combines with the air entering through the grate. At a high temperature this combination is burnt up, whilst the coal from which the gas is partly extracted is consumed in the shape of coke. The inconvenience of the generation of smoke immediately after the supply of fresh fuel, and which it is impossible to avoid in a furnace of ordinary construction, is obviated in the "dike" furnace immediately after firing, provided care is taken that the coal resting on the grate is piled obliquely against the partition wall. If this precaution is taken, the part of the furnace intended for the distillation of the coal and the firing-chamber proper, with the flues, are separated by the glowing wall. The hydrocarbons can thus be freely generated, and, instead of being drawn away from the furnace, are carried right through it. Such portions of them as may have escaped are caught up and carried forcibly into the furnace, where, being still more highly heated and brought into contact with the outer air, they are completely consumed by combustion. By this method of burning coal, the consumption of smoke has been fully accomplished; and therefore a great stride towards the solution of this important problem has been made by Herr Wilsmann's arrangement.

In principle, the "dike" furnace corresponds exactly with that of the generator furnace as employed in the heating of gas-retorts, where the hydrocarbons generated from the fresh coals charged into the furnace are forced to pass through the layers of glowing coke. In each case carbonic acid is produced at the outset of the firing. In passing through the glowing coke, this compound, in consequence of coming into contact with the fresh carboniferous material, is reduced to carbonic oxide, which is burnt into carbonic acid if there is a sufficient supply of air. Numerous attempts have been made to apply generator firing to steam-boilers; but hitherto without success. Either the arrangement has been found to be too costly, or other difficulties have arisen involving heavy pecuniary sacrifices, though they might perhaps have offered the slight compensation of a partial consumption of smoke. For this reason it must be readily admitted that the simple method of consuming smoke which has just been described, must be attended with great success if properly carried out. If any proof is needed, it is supplied in the fact that upwards of 600 furnaces on the Wilsmann system have been in operation for some years past in all kinds of works in the Rhenish provinces, in Westphalia, and in South Germany; and that from all quarters, without exception, the most favourable testimonials have been received, not only with regard to the abolition of smoke, but also to the important saving effected

in coal, amounting to from 15 to 30 and even 40 per cent. on the consumption by the old systems.

The author concluded by giving the results of some trials made with a horizontal Cornish cylindrical boiler furnished with an ordinary grate, and subsequently with the same boiler fitted with the Wilmsmann arrangement. In the former case, 1 kilo. of coals evaporated 6.13 litres of water having a temperature of 0° C. (32° Fahr.) at atmospheric pressure; in the latter, 1 kilo. of coal evaporated 8.87 litres of water having a temperature of 0° at atmospheric pressure. The evaporation per hour was found to be 275.7 litres; the evaporation per hour per square metre of heating surface, 15.3 litres; the hourly evaporation per square metre of grate surface, 458.5 litres. By the employment of Wilmsmann's method instead of the old grate firing, a saving of about 30 per cent. in coals is obtained, simply because the consumption of smoke is rendered perfect.

At the close of the paper, a short adjournment took place. On the resumption of the proceedings,

Herr Viehoff, of Saargemünd, related his latest experiences in the employment of wrought-iron tanks for gasholders. In response to his invitation, Herr Blum, of Berlin, informed the meeting that the iron tanks for the holders constructed of late according to the plan of Professor Intze* had answered the purpose perfectly well, and adduced the following instances where the system has been adopted with equally favourable results:—Telescopic holders at Charlottenburg, 10,000 cubic metres capacity; Wurzen, 2100 c. m.; Frankfort, 1000 c. m.; Liegnitz, 3000 c. m.; Bernburg, 2000 c. m.; Freiberg, 2000 c. m.; Hamm, 1500 c. m.; Fürstenwalde, 1000 c. m. Single-lift holders: Spandau, 2500 c. m.; Göttingen, 2000 c. m.; Emmerich, 2000 c. m.; Marienburg, 600 c. m.; Borna, 600 c. m.; Konitz, 400 c. m.; and Burgstädt, 400 c. m. In addition to the foregoing, there have been constructed a telescopic holder at Chemnitz, with a capacity of 7000 cubic metres; two telescopic holders at Plauen, each of 300 cubic metres capacity; and the following single-lift holders:—Two for Guayaquil (Ecuador), each 2000 c. m.; one for Bienne, of 2000 c. m.; one for Lüben, of 600 c. m.; one for Lauscha, of 600 c. m.; one for Oberursel, of 130 c. m.; and two for Terni, (Rome) of 100 c. m. and 50 c. m. respectively. Well-executed photographs were shown of the holders at Charlottenburg and at Spandau. The speaker proved conclusively that with holders constructed according to Intze's system, the outward thrust of the soil is so completely counteracted that it may be disregarded, and only the vertical pressure upon the foundation considered. Attention was drawn to the connection between the guide-framing and the tank itself, which is arranged so that even the greatest pressure of wind on one side of the structure would not affect, to a marked extent, any particular parts, since the whole wind pressure is transferred to the solid rest-ring. Consequently, there is nothing to prevent the construction of three-lift and even four-lift telescopic holders with tanks on Professor Intze's plan. The advantages of the Intze tank consist mainly in this—that all the parts of the entire structure are readily accessible and easy to examine. Destruction of the lower portion by rust is therefore easily prevented by applying an occasional coat of paint. In reducing the bulk of water to half the usual quantity, the foundations (which consist only of a ring of cement masonry) have but little weight to bear. At Charlottenburg this weight amounts to less than 2 kilos. per square centimetre; and even this can be reduced still further by making the ring wider, so that it is possible to build upon the most unfavourable soil. It is further requisite to utilize as much as possible the space under the dome, which takes the place of the usual earth cone. At Charlottenburg, for instance, this space is 32 metres wide, and is used for storing retorts, fire-bricks, tubes, chandeliers, &c. The space is lighted by means of windows in the daytime, and at night by the aid of lamps from the outside; the warming being done by a steam-pipe carried round the structure. To the foregoing advantages must be added that of rendering the inlet and outlet pipes more easily accessible than they are with ordinary gasholders. In conclusion, the speaker explained the arrangements for heating the water in the tank during the prevalence of inclement weather.

In the course of the discussion which followed, Herr Erpf (Pforzheim) confirmed the statements made as to the good results to be obtained by the adoption of Professor Intze's idea, and only complained of difficulty experienced in connection with heating with underground water. Herr Morz, of Carlsruhe, on the other hand, maintained that very good results had been obtained at his works by heating with underground water at a temperature of 8 to 10° C. Herr Kugler (Offenbach) alluded to the heavy expense which the application of the Intze system involves, and to the difficulty of making a good foundation for full-sized tanks, so as to protect the bottom effectually against rust. He admitted, however, that the danger of rust was not so great as altogether to stand in the way of the adoption of the system. Herr Pechner (Ludwigshafen) closed the discussion by making some very favourable remarks both as to the durability of the Intze tanks and the facility with which they could be constructed.

The next subject introduced was the question, "Can the Butzke lamp be recommended for intense lighting?" by Herr Kugler (Offenbach), who stated that he made numerous experiments both

with this and the Wenham lamp, and found that the latter generally burnt with an unsteady light, instead of with a round, even flame, whilst his experience of the Butzke lamp was that it gave a very steady light. Herr Dr. Götzke (Berlin) pointed out that the flame of the Wenham lamp burnt from within outwards, whilst the Butzke lamp burns in an opposite direction. The consequence is that the tops of the flames disappear in the central mass, as in all inverted burners; whereas in the Wenham lamp the jagged points are bound to remain visible to the eye. The President mentioned, as an advantage, that the Butzke lamp produces a pure white light; whilst the Wenham lamp burns with a yellowish flame.

The next subject to occupy attention was: How can the lead packing used in pipe-joints best be prevented from being driven out by the high pressure of water or of any other force? On this point Herr Reuther (Mannheim) remarked that the best means of preventing the displacement of the packing, even under a high pressure, was the widening of the inner end of the socket. The President stated that the displacement of a lead ring under a pressure of 18 atmospheres had occurred to his own knowledge; and he suggested that it might be prevented by the application of a concave mould in the interior of the socket, which, however, should be constructed in such a form that the mould in fitting the lead mortice, should not be sheared off. Herr Blum (Berlin), on the other hand, did not consider the use of socket-pipes at all advisable at so high a pressure; and he recommended the employment of flange-pipes instead.

At the conclusion of the technical portion of the proceedings, Herr Lux (Ludwigshafen) explained his gas-balance by the aid of a model, and expressed a hope that it would prove of great assistance in experiments connected with the testing of gases produced from different kinds of coal.*

A vote of thanks was then passed to those who had introduced subjects for the consideration of the meeting, or taken part in the discussions, and the meeting broke up.

The following morning was profitably employed in a visit to the pumping station and the high reservoir of the Municipal water-works at Ludwigshafen, where an excellent sample of Wilmsmann's smoke-consuming furnace was seen in operation. A hurried inspection of the gas-works, and of the local organ-building establishment was followed by an excursion by train to Marbach, Schiller's birthplace; and a pleasant *réunion* of the members in the evening brought the meeting to a close.

THE HALIFAX GAS COAL CONTRACTS.—It has been intimated that the Sub-Committee of the Halifax Corporation appointed to consider the recent correspondence between the Town Clerk and Mr. Ellis Lever, Mr. Thomas Fox, and the Editor of the *Pall Mall Gazette*, with power also to take such steps as they might think expedient with the object of bringing about a satisfactory investigation of certain charges in reference to contracts, will make a report to the Town Council to-morrow (Wednesday), when the usual meeting of the Council will be held.

PRESENTATION TO MR. J. DIGGS, OF NOTTINGHAM.—Last Saturday week, the *employés* at the Basford works of the Nottingham Corporation Gas Department met at the Clinton Hotel for the purpose of presenting Mr. J. Diggs, the Deputy-Manager of the works, with a substantial token of their regard, on his leaving England for Buenos Ayres, at which place he has accepted a similar position under Mr. L. T. Wright. The presents consisted of an elaborate marble timepiece, a silver teapot, and a magnificent set of lace curtains—the latter being the gift of Mr. C. Hardy, of Nottingham, and intended to remind Mr. and Mrs. Diggs in their far-off home of the affection displayed to them by all who knew them in the town. The chair was taken by Mr. Wilkinson, the Manager of the Traffic Department; the vice-chair being occupied by Mr. West, the foreman fitter—both of whom alluded, in touching terms, to the sorrow and regret felt by all in parting from Mr. Diggs, in whom they had always found a kind and cheerful master, and who, while a strict disciplinarian and firm administrator, yet always lent a willing and sympathizing ear to the troubles of his men. Mr. Diggs, in reply, thanked them all for their beautiful and costly presents; saying he could assure them he valued them, not only for their intrinsic value, but as showing the spirit in which his friends regarded him. He was told that out of a total of 120 men at present engaged on the works, 110 were subscribers; and this fact was a source of great satisfaction to him. Wherever in the future fortune might place him, he should always think with affection of the hands at Basford. He trusted they all would do their utmost to maintain the efficiency and good manufacturing results they were now obtaining. Many of them would remember the poor results of carbonization before the advent of Mr. Wright, who came (almost simultaneously with himself) from Beckton to Nottingham. At that time it was with the greatest difficulty that 9800 cubic feet of gas per ton of coal carbonized could be obtained; with a mouthpiece delivery of about 4800 or 4900 cubic feet. Now, however, with inferior coal to that previously used, they were producing 10,700 cubic feet per ton; whilst the mouthpiece returns were over 6000 cubic feet, and the illuminating power was more than 19 candles. The remaining part of the evening was spent with glee-singing; the proceedings terminating with enthusiastic cheers for Mr. and Mrs. Diggs.

* The system of gasholder construction devised by Professor Intze was described in a paper presented by him to The Gas Institute in 1885; and it was subsequently dealt with in articles which appeared in the *JOURNAL* on Sept. 15 and Oct. 20 of that year (pp. 457, 685.)

* The latest forms of this instrument were brought under the notice of The Gas Institute by Herr Lux at the recent meeting.

A NEW PROCESS FOR THE MANUFACTURE OF SULPHATE OF AMMONIA.

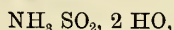
In the abstract of the papers read at the last congress of the Société Technique du Gaz en France, which appeared in the JOURNAL for July 24, notice was taken of the communication made to the members by M. de Lachomette, on the subject of his new process for the manufacture of sulphate of ammonia. As this paper was regarded as one of the most important of those presented to the meeting, it may be of interest to amplify our previous notes by the aid of the full text of the paper, which was given in a recent number of the *Journal des Usines à Gaz*.

The author began by stating that about two years ago he set before himself the problem of dispensing with sulphuric acid in the manufacture of sulphate of ammonia; being of opinion that the attainment of such an object would be attended by many advantages. After making a number of experiments, he thought he had solved the problem from a commercial point of view. He came to the conclusion that the coal itself (or, more correctly speaking, the oxide of iron which has served for the purification of the gas) would furnish the sulphur which, in combination with the oxygen of the air and subsequently with ammonia, is required for the production of sulphate, and that there could be obtained in this way a salt of which all the constituent elements would be derived from the coal. His first idea was to convert the sulphur of the coal into sulphuric acid, with the intention of subsequently manufacturing sulphate by the ordinary process. This plan, however, was soon abandoned, owing to the outlay necessary for the installation of the plant, and the difficulties attending the manufacture of sulphuric acid on a small scale. But the question arose as to whether these difficulties could not be surmounted by the employment of sulphurous acid, produced by the burning of sulphur, in the formation of sulphate of ammonia capable of being used directly in agriculture as a nitrogenous ingredient in the making of manure, or of being easily converted into ordinary sulphate of ammonia.

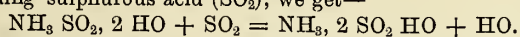
It was in consequence of noticing the heavy vapours of sulphite of ammonia produced by the combination of the sulphurous acid escaping from the test-vessels used in the manufacture of sulphuric acid with the ammoniacal vapours from a neighbouring alkali vessel, that the author's attention was first turned to this matter. These very heavy vapours formed upon the soil a kind of dense cloud, and the idea of condensing them was perfectly natural; but all kinds of appliances were brought into use for the purpose, but without success. Recourse was then had to the wet process, by passing into a vat containing water a current of ammonia and gaseous sulphurous acid, in the proportions required for the production of sulphite of ammonia. When the liquor had become saturated, the salt formed was deposited at the bottom of the vat, precisely as in the manufacture of sulphate; but this method presented many difficulties. In the first place, it was necessary to regulate with great care the proportion of the two gases—a by no means easy matter; then frequent obstructions occurred in the pipe conveying the ammonia.

A very interesting observation started the author on a fresh track. While working the foregoing method, he happened, without at first noticing it, to use an excess of sulphurous acid. The liquor in the vat, which ordinarily indicated 27° Baumé (1·216 sp. gr.), and which crystallized, went up to 34° or 36° Baumé (1·288 or 1·310 sp. gr.), and all the crystals disappeared. Though perplexed at first, he soon ascertained that bisulphite of ammonia had formed, and that this salt was much more soluble than sulphite. This difference in solubility between the two salts, the author proceeded to turn to account. The sulphite liquors, which he obtained in the manner indicated above, were treated simply with sulphurous acid, and converted by a continuous process into bisulphite liquors. These, being collected in crystallizers, were afterwards treated with a current of ammonia, by which they were converted into sulphite. This reaction was accompanied by a great increase of temperature; and when the liquid cooled again, a very considerable deposit of salt was produced. The mother liquors were then treated again with sulphurous acid, and afterwards with ammonia; these two operations being repeated successively. Before saturating the bisulphite with ammonia, it was found to be indispensable to add to it the quantity of water necessary for the crystallization of the salt to be formed, in order to preserve for the succeeding operation the original volume of mother liquor, which otherwise would tend to gradually diminish. It was easy to determine this volume, either by calculation or, more simply, by experience.

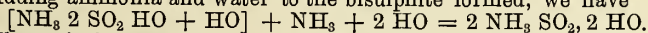
The following are the formulæ of the reactions which take place in the operations above described. The formula for sulphite of ammonia is—



By adding sulphurous acid (SO_2), we get—



Adding ammonia and water to the bisulphite formed, we have



Theoretically, the bulk of liquor at the end of the operation will be exactly what it was at the outset, provided, be it understood, that the temperature is kept equal. For example, if a volume of liquor containing in solution a certain equivalent of sulphite—say, 67 kilos.—is treated, there will be found in the vat, in a state of crystals, the same quantity of salt. In practice, however, the amount of salt deposited will be less, because it is difficult to completely saturate the sulphite by sulphurous acid; but it is amply sufficient for satisfactory working on a commercial basis.

Here, then, we have a practical process for the manufacture of

sulphite of ammonia on a large scale. In order to arrive at the complete solution of the problem which the author set himself, it is of course necessary to convert this salt into sulphate. This can be effected by the simple exposure of it to the air; but in that case a great deal too much time is needed. He asked himself if, in depriving the sulphite of one of its equivalents of water, the equivalent of oxygen necessary to transform it into sulphate would not be fixed more rapidly. This was found, on trial, to be correct; and under these conditions oxidation was effected in a few hours instead of requiring weeks. The reaction is very quick, and may cause a rise of temperature to the extent of 100° C., which has to be avoided in order not to cause the decomposition of the salt. It is very easy to moderate this re-action by working in a confined space, and regulating the admission of air.

The author remarked, in conclusion, that he only wished to indicate the theory of these new manufacturing processes; reserving for some future paper the description of the apparatus to be employed, which was being somewhat modified. At the same time he thought he was in a position to state that this manufacture would henceforth require only simple appliances easy of manipulation, and comparatively inexpensive to set up; and their cost would be covered by the value of the oxides of iron resulting from the roasting of the spent purifying material for the production of sulphurous acid. Some trials were made of the sulphite for agricultural purposes, as compared with the sulphate manufactured by the ordinary processes; and the sulphite stood the test well. These experiments have just been confirmed by the results obtained by authorities more skilled than the author in matters of agriculture; and further experiments are now being carried out at certain agricultural stations. He considers that manufacturers will confine their operations to the production of sulphite of ammonia by the method indicated, and that it will be in this form that the ammonia resulting from the carbonization of coal will in the future be disposed of for agricultural purposes.

WOODEN WATER-PIPES.—At the meeting of the Newcastle Society of Antiquaries last week, one of the members presented some pieces of wooden pipes that were recently discovered in the Side, while some new telephone lines were being laid. They were made of elm, and illustrated two methods of joining pipes. There was, in one method, a butt joint, which was made water-tight by an iron ferrule. There was also the spigot and faucet principle; a pointed end fitting into a cup-shaped socket, fastened with a pin. It was mentioned at the meeting that in 1698 an Act was obtained to supply the town with water; and 4-inch pipes were put down from the Town Moor and across to Gateshead. It was believed by some that these were part of the water-pipes used.

PRESENTATION TO MR. J. C. INGHAM.—The retirement of Mr. Joseph C. Ingham from his position on the staff of the Bury Corporation Gas Department was taken advantage of by the *employés* at the works to signalize the friendly relations which have for so long a time existed between them and their late Assistant Manager, by presenting him with a handsome black marble timepiece, inscribed as follows:—"Presented to Mr. Joseph C. Ingham by the Engineer and general *employés* of the Bury Corporation Gas-Works, on his being appointed Manager of the Ramsbottom Gas Company, as a small token of their esteem and well wishes for the future." The presentation took place after a dinner at the Dun Horse Hotel, Elton. Mr. William Woodward, the Engineer and Manager of the gas-works, occupied the chair. After the usual loyal toasts had been honoured, he proposed the "Health of Mr. Ingham," and called on Mr. John H. Walker, the foreman, to make the presentation on behalf of the men. Mr. Ingham received the present amid applause, and appropriately responded to the toast bearing his name.

ENGINE INDICATORS AND DIAGRAMS.—Mr. W. W. Beaumont, M. Inst. C.E., has just edited and enlarged in book form a series of articles on this subject that appeared a short while ago in the pages of the *Electrician*; his work appearing under the comprehensive title of "A Practical Treatise on the Steam-Engine Indicator and Indicator Diagrams," and containing some notes on steam-engine performances, on the expansion of steam and the behaviour of steam in the cylinders of steam-engines, and on gas-engine diagrams. The author declares his intention in preparing the book to have been "to place in the hands of students and practical men a concise guide to the objects, construction, and use of the indicator, and to the interpretation of indicator diagrams." The plan of the work is first to consider the object sought for in the preparation of indicator diagrams—what it is desired shall be shown by them. The construction of the various forms of apparatus devised for the purpose, their attachment to the engine, and the manner of their use form the next section of the book; followed by examples of diagrams for engines most in use, with an interpretation of them, so as to show how far they agree with theoretical diagrams. The author also gives simple methods of calculating and constructing theoretical curves of expansion, and of comparing the actual with the theoretical performance of steam in particular forms of steam-engine cylinders. In order to render the book useful to practical men, arithmetical treatment of figures has been adopted throughout. A special chapter has been devoted to gas-engine diagrams; the types being those singled out by Mr. Dugald Clark in the course of his investigation—the Lenoir engine, the Simon engine, and those of the Otto, Clerk, Atkinson, Beck, and Griffin type.

Register of Patents.

GOVERNORS FOR STEAM, GAS, AND OTHER FLUIDS AND LIQUIDS.—Parkinson, F. B., of Bury, Lancs. No. 10,853; Aug. 8, 1887. [6d.]

This invention consists in enamelling with vitreous enamel the metal surfaces of the diaphragm chambers of governors, and any other portions where desirable; the object being to prevent any possibility of corrosion through exposure of the parts to damp and moisture.

REGENERATIVE GAS-LAMPS.—Clark, F. W., of Upper Ogle Street, London. No. 13,120; Sept. 28, 1887. [8d.]

The object of this invention is to ensure the steady burning of regenerative gas-lamps in strong currents of air.

In the illustrations, the burner and the passages by which the air for supplying the flame is heated by the escaping products of combustion passing up into the chimney, are arranged as in the Wenham lamp. The chimney is surrounded by a casing D, of such a diameter as to leave an air space between its inner side and the exterior of the chimney. The casing communicates at its lower end with the lower hood E, into which air enters by the perforations to supply the flame by passing through the channels of the heater. The upper end of the casing opens

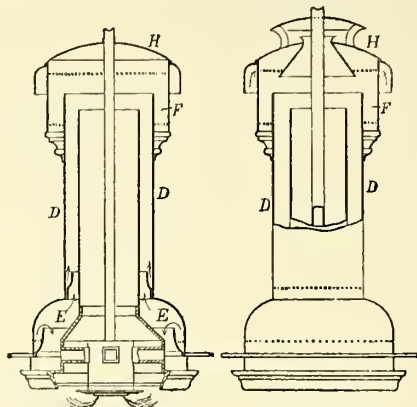


Fig 1

Fig 2

into the chamber F, into which the upper end of the chimney also opens, as shown. This chamber has perforations in its top and bottom; the upper ones being covered by a hood formed in one with the top cover or cap H of the lamp. Perforations are also made in the lower part of the casing; and the two sets of perforations have opposite them (inside the casing D and hood E respectively) deflectors, which direct the air entering the perforations upwards, so that any excessive amount of air due to sudden gusts of wind will not enter directly into the tubes of the heater and impinge on to the flame, as the surplus beyond that required for the flame passes upwards, and finally escapes with the products of combustion through the perforations in the chamber F. This controls and ensures the proper and regular flow of air to the flame caused by the draught in the chimney.

In some cases—more particularly in lamps of large size—in place of, or in addition, to the perforations in the chamber F, there is (as shown in fig. 2) a series of perforations in the cap H, with a weather guard above the opening. This guard (opposite the perforations) may also be perforated; as this, says the patentee, will be found to be a ready means of regulating the air supplied to the flame.

GAS-LAMPS, BURNERS, AND SHADE-CARRIERS.—Kennedy, W. W., of Edinburgh. No. 16,276; Nov. 26, 1887. [11d.]

This invention relates to an appliance to be attached to an ordinary wall gas-bracket, or to the bracket or arm of a centrally-suspended gasolier, having within it an annular passage for heating the gas, extending vertically upwards above the burners, and so that a portion of the heat escaping from the burners is caused to gradually heat the gas on its travel through the annular passage towards the burners.

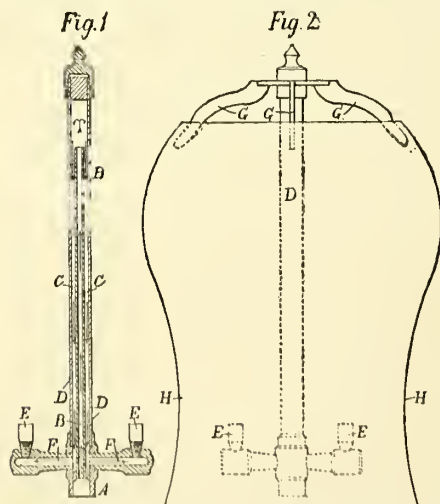


Fig 1

Fig 2

The apparatus shown in fig. 1 is attached by the screw socket A to the screw on a wall bracket or on the branch of a gasolier, whereon the gallery for carrying the shade is usually attached. The gas, as it passes the tap, ascends through the central pipe B, until reaching the upper part, when it descends in the annular space C contained between the

inner pipe B and the outer pipe D. On arriving at the bottom of the passage C, the gas has become heated by the flames issuing from the burners E; and in this heated state it escapes into the passage F, and thence to the burners.

For the purpose of carrying the glass shades used with the burners, the gallery consists of the central piece and arms G shown in fig. 2, to be carried at the upper part of the tube D. From this arrangement it will be seen that the glass H is suspended over the burners E by its other end resting upon the points of the three arms G. This arrangement not only gives complete support to the shade, but admits of it being moved without difficulty for the purpose of being either cleaned or replaced.

APPLICATIONS FOR LETTERS PATENT.

12,273.—LAWRENCE, J., "A new or improved device for stopping leakage in hose and other pipes." Aug. 25.

12,281.—CUNNINGHAM, J., "Improvements in machinery or apparatus for charging gas-retorts." Aug. 25.

12,283.—WILSON, C. C., "Improvements in gas-stoves." Aug. 25.

12,313.—BOSSHARDT, F., "Improvements in apparatus for detecting and announcing the presence of explosive gases in mines or other places." A communication from Molas, J. Aug. 27.

12,318.—JARDINE, J., and FERGUSON, J., "Improvements in and relating to gas and air reversing valves for regenerative, smelting, and other furnaces or purposes." Aug. 27.

12,370.—WILLIAMS, S. DE LA GRANGE, "New or improved burners for heating lime-kilns, and brick and other kilns by the combustion of gas, and for other like purposes." Aug. 28.

12,399.—CHARON, L., "Improvements in gas motors with variable expansion." Aug. 28.

12,467.—BIDDISON, S. M., "Water and oil gas machine and burner." Aug. 30.

12,472.—WILLIAMS, H., "Improvements in gas motor engines." Aug. 30.

12,518.—MAXIM, H. S., "Improvements in apparatus for naphtholizing or carburetting illuminating or other gas." Aug. 30.

PATENTS WHICH HAVE BECOME VOID.

[AFTER THE FOURTH YEAR.]

8030.—NOBES, G., "Self-acting gas-cocks."

8080.—LEONI, S., "Gas-ovens."

8110.—REDMAN, T., "Mercurial gas governors."

WEST KENT GAS COMPANY.—The Directors of this Company report that there has been a slight increase in the sales of gas during the half year ending June 30 last; and they think that there is a probability of a further increase in consumption, owing to the introduction of new industries into the district. The residua have realized better results. Referring to the public lighting of Erith, they say that the lamps are now being experimentally lighted with oil; and even if this mode of lighting can be adhered to, they do not anticipate that it will materially influence the dividend, as the profits on public lighting are small. The total receipts in the half year amounted to £7329 9s.; and the expenditure to £4333 18s. The Directors recommend the payment of the statutory dividends.

HARROGATE GAS COMPANY.—The half-yearly meeting of the shareholders of this Company was held on Thursday last. The interim statement of accounts was read by the Secretary (Mr. P. H. Wilkinson). This showed a profit of £3267 7s. 4d., which, with the addition of the balance brought forward, left an amount available for dividend of £4046 13s. 9d., out of which (after the preferential charges were met) the Directors recommended the payment of an interim dividend of 7½ per cent. on the "A" stock, £5 12s. 6d. per cent. on the "B" stock, and 5½ per cent. on the "C" stock, leaving a balance to carry forward of £966 12s. 8d. The Chairman called attention to the fact that, notwithstanding a reduction in the price of gas of 3d. per 1000 cubic feet in January last, the net profit of the half year was about £500 in advance of the corresponding portion of the previous year; and he anticipated, if the Harrogate season is not materially injured by the unfavourable weather, a further reduction in price may be made in 1889. He considered that the advantages of the sliding scale, when properly and judiciously developed, were of equal benefit to stockholders and consumers. For example, in 1881 the Company's "A" stock was selling at 177½, and the "B" at 148. The price of gas had been reduced 1s. 6d. per 1000 cubic feet; and at a sale by auction recently, the same stock realized 327 and 237 respectively. He was also pleased to state that the Company were in thorough accord with the local authorities; and complaints from the consumers were comparatively speaking unknown, as the Company's officials educated their consumers in utilizing gas to advantage. The recommendation of the Directors was adopted, and a dividend declared in accordance therewith. The meeting closed with a unanimous vote of thanks to the Chairman, the Directors, and the Engineer.

COMPLETION OF NEW FILTER-BEDS AT DEVONPORT.—Two new filter-beds in connection with the Devonport Water Company's reservoir at Crownhill have recently been completed, and are now in use. They are situated to the north of Crownhill Fort, and are about a ½ mile from the Company's filter-beds at Brooklands, which were completed in 1877. Since then there has been such a large increase of population, and a consequent additional demand for water, that further works were necessary. The new beds were commenced in November, 1886; and it is expected that these increased filtering facilities will meet the Company's requirements for about ten years to come. The work just completed consists of two filter-beds, each 115 feet long, 80 feet wide, and 8 feet deep; a pure-water tank 80 feet long, 20 feet wide, and 9 feet deep; a gauge tank; and a service of 20-inch cast-iron pipes, connecting the beds with the mains at Brooklands. Both the old and the new filter-beds are connected with the Crownhill reservoir by 15-inch cast-iron pipes. The area of each of the new beds is about 1000 yards; and each bed is capable of filtering about 500,000 gallons of water per day, equal to about 500 gallons to each superficial yard. In each bed there is a depth of about 4ft. 6in. of filtering materials; the top 18 inches consisting of clear silicious sand, brought specially from Bridport, and which, before being placed in position, was carefully washed in machines provided and fixed in the centre of each bed for the purpose. The filtering material, which amounts to about 3000 tons, was washed and put in place by the Company's own staff. The chief Engineers were Messrs. T. and C. Hawksley; the progress of the work, which has cost several thousand pounds, being watched by Mr. H. Francis, the Company's Resident Engineer. The Contractor for the excavations, draining, and masonry, was Mr. G. Shillabeare, of Plymouth.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

MR. CARPENTER ON GASEOUS FIRING.

SIR,—Your correspondent, “Jocelyn Cruikshank,” has misread my letter of July 28. By coke sold, I meant the quantity sold to, and paid for by, consumers per ton of coal carbonized; and the figure given, of course, represents that available after the work’s consumption for steam-raising and other purposes besides retort heating.

As “Jocelyn Cruikshank” very truly says, there cannot be much difference in the weight of the residual coke left behind in the retort after carbonizing a ton of coal in either of the places mentioned in his letter. Surely then, “coke sold” is a better indicator of real work’s economy than figures dependent on assumptions of production discordant in the highest degree, as “Jocelyn Cruikshank” well points out.

In conclusion, I am confident that, despite “Jocelyn Cruikshank’s” evident penchant for a scientific regenerative furnace, he would be the last person to affirm that a scrap of value attaches to any of the patents for “regenerators” themselves—certainly a not unimportant consideration in the economic construction of carbonizing plant.

Sept. 1, 1888.

CHAS. C. CARPENTER.

THE METROPOLITAN GAS COMPANIES.

SIR,—Though not a gas engineer, I have for some years past taken great interest in the working of the three great Gas Companies which share the monopoly of the London Gas Supply, and in the proceedings at their general meetings. More particularly, as a statistic, I am in the habit of scrutinizing the statements made as to financial results.

The Governor of The Gaslight and Coke Company, as is well known, is accustomed to treat the proprietors, in general meeting assembled, to a review of the figures contained in the half-yearly statement of accounts. At the last half-yearly meeting of the Company, held on Aug. 10, Colonel Makins gave, among other statistics, the figures relating to the net cost of coal, showing a reduction, which he said was “the largest reduction I ever recollect in a half year.” It is fairly presumable that the Chairman of an important public Company—certainly the largest, “the premier,” of its kind in the world—when he makes a deliberate statement of this sort at the shareholders’ meeting, speaks from information, and knows what he is talking about. I have worked out all the details; and I think that the proprietors of the Chartered Company—who, as a matter almost of course, accept the Chairman’s words as “gospel”—will perhaps be surprised to learn that the said reduction in the net cost per ton of coals for the half year ended June 30 last, as compared with the corresponding period of 1887—viz., 10·44d.—though large and satisfactory, had previously been exceeded, and that considerably and so recently as in the half year immediately preceding (ended Dec. 31 last), as well as in the half year ended the 30th of June, 1887, with which comparison was made.

The following tabular statement contains the net cost of coal per ton for the five half years here brought into comparison, and the several decreases referred to, as well as the rate or percentage of decrease:—

Particulars.	Half Year ended				
	1886.		1887.		1888.
	June.	Dec.	June.	Dec.	June.
Net cost of coal, per ton . .	d. 78·55	d. 76·08	d. 63·82	d. 62·54	d. 53·38
Decrease on corresponding period of previous year, per ton	—	—	14·73	13·54	10·44
Rate of decrease, per cent. .	—	—	18·76	17·80	16·35

Among meaner mortals, such an oversight or error would go far towards convicting a speaker of ignorance and incapacity in matters within his own cognizance. Seeing that Colonel Makins was so singularly and utterly oblivious of a not unimportant detail in the working during the past two or three years of the Company which is his especial charge, he can hardly be expected to know or care to know that the decrease which he deemed unprecedented had, also recently and largely, been exceeded by his immediate and nearest rivals—the South Metropolitan Gas Company, as under:—

Particulars.	Half Year ended			
	1886.		1887.	
	Dec.	June.	Dec.	June.
Net cost of coal, per ton . .	d. 58·54	d. 59·65	d. 46·15	d. 41·91
Decrease on corresponding period of previous year, per ton.	—	—	12·39	17·74
Rate of decrease, per cent. .	—	—	21·16	29·74

In this connection, I may also further note that in the two consecutive half years ended June 30 and Dec. 31, 1884, the decrease in the net cost of coal to the South Metropolitan Gas Company was, respectively, 23·46 and 24·59 per cent.; also that the Commercial Gas Company’s accounts showed decreases, in the net cost of coal, of 22·35 per cent. in the half year ended Dec 31, 1884, and of 20·12 per cent. in the half year ended Dec. 31, 1886.

It may—it no doubt will—be said, in reply, that the Chairman is not expected to speak on technical matters as an expert therein; and that all such figures are to be taken *cum grano salis* as mere figures of speech. Against that, however, I would urge that I have in my mind the case of at least one Chairman, if not more than one, who makes it his business to understand and to speak of all such details with knowledge, and therefore correctly. But it is still more cogent to remark that these are

not technical matters of working at all; but are mere questions of treating the resulting figures by the four plain and simple rules of arithmetic, and quite within the competency of the Board-scholar of the period.

Moreover, these statistics are put forth on authority, as fixed standards for comparison, from year to year. If the Chairman is to be regarded as a mouthpiece merely, the responsibility for their accuracy is only shifted one stage farther back, where it will assuredly press with still greater weight.

The discrepancies which I have pointed out are so startling that I trust you will accord space in your columns to this expression of the views of one who—beyond paying his gas-bill to a Suburban Gas Company—has no connection whatever with the Metropolitan Gas Companies, and is therefore impartial and independent.

Aug. 31, 1888.

OUTSIDER.

MR. KEY’S NORTH BRITISH ASSOCIATION PAPER.

SIR,—In your issue of the 28th ult., in the paragraph immediately under the heading, “Mr. Key’s Paper,” I am made to say, “The effect was to put out the gas.” I said no such thing. What I did say is quoted in my paper, reported near the bottom of the second column of page 291 of the JOURNAL for Aug. 14—namely, “The flame of gas has almost entirely lost its luminosity, although the shape and size of the flame remains as large as before.”

My remarks on Mr. W. Young’s very valuable paper on the subject of gas and oil contact, read before the West of Scotland Association, and reported in the JOURNAL for Oct. 27, 1874, have been entirely omitted from your report of my remarks. I have frequently verified Mr. Young’s experiments, and proved for myself the destructive effect of hydrocarbon oils or gas at low temperatures. I may mention that the temperature of the air of the lecture hall in which I read my paper was found to be 68° Fahr., which in my experience quite justified the result of the experiment, and proved my reason why the temperature of all apparatus in gas-works should be maintained at 60° in winter.

I showed a sketch of my apparatus, to extract the tar by striking the gas by revolving fans, to Mr. Alex. Black, Manager of the gas-works at Alexandria, N.B., 17 years ago.

Exception was taken to my paper from the fact of its being of a theorizing nature, and for not having brought it forward before. I may perhaps be allowed to know best when is the time to bring forward my plans or theory; and this I thoroughly explained to the meeting, but it also is entirely left out of the report. Valuable papers have been, from time to time, read before the members of The Gas Institute, which were wholly hypothetical in their character; and they were discussed then much in the same spirit in which the authors brought them forward. The authors received condemnation from no one. The most recent case is the question of gasholders without guide-framing. There was, in that case, not even the desired ounce of fact, and very likely, but for the theorizing advanced on paper, Mr. Geo. Livesey may not have had the honour of being the first to put it into practice at Rotherhithe.

The remainder of the President’s remarks on my paper, I will not take any notice of, further than to say (quoting him), “It would have been far better if it had never been said;” and especially in this case, that the Revision Committee had exercised more discretion than to have publicly reported them.

Glasgow, Sept. 1, 1888.

WILLIAM KEY.

THE DARWEN NEW GAS-WORKS.—At the meeting of the Gas and Water Committee of the Darwen Town Council on Monday afternoon of last week, it was reported that the new gas-works were in an advanced state; and that probably in a fortnight’s time the manufacture of gas would be commenced there. It was also stated that the supply of gas had gone up 20 per cent. during the month.

NEWPORT (MON.) WATER-WORKS COMPANY.—The final half-yearly meeting of this Company was held yesterday week. In moving the adoption of the report, the Chairman (Mr. J. Lawrence) referred to the acquisition of the undertaking by the Corporation. He expressed the regret of the Directors at parting with the property; but said he hoped the transfer would be for the benefit of the town at large. The usual maximum dividends would be paid, and the new annuities created by the transfer would bear interest for the next half year, and be payable on Jan. 1, 1889. The motion was carried unanimously. In the course of the subsequent proceedings, the Chairman remarked that the question as to what should be done with the reserve fund was engaging the attention of the Directors; and as soon as a scheme had been arranged, an extraordinary meeting of the shareholders would be called to consider it. It was impossible at present even to indicate the sum which would be at disposal. Colonel Lyne moved a vote of thanks to the Chairman and Directors, and alluded to the success which had attended the Board in conducting the delicate negotiations with the Corporation. He believed the transfer had been satisfactory to all parties; and said that proof of this was to be found in the circumstance that the new stock was £20 above par. Mr. E. Grove, in seconding the motion, expressed the hope that the old servants would be considered in the scheme for dealing with the reserve fund. The motion was passed unanimously.

WOLVERHAMPTON GAS COMPANY.—The half-yearly meeting of this Company was held last Tuesday. The accounts showed that the receipts for the six months ending June 30 last amounted to £27,904, and the expenditure to £20,637; leaving a net profit of £7,267, which, added to the balance brought forward from the previous accounts, made a sum of £7700 available for division. The dividend recommended would absorb £6392; a balance remaining of £1308. Of this sum the Directors proposed to place £1000 to the reserve, and to carry forward the remaining £308. The Chairman (Mr. J. Underhill), in moving the adoption of the report, congratulated the shareholders upon their improved position, remarking that last year they had to take £1700 from the reserve for the purpose of paying the dividend. The £1000 to be added this half year would make the reserve stand at £3327; but their Act allowed them £5000. When this aggregate had been reached, the Directors would consider the question of reducing the price of gas. Residuals were still below their former value; but they hoped in time to be able to increase the present selling price. The motion was carried; and a dividend of 5 per cent. was afterwards declared upon the consolidated stock, and 3 per cent. upon the preference capital. A vote of thanks was passed to Chairman and Directors; and a similar compliment was paid to the officers, in replying to which Mr. John Annan, the Consulting Engineer of the Company, said that he believed as the price of gas was reduced there would be an increased consumption.

Miscellaneous News.

THE PROPOSED REFORM OF PRIVATE BILL LEGISLATION. THE MINORITY REPORT.

When noticing, in a recent number of the *JOURNAL* (*ante*, p. 214), the proceedings of the Joint Committee of the two Houses of Parliament appointed to examine into the present system of Private Bill Legislation, we stated that, at the conclusion of the Committee's labours, two reports were presented—one drawn up by the Chairman (Lord Monk Bretton), and the other by Lord Balfour of Burley. Both reports were read to the Committee; that of the Chairman being adopted, with some slight modifications, and presented to Parliament. At the meeting of the Committee at which the report was agreed to, the only absentee was Mr. T. Healy; and the final decision in favour of the Chairman's report was come to by a majority of seven votes to four. The voting was as follows:—For: Lord Monk Bretton, Earl Bathurst, Lord Kensington, Sir J. Mowbray, Mr. Craig-Sellar, Mr. Raikes, and Mr. J. Morley. Against: Lord Balfour of Burley, Lord Stalbridge, Lord Colville of Culross, and Sir J. Pease. It will be seen that the representatives of the Upper House were thus equally divided on the question of a commission acting locally; while the members of the House of Commons were four to one in favour of reform. Leaving out Mr. Healy, the solitary exception to the general opinion of the representatives of the Lower House was Sir Joseph Pease, who did not attend any of the sittings of the Committee at which evidence was taken. The text of the adopted report was given in the *JOURNAL* last week; and it may be interesting, in connection therewith, to make our readers acquainted with the views of the minority, as embodied in Lord Balfour's report, by reproducing this document, which was as follows:—

In the earlier part of the inquiry, the Committee directed their attention to the complaints which have been made against the present system of Private Bill Legislation, with the view of finding remedies for them. Incidentally, they heard allusions to the burden imposed on members of the House of Commons by the duty of serving on Private Bill Committees, intensified by the alteration in the hours of sitting and the appointment of Grand Committees; and they were informed of a resolution of a Committee of the House of Commons, that if the House were divided into four Standing Committees, arrangements should be made to relieve the House from the duty now discharged by Private Bill Committees. In reference to this matter, Mr. Stanhope said: "It certainly seemed absolutely impossible, if any of those schemes were adopted, that private members of the House of Commons could continue to sit upon Private Bill Committees; and although, for the present at any rate, those schemes are put on one side, yet I cannot help thinking that even now the enormous demand made upon members of the House of Commons to sit either upon Grand Committees or upon Public Committees, involves such a strain upon them, that it cannot be hoped that for very long they will be able to sit on Private Bill Committees also, especially if, with a revival of trade, there should be, as there probably would be, a large increase in the number of Private Bills."

Towards the end of their investigation, Sir John Mowbray, a member of the Committee, gave evidence to the same effect, but of so emphatic a nature, that it seems right to deal with this point before considering the other matters referred to the Committee. Sir John Mowbray says: "I do not either deny the competence of the Committees, or the satisfaction their decisions give; but I think there must be a change, and that sooner or later Parliament will have to transfer its jurisdiction on Private Bills to some external tribunal." "I find that in each Parliament every year it becomes more and more difficult to man the Committees, speaking from my experience as Chairman of the Committee of Selection;" and, when he is asked, "The consequence is that, owing to those various reasons, the number of members, out of the 676 members composing the House, who are available for Private Bill Committees is very materially reduced?" And again, "It is very materially reduced. And there is another fact I would mention, and that is the altered condition of Parliamentary life. Members go a great deal more into the country than they used to do. They go down to visit their constituencies, to make speeches, to open schools, to open bazaars, and for various reasons; and after they are put on Committees they ask to be allowed to absent themselves for a particular day of the week, or not to be put on until such a time, because they have to go down to meet their constituents. Then when certain members are asked when they will serve, they say, 'July, or late in the Session;' and they send us no reply in many cases. In one Parliament I knew a member who, whenever he was put on the panel or summoned by the Committee of Selection, went to Paris, and telegraphed to us from Paris. We are met with every sort of dodge of that kind. Many members are in London; yet it is very difficult to find them, although they are in London, when they are wanted to serve on Private Bill Committees."

The Committee are of opinion that the question whether a change shall be made in the system of Private Bill Legislation, in order to relieve the House of Commons, is of such great importance, that it should be settled by the House itself, after having been formally discussed. If the House of Commons decide that they are no longer able or willing to find efficient Committees to deal with Private Bills, it will, of course, be necessary to find some other method of dealing with Private Bill Legislation than that which has hitherto been in practice. Subject, therefore, to the opinion that the decision of the House of Commons must settle whether their convenience requires that Private Bills must be removed from the consideration of Committees of Parliament, the Committee believe that they can best serve the object for which they were appointed by considering the question from the point of view of what is most desirable in the interests of the public and the parties to Private Bills. They believe that the value of their conclusions would be diminished if they were affected, or seemed to be affected, by an under current of desire to get rid of an irksome and thankless duty. If not so affected, their recommendations as to the best mode of dealing with Private Bills will be of use when the House of Commons comes to discuss the governing question.

The Committee would press upon Parliament the fact that, though each Private Bill only affects individuals, the sum of Private Bill Legislation is of enormous importance to the commercial interests of the whole country. In connection with Mr. Courtney's recommendation of a Special Commission to deal with Private Bill Legislation, this question was put to him: "There is the immense sum of a thousand millions of money, I believe, already invested upon the faith of the existing Private Bill Legislation. Would you allow your Commission to rip up, if it became necessary, the existing Private Bill Legislation by schemes which impinged upon others which had already been passed by Parliamentary statute?" and his answer was: "I conceive that the Commission would proceed upon the same principles as Parliamentary Committees proceed upon, and I should reserve the last word to either House of Parliament, so that if the Commission became revolutionary either House might interpose. The Commission would, I presume, entertain schemes of competition with existing companies, just upon the same principle as Committees of the House of Parliament do."

It seems only necessary further to add, in connection with this part of the subject, that several suggestions have been made for mitigating the burdens upon members of the House of Commons. For instance, it has been proposed that the number of members of a Committee be reduced to three, and that at the beginning of the session a larger proportion of the total number of Bills introduced should be assigned to the House of Lords than has hitherto been the custom. It should be mentioned that in recent years that proportion has already been increased.

The complaints against Private Bill Committees have come principally, as might be expected, from Scotland and Ireland, and have been chiefly with regard to Bills of a certain type, usually promoted by corporations. The analysis of these complaints shows that the real grievance is almost always the expense caused by Committees sitting at a distance from the localities interested. Almost the only complaint against Committees themselves is contained in the evidence of the Lord Advocate, who says: "I do not know what confidence in the country a Committee of the House of Lords or of the House of Commons commands. I only know that I hear them spoken very much against wherever I go. I know sometimes one Committee decides one way, and another exactly the reverse. Both of these cannot possibly command the confidence of the country generally." This expression of opinion is not borne out by any facts placed before the Committee, and is contradicted directly by the evidence of those who have most experience of the present system. Everyone else, however hostile to its continuance, admits that, so far as the tribunal itself is concerned, it would be difficult to improve upon that afforded by a good Committee of either House; and some recommend the actual transference to the locality of a tribunal composed of the same individuals. It may also be pointed out that every decision is probably regarded with disfavour by one of the parties concerned; and as the one who is dissatisfied probably makes more of his grievance than the individual in whose favour the decision has been given says about the satisfaction with which he regards it, it is not to be wondered at that such feelings as here find expression should have grown up. It is also obvious that if the confidence of the country can only be obtained by a tribunal whose decisions are never reversed, all appeals must be abolished; and this objection applies even to every Court of Law but the ultimate Court of Final Appeal. The Lord Advocate himself gave no examples; but, as an instance of the loose and inaccurate statements which are made on this point, the Committee may refer to the evidence of Mr. J. Wilson, in which he mentions the action of a Committee in regard to a Bill for supplying the town of Falkirk with water, and says that the Bill now before Parliament is "practically the same as the Bill which came before the House of Lords a few years ago." Being questioned upon the subject, he is obliged to admit that the present Bill has nothing in common with the former one except that, like it, it proposes to supply the town of Falkirk with water, but that it does not even go to the same source to procure it. It may be pointed out that but for the accidental knowledge of a member of the Committee of this fact, the complaint made by Mr. Wilson would have been added to the list of grievances laid to the charge of the present system of Private Bill Legislation. The chief complaint of Mr. Beveridge, the Town Clerk of Dublin, appears to be directed against the reversal of the decisions of Committees by the House itself.

It is worthy of remark that no witness from England came before the Committee to complain of the cost of Private Bill Legislation by reason of the inquiries connected with it being conducted in London. With Scotland it was otherwise. Witnesses deputed by the Corporations of Edinburgh, Glasgow, and Aberdeen, and by the Convention of Royal Burghs, urged that much unnecessary expense was incurred which would be saved if these inquiries were delegated to an external tribunal, with powers to conduct them in the localities affected. But there was no uniformity of opinion among these witnesses as to whether the tribunal should sit in Edinburgh, or should hold its sittings in towns and places more nearly interested in the subject of inquiry.

In support of their views in regard to the expense of the existing tribunal, these witnesses produced statements of the costs incurred for a term of years by the corporations which they severally represented. But, so far from justifying the conclusion that the real burden of expense was chargeable upon the London tribunal, these statements showed that it was to be ascribed partly to the expense which must have been incurred before any tribunal, whether local or metropolitan, and in no inconsiderable degree to expenses incurred by the presence in London of deputations and witnesses not always essential to the transaction of the business.

This appears very conspicuously in the statement produced by Mr. Colston of the expenses of "The Edinburgh Extension and Sewerage Act, 1885." Upon the face of this Statement, £1477 12s. was alone applicable to London, while the total charges amounted to no less than £5826 12s. 6d. It is moreover to be observed that the £1477 12s. set down as applicable to London, included the large sum of £257 19s. 6d. paid to the Town Clerk and Deputy Town Clerk for their expenses there, and a further sum of £197 14s. 6d. as the expenses of a deputation to London of members of the Town Council. It is difficult to understand why the presence both of the Town Clerk and Deputy Town Clerk should have been required in London; and though these are in themselves small matters, they show the way in which the present system has been worked by those who are now most forward to complain of the expense of it. On the other hand, the expenses of London professional witnesses of high standing was only £246 15s., an amount obviously very far below what must have been paid to these gentlemen had they been required to go down to give their evidence in Edinburgh. Again, the Parliamentary Agent's professional charges are stated as amounting to only £350, whereas the Town Clerk, who acted as local agent in promoting the Bill, had the sum of £500 paid to him for professional services in London alone, and general business in connection with the Bill. Again, Mr. Berry, the witness for the Corporation of Aberdeen, being asked: "Are any measures taken by the Town Council of Aberdeen to get the allowances made to the deputation taxed in any way?" replied "We are generally pretty liberal in that way; we deal with them generously."

The statement produced to the Committee by Mr. Colquhoun on behalf of the Corporation of Glasgow, when it comes to be analysed, works out in much the same way. Mr. Colquhoun produced a statement showing that the Parliamentary expenses of Glasgow for 10 years from 1872 to 1882 amounted to £108,302; but that statement includes not only the expenses of the corporation as a corporation, but their expenses as owners and promoters of tramways and gas-works, and the supply of water to the city, and a considerable sum incurred in connection with deputations to London on Public Bills. In regard to the cost of promoting and opposing Bills in Parliament, an analysis was presented to the Committee, from which it appears that the Corporation of Glasgow paid for promoting and opposing Bills between 1870 and 1884 inclusive, the sum of £79,546 17s. 6d. Of this sum £10,699 2s. 11d. are stated to be the London solicitors' charges, while the local solicitors' charges amount to £20,821 3s. 9d., or nearly double; £3,383 is charged as deputation expenses (including officials), while the whole cost of witnesses, other than members of deputations, is only £1,803 2s. 3d. House fees about £5,257 19s. 6d.; London counsel's fees, £5,263 5s. 4d; engineers, architects

accountants, &c., £16,279 7s. 9d.; and printing, advertising, lithographing, and miscellaneous, £16,039 7s. 3d. It is obvious that the great bulk of these expenses is not specially due to the fact that Parliament had to deal with the questions at issue. They must have been incurred, whatever the tribunal, or wherever it sat; and if the number and magnitude of the questions dealt with be considered, it is by no means certain that these expenses will not compare favourably with the expenses which would be incurred before any tribunal, legal or other, in which issues equally important would have to be discussed.

The statement produced by Mr. Berry on behalf of the Corporation of Aberdeen, leads to similar conclusions. It is not subdivided so thoroughly as the Glasgow statement; but it shows that the Parliamentary expenses incurred by the Corporation *quâ* Corporation, and as Harbour Commissioners, between 1886 and 1887, were £44,347 7s. 9d., of which £16,483 2s. 7d. were spent in London, that sum covering House fees, fees to counsel, printing evidence, &c. This evidence has, however, to be corrected by the evidence of Sir Theodore Martin, from which it appears that the amounts set down as Parliamentary Solicitors' accounts are in some instances overstated, and in others understated, but with the result, upon the whole, that the London expenses were greatly less than the amount shown upon Mr. Berry's statement. To quote only one instance, Mr. Berry gave the amount of the Parliamentary Solicitor's account, in connection with obtaining the Aberdeen Municipality Extension Act of 1871, at £4664, out of a total expenditure of £8031. Upon inquiry and correction it was discovered that the total account furnished by the Parliamentary Agent to the Corporation in connection with that Bill amounted to £2919, of which £1007 was for professional charges, the balance being made up out of outlays of various kinds, and bear a relatively small proportion to the sums set down for deputations, engineering, local agents, and miscellaneous expenses, the greater part of which, with the exception of those for deputations, must obviously have been incurred before any tribunal, with the further certainty that if skilled witnesses from London were called in before a local tribunal, the expenses of the proceedings would be seriously increased.

There is almost a general consensus of opinion that two hearings are absolutely necessary. In the first hearing the parties are more or less in doubt as to the case of their opponents, and evidence for which they are not fully prepared, is often placed before the Committee. It is objected that when promoters are defeated at the first hearing they have no appeal; but the Committee are of opinion that this hardship is superficial, for the burden of proof is clearly upon those who come to ask Parliament for special privileges for which they require a Private Act. Moreover, it is open to them in the next session to bring in a new Bill, in which they can meet the objections raised, and which is heard by a fresh Committee. This leads to the remark that promoters, if defeated upon the first occasion, would be much less favourably situated if they brought back their Bills a second time to a permanent tribunal, and that such a tribunal would, by making precedents, gradually acquire fixed habits and preferences, and would not readily adapt itself to the changing views entertained by the public and Parliament. One of the chief difficulties which beset those who recommend the transference of the Committee work now done by the two Houses to an outside tribunal, is the question whether that tribunal is or is not to be required to give reasons for its decisions. If reasons are not to be given, it is difficult to see how Parliament is to exercise any effective control in the absence of individuals familiar with the lines upon which the work has been transacted; if on the other hand, reasons are given, the tribunal will very shortly find itself seriously hampered by precedents of its own creation, which are too nearly akin to the case under discussion to be disregarded, and the disregard of which would not be easy to explain to Parliament, but which might not be so exactly the same as to altogether rule the question at issue.

One witness suggested that reasons should not be given under ordinary circumstances, but only when an appeal was taken to Parliament. It is obvious that the enactment of such a condition would be the surest way of multiplying appeals to Parliament, if only to satisfy promoters or opponents as to the consideration which had guided the tribunal in arriving at its decision.

Nearly akin to this, is the question how it would be likely that a permanent tribunal would deal with new questions of policy which from time to time force themselves on the attention of Parliament. Such questions as that of the payment of interest out of capital during the process of construction of works, and the financial problems of which the set of clauses known as the auction clauses are examples of questions in which difficulty would be almost sure to arise. On this point the whole of Mr. Courtney's answer to Question 4311 is well worthy of serious attention.

There is also a general agreement that Parliament must in every case retain the control of Private Bill Legislation. The majority of the witnesses who object to the present system admit this with perfect frankness. The most common suggestion is that this should be effected by the Bills going through their stages in Parliament as at present, except that at the Committee stage they should be referred to a permanent Commission; and that it should be competent to any member to move either House to order a re-hearing, or to reject the Bill on second or third reading. Against this the Committee would quote Mr. Courtney, who says, "Any scheme which contemplated that Bills should be read a second time and then sent for examination to some outside tribunal, in my opinion, is subject to such objections that they are scarcely worth serious consideration." The Lord Advocate, on the other hand, says, "The re-hearing should not be allowed unless there was a *prima facie* case made out for it by argument in the House itself." It is certain that the strength of the case would be gauged by the number of members who could be got to support the demand for a re-hearing; and the Committee are of opinion that any plan which requires that the attention of Parliament should be called to a Private Bill by motion in the House itself, would bring back all those evils which induced the reference of Private Bills to Select Committees, and would cause an intolerable interference with the time of Parliament. Debates upon Private Bills would almost certainly take place with greater frequency than they do at the present time; and it is not improbable that the time gained by abolishing Committees would be more than lost by debates taking place in the whole House.

Various schemes for the establishment of an outside tribunal have been suggested to the Committee, and whilst recognising their ingenuity, the Committee would point out that they differ essentially from one another, both in the form of the tribunal itself, and more especially in the mode in which the control of Parliament is proposed to be retained.

It appears to the Committee that the remedy of creating a new tribunal far outstretches the evil complained of.

It is not suggested that the more important Railway Bills, or other Bills dealing with engineering works of the first magnitude, could be dealt with better locally than at Westminster. The evidence proves that important companies, even the Scottish and Irish, prefer to transact their business in London. One Scottish witness told the Committee that if an Aberdeen Bill could not be dealt with in Aberdeen, he would prefer that

it should be dealt with in London rather than in Edinburgh. Reference may also be made to the action of the town of Dundee in regard to its arbitration, as to the value of the gas-works when purchased by the Corporation. The witness who appeared on behalf of the Corporation to protest against inquiries on purely local matters being in London was actually Provost of Dundee at the time when that arbitration was held. It might be thought that no subject could be more properly matter for local inquiry than that. While it was in the power of the Corporation to have held that inquiry at Dundee, they voluntarily went to London, in preference to taking the course which they now recommend should be compulsorily imposed upon themselves and all other parties to Private Bills.

The Committee are of opinion that it is by no means certain that any saving of expense would be effected by local inquiries, except in the case of comparatively unimportant Bills, and of Bills which only affect a very narrow locality. By an extension of the Provisional Order system many of these Bills could be inquired into on the spot by an inspector from a Government Department; and in more important cases these Departments might be empowered to conduct an inquiry by a small Commission appointed for the purpose, which would carry greater weight than any single official.

Some relief from the burden imposed upon the time of members of Parliament by the present system of Private Bill Legislation would certainly be obtained by an extension of the Provisional Order system in that class of cases to which it is more especially applicable, such for example as Municipal and Improvement Bills—schemes for short tramways, and undertakings for the supply of gas and water.

The first cost to promoters who proceed under the Provisional Order system is much smaller than by Private Bill. Everybody interested might be heard at the local inquiry without the question of *locus standi* arising, and some advantage in the way of getting rid of opposition is certainly gained by the fact that opponents can see the Draft Provisional Order before it is submitted to Parliament. The total number of Provisional Orders which have been confirmed under the Local Government Board alone between 1874 and 1887 is 1,169; the number refused confirmation is 11; and 11 more were withdrawn by the Board for various reasons. The number of confirmation Bills required was 195.

Except in the case of opposition in Parliament, promoters are put to no trouble or expense in obtaining the confirmation of their Orders. They have not to be present to prove compliance with Standing Orders, and even if there is opposition the promoters have to defend their own Order only at the Committee stages.

The time which members of either house have to devote to Provisional Orders is much smaller in proportion to Private Bills because the oppositions are so few.

Amongst the disadvantages under which the present system of Provisional Orders labours, may be mentioned, that in opposed Orders there may be three inquiries instead of two, as in the case of a Private Bill; and, consequently, the expense to the parties may be increased; and in some cases it is complained that there is not sufficient elasticity in the provisions of those Acts under which Provisional Orders are issued to enable a scheme which might be arranged by Provisional Order to be made complete in all its details.

The Committee are of opinion that though one appeal is necessary, a double appeal in the case of an opposed Provisional Order to both Houses of Parliament is unnecessary; and they suggest that, although there are some objections to frequent recourse being had to a Joint Committee of both Houses, either this course should be adopted in cases in which a local inquiry has been held, or by amendment of the Standing Orders of both Houses of Parliament, no petitioner shall be allowed to be heard a second time.

The Committee believe that almost everything complained of could be remedied by improvements in the present system. They hesitate, therefore, to recommend a new tribunal (of which no one can foretell how it will work) to take the place of Committees of Parliament, which they believe in the main command the confidence of the business world and of the country generally. Many of the witnesses who have demanded the substitution of a permanent tribunal for Committees of Parliament, have frankly stated that they had no experience of railway business, and the Committee are decidedly of opinion that such a change would be unwelcome to those responsible for the conduct of these important undertakings, and little less than disastrous, if, as the Lord Advocate observed in regard to a subsidiary matter, it is expected to be that several years must pass before the new tribunal can settle down to a fixed regime. "The question is what it will be five years hence; in starting any new thing you will have troubles; you cannot put up a building all in a moment."

Considering that there has been no single complaint from anyone familiar with railway matters, the Committee cannot take the responsibility of recommending that these vast interests should be made the subject of a doubtful experiment.

Conclusion.

Upon the whole, and subject to the proviso mentioned in the earlier part of the report, the Committee have come to the conclusion that the main features of the present system of legislation by means of Private Bills and Provisional Orders should be maintained; but at the same time it is capable of amendment and reform. What they would propose in this respect may be briefly summarised as follows:

- (a) The House fees might be reduced by nearly one-half, and yet pay the expenses properly chargeable to them.
- (b) The costs of public bodies, such as corporations, harbour trusts, and public companies, should not only be taxed by the Taxing Officers of the House, but be audited by a public official.
- (c) The length and expense of the notices required by the Standing Orders could be much diminished.
- (d) Possibly some further powers should be given for the awarding of expenses in cases of vexatious or unnecessary oppositions.
- (e) There is room for assimilating and harmonizing the provisions of the Standing Orders of the two Houses; and it would tend to economy and efficiency if questions of non-compliance with the Standing Orders were either remitted to a Joint Committee, or if the decision of the Committee of the House in which the Bill originates were to be held as binding upon the other.
- (f) By judicious alterations in the rules for the reference of Private Bills to the Examiners, it is probable that Committees could begin to sit at least somewhat earlier in the session than is the case at present.
- (g) It would be desirable that more consultation should take place between the officials of the two Houses, so as to secure that too many Committees are not appointed at the same time.
- (h) Some economy of the time of the House of Commons could be effected by originating a still larger number of Bills in the House of Lords.
- (i) It should also be clearly established that the discussion of clauses in the First House should not necessarily be held to disqualify opponents from opposing the preamble in the Second House. If it were not for the fear of this technical objection being taken, a practice which seems to have grown up without any definite authority, it is probable that an even

larger number of opposed Bills would be satisfactorily settled in the First House.

(j) The practice of "starring" Bills sent to Select Committees in the Commons should be extended to the House of Lords.

(k) The system of Provisional Orders might with advantage be extended, and provision made for special local inquiry, in cases of purely local concern, to be held by a stronger tribunal than is the case at the present time.

(l) Provision should be made that opposed Provisional Orders should only be heard before one tribunal in Parliament; that tribunal to be either a Joint Committee or a Committee of one of the two Houses.

(m) It is also worth consideration whether a power should not be given to the Chairman of Committees in either House to report to the House that a matter proposed to be dealt with by Private Bill is rather a matter for local inquiry; and if that report were adopted by the House in which the Bill is arranged to originate, it might be remitted to the Government Department concerned with the class of cases to which it belongs, and, thereafter, the procedure in regard to it might be on the lines of that recommended for Provisional Orders.

GAS CONSUMERS AND THEIR CONTRACTS.

Commenting on the case which recently came before Mr. Biron, Q.C., at the Westminster Police Court, as reported in the *JOURNAL* for Aug. 21 (p. 340), the *Law Journal* says: "An important branch of domestic law in small households is represented by the gas account, although the decision of questions is generally simplified in far too one-sided a way by the power given to companies to cut off the supply. When a person other than the householder has agreed to pay for the gas, the solution of difficulties is not so easy. No pressure can be brought to bear on him by cutting off the gas; and the question is, Who is liable to pay the bill? The question came before Mr. Biron, Q.C., at the Westminster Police Court, and seems to have been decided somewhat too summarily. By section 13 of the Gas-Works Clauses Act, 1847 (10 Vict., cap. 5), the undertakers may, among other things, enter into a contract with any person for supplying with gas any private building; and by section 16 it is provided that if any person supplied with gas by virtue of this or the Special Act neglect to pay the rent due for the same to the undertakers, the undertakers may stop the gas from entering the premises of such person, and recover the rent due from such person summarily if under £20. In the case before Mr. Biron, the house in question had been occupied by Mr. Darbyshire, who had entered into a written agreement to pay for the gas, to be terminated by written notice. Two years ago, Mr. Darbyshire left the premises, and gave verbal notice at the Company's office that the supply should be discontinued. The Company sent a man to disconnect the supply; but as a new tenant was coming in, he refrained, and left the meter. The new tenant paid for the gas he consumed except three quarters' rent, which when he left the house, was unpaid, and for which the previous tenant was sued. The first question was whether the contract between the Company and the old tenant was not rescinded by his notice, accepted by the Company, by their sending a man to cut off the supply, and by taking rent from the new tenant. The Act, it is to be observed, does not require a written contract; so that the contract may be rescinded verbally and by mutual consent. This question appeared to require more consideration; but there was a preliminary question. The summary remedy which the Gaslight and Coke Company were adopting was by the Act applicable only as against 'the persons supplied with gas;' and that this person must be the person actually supplied, and on the premises, seems clear from the fact that only one person is contemplated as liable by the section—that is, the person whose gas may be cut off. This view is confirmed by section 39 of the Act of 1871, which relieves the incoming tenant from liability for the arrears of his predecessor, and by the use of the word 'rent'—that is, payment in respect of occupation."

ELECTRIC LIGHTING OF THE PUBLIC STREETS AT BARNET.—The streets of Barnet were lighted by electricity on Saturday night; and the novelty excited much interest. There are 71 lamps, each placed on a strong ornamental iron post, 12 feet in height, and fitted with a reflector. The dynamo and other machinery are at the Hadley end of High Barnet; and the Company are said to purpose laying down plant sufficient for supplying from 1000 to 5000 lamps for use in private houses and places of worship.

THE PUBLIC LIGHTING OF ERITH.—The people of Erith are already beginning to understand a little of the discomforts which are associated with such a retrogressive system as that of "illuminating" their public streets by means of oil-lamps; and the Chairman of the Local Board has already complained that Messrs. Defries are endeavouring to light the district with rather a short-handed staff. Complaints are made that some of the lamps are not lighted; and in consequence of this the Local Board have called upon Messrs. Defries to pay a fine of 2s. 6d. (to which they are liable under their contract) for each night in respect of each lamp which may not be lighted. Messrs. Defries have pointed out that, as their charge for each lamp is under a 1s. per lamp per week, a fine of 2d. per lamp would be quite sufficient; but finding that the Erith Board are not disposed to look at it in this light (but intend to have their "pound of flesh" for each default), an excuse is now formulated to the effect that the lamps have been properly lighted but have been extinguished by some maliciously disposed persons. This excuse is likely to be unavailing, for the Board consider that if the lamps are not lighted during the time agreed upon, the defect rests with Messrs. Defries.

RICHMOND (SURREY) GAS COMPANY.—The half-yearly meeting of this Company was held last Thursday—Mr. George Noyce in the chair. The report of the Directors announced that, in consequence of the increased efficiency in working, and the general improvement of the works referred to in their last report, they were enabled to make a further reduction of 2d. per 1000 cubic feet in the price of gas. They recommended maximum dividends on all the capital. The Chairman proposed that the report and statement of accounts should be adopted; both being very satisfactory. The capital account, he said, showed a slight increase of expenditure; but they obtained a very good premium for their stock. In the repairs and maintenance account there was a slight increase also, accounted for by the renewal of purifiers. The loss on bad debts was so small that it did not exceed 2s. 4d. per cent. After paying full dividends, the profit and loss account showed a good balance to be carried forward to the next account. In about twelve months the Company had reduced the price of gas to the extent of 8d. per 1000 cubic feet; and were now selling at 2s. 10d.; and as long as they were able to do this, he thought they would be able to hold their own against the electric light. The Company altogether were in an excellent position; and he congratulated the shareholders on the success that had been achieved. Mr. Clarke seconded the proposition, and it was carried unanimously. The Chairman then proposed that dividends in accordance with the report be declared; and this was agreed to. Votes of thanks to the Directors, the Engineer and Manager (Mr. T. May), the Secretary (Mr. E. B. Blott), and the other officers concluded the meeting.

CRYSTAL PALACE DISTRICT GAS COMPANY.

HALF-YEARLY REPORT AND ACCOUNTS.

In the course of their report to be submitted at the half-yearly meeting of shareholders on the 14th inst., the Directors of this Company state that the general working of the concern during the half year to June 30 last has been satisfactory. The price of coal has been less, and that of coke has improved; but owing to the low value of tar, about two-thirds of the total make has been used for fuel. This, it is pointed out, makes the tar sales appear low; but the increased quantity of coke made for sale brings up the total for residual products to £14,247, or £2664 more than in the corresponding period of last year. The increase of private gas-rental over the June half of 1887 is £1623; this being partly accounted for by an augmented consumption of gas, in consequence of the cold and dark weather during the six months. The Directors express regret in having to announce that, owing to continued illness, Mr. H. Palfrey Stephenson declined to be nominated as Chairman. The Directors have, therefore, elected Mr. Frederic Lane Linging to that position; and Mr. Stephenson to that of Deputy-Chairman. The Directors recommend the declaration of a dividend for the half year at the following rates per annum:—6 per cent. on the preference stock; 7 per cent. on the ordinary 7 per cent. stock; 10 per cent. on the ordinary 10 per cent. stock; and 7 per cent. on the new ordinary 7 per cent. shares. This will absorb a sum of £13,625 17s. 4d., less £369 for income-tax. Turning to the accounts, we find that £45,542 was received for gas from private consumers, and £3946 for gas used in the public lamps; making the total gas-rental £49,488. Meter and stove rental amounted to £974; and residual products (as already mentioned) produced £14,247. These various items, with a sum of £57 for "rents," together make the total receipts £64,767. The total expenditure amounted to £48,122, more than half of which (£26,242) was spent in coals, including all expenses. The balance of £16,645 is carried to the profit and loss account; making the net profit to be carried forward to the next accounts (subject to the June half-year's dividends) £21,417. The quantity of coal and cannel carbonized in the half year was 37,697 tons, from which 365,719,000 cubic feet of gas were produced. Of this amount 354,340,400 cubic feet were sold.

DERBY GASLIGHT COMPANY.

The Half-Yearly Meeting of this Company was held last Wednesday—Mr. G. GASCOYNE in the chair.

The notice calling the meeting having been read,

The CHAIRMAN moved the adoption of the balance-sheet. In doing so, he referred to the fact that during the whole of the 70 years the Company had been in existence, their maximum dividend had never yet disappointed them, and had never yet been withheld. Their total receipts for the half year ending June 30 from all sources had been £27,835, and the total expenditure £16,627; the net profit available for dividends being £10,898. The amount of dividends now due and payable was £8659; and the total amount of interest due to the bondholders, £349—thus leaving a surplus of £2239 5s. The surplus in the corresponding period of 1887 had been only £1343. The gains by which the result arose were in nine items—gas and meter rents, £130; residual products taken in the bulk, £404; carbonizing, £203 10s.; fewer bad debts, £94; rates and taxes, £121 19s.; maintenance of works, plant, &c., £96; extra materials sold, £24; maintenance and renewal of mains, &c., £36; and discount on various bills, £59. The total gains amounted to £1269 12s. 7d. The losses were occasioned by the following five items:—Coals, £127 7s.; purifying materials and labour, £94; salaries of the whole of the staff at both establishments, £9 16s.; printing, &c., £91 6s.; and additional meters, £26 16s. The total loss was therefore £267 13s; leaving a balance of "gains" of £902. The quantity of gas manufactured and sold had been diminished by the loss of several mills, which just latterly had unfortunately been shut up. Tar, he might say, had greatly increased, and was still going up in value. Sulphate had risen a little; but coke, he feared, was irredeemable. Referring to the condition of the works, he said that several of the gas-tanks required alteration; and the purifying plant and apparatus was also deficient. Profit had been made on their stock, which fetched £215 on the 10 per cent., and £150 on the 7 per cent.; and this he considered a very satisfactory result. Their good fortune of to-day, however, was not likely always to last to an equal extent; and considering the expenditure they had before them, they must not let their expectations be formed too high. Concluding his remarks, he said the balance-sheet showed that, whilst their gas remained as cheap as any in the United Kingdom, they would be able, after paying substantial dividends and interest on the bonds, to carry over £2249 to the next account; and the reserve fund, compared with what it was in the corresponding period of 1887, had been increased from £14,160 to £18,057.

Mr. RICHARDSON seconded the motion, which was carried.

Dividends were next declared for the half year at the rates of 10 and 7 per cent. per annum.

Votes of thanks were next passed to the Chairman and Directors, and to the Engineers (Messrs. T. and C. Hawksley).

Mr. T. HAWKLEY, responding to the vote, mentioned that he had been Engineer of the Company for about 50 years. He regarded the Company as one of the most secure gas properties in the kingdom. Mr. Goschen's new law relative to the dividends of gas and water companies had certainly conferred a benefit on the Derby Gas Company, whatever else it might have done to other people.

The proceedings then terminated.

EASTBOURNE GAS COMPANY.

The Half-Yearly Meeting of this Company was held on Monday last week—Dr. JEFFERY in the chair.

The notice convening the meeting having been read,

The CHAIRMAN said that it gave him much satisfaction to move the adoption of the report and balance-sheet (see *ante*, p. 341). In the first place, he was satisfied because the Directors had been enabled to offer a good round dividend to the shareholders. They had embarked a considerable amount of money (over £90,000) in what he considered a speculative business, which business, he maintained, should have a high percentage of interest. He was satisfied also because they had been able to make the public participants with them in their success. They proposed to lower the price of gas both to the Corporation and to private consumers. The balance-sheet showed that the affairs of the Company were in a thoroughly healthy state. The balance of revenue was £4556 12s. 8d. They deducted therefrom £18 17s. 6d. for interest; and there remained £4537 15s. 2d., which, added to £2403 18s. 6d. brought forward, gave £6941 13s. 5d. available for dividend. The Directors recommended a dividend at the rate of 12½ per cent. per annum on the £20,000 original capital of the Company, and also upon the £12,490 of "C" shares, and at the rate of 9½ per cent. on the £55,000 paid-up capital of "B" shares. This would absorb a sum of £4517 7s. 6d. and leave a balance of £2424 5s. 11d. to be carried forward. The capital of the Company had been slightly increased since they met last time; but the sale of gas had been a little higher than the rate of interest on the capital. The price of coals was more than 6 per

cent. higher than last year, and this was due to the increased purchase of cannel coal; for the Directors were anxious, not only to lower the price of gas, but to keep the illuminating power at a high standard. They had sold to private consumers 59,373,900 cubic feet of gas, and to the Corporation 8,123,300 feet of gas, at the cost of £11,991 14s. 4d. The leakage had been considerably less than last year. Taken altogether, the residual products showed an increase in price. In regard to the price of gas, he had to propose to the shareholders that it should be lowered 2d. all round—that was to say, that it should be reduced from 3s. 4d. to 3s. 2d. per 1000 cubic feet to the Corporation, and from 3s. 7d. to 3s. 5d. to private consumers. The loss to the Company by this reduction would be something like £1200. The Directors regretted to see that while they had recently given the Corporation of Eastbourne a reduction in the price of gas of 2d., and were now giving them a second reduction of 2d., the Corporation, instead of giving any relief to the long-suffering ratepayer, were putting the money received from the pockets of the Gas Company into those of the Electric Light Company. The latter had been providing lamps on the Parade for £25 each per year; and they now wanted £35. The Corporation, he understood were going to offer them £30 per year. The Gas Company had taken off 2d. per 1000 cubic feet; and the Electric Light Company wanted to put on £10 per lamp. The Chairman then quoted from a circular by Messrs. Long, Wharton, and Down, who, with the Thomson-Houston system of electric lighting, supplied 1200-candle power lamps all night in Taunton and Waterford for £22 per annum. Surely, he observed, if these gentlemen could supply 1200-candle power electric lights all night at a cost of £22 per annum, the Eastbourne Electric Light Company should be able to do it at £25. In conclusion, he referred to the services of the officers—remarking that they were indebted to their Consulting Engineer (Mr. H. E. Jones, M. Inst. C.E.) for much valuable advice; and as to their Manager (Mr. J. Hammond), as far as his connection with him went, he could not speak in too high terms of him.

Mr. T. BENNETT seconded the motion, which was adopted without any discussion.

The retiring Directors and Auditor having been re-elected, It was agreed to increase the Directors' remuneration from £400 to £500 a year.

The usual complimentary votes of thanks having been accorded, the proceedings terminated.

HARTLEPOOL GAS AND WATER COMPANY.

The Annual Meeting of this Company was held last Wednesday—Mr. W. H. FISHER, J.P., in the chair.

The SECRETARY (Mr. T. Trehwitt) read the notice convening the meeting; and it was agreed to take as read the Directors' report for the year ending June 30 last, a summary of which was given in the JOURNAL last week, p. 390.

The CHAIRMAN said he thought he might fairly congratulate the proprietors upon the improved financial position of the Company. Last year they paid a dividend of 5½ per cent.; and to do this, they had to reduce the floating balance by £406. This year they had earned the whole of the dividend that the Directors recommended—that was 3 per cent. more than last year, which on their capital meant £1300. In addition, they were enabled to carry £292 to the surplus balance, which they usually kept in hand. Having alluded to the improvement in business generally in the Company's district, he went on to say that it was an agreeable fact that they had made 192 million cubic feet of gas in the year, or 22 million in excess of last year. As to the cooking-stoves, &c., this department was likewise very satisfactory. Last year they let out 124 stoves; this year 201—being an increase of 77. This increase necessarily required additional accommodation; and it would at once be seen that the time was not far distant when the Directors would have to look forward to extending the ground they now occupied. They were at present bound within the four corners of an Act of Parliament, and nearly the whole of the space comprised therein was covered; and the Board had now under consideration the selection of further space to be submitted for approval when necessity for it arose. As to the water undertaking, this had also been satisfactory; there being an increase in the quantity of water sold of 38 million gallons; and a consequent increase of revenue of £727 odd. The Chairman then made a feeling allusion to the death of Mr. E. Turnbull, who, for the long period of 45 years, had acted as Solicitor to the Company. He concluded his remarks by moving the adoption of the report, and the payment of a dividend at the rate of 6 per cent. per annum, less income-tax.

Mr. BAKEWELL seconded the motion, which was unanimously carried. The CHAIRMAN, replying to a question, stated that the cost of their new sulphate of ammonia works would be roughly £1500.

The retiring Directors were next re-elected; and Mr. Waddington was appointed to succeed Mr. C. Robson, who retired from the Board on account of failing health.

A vote of thanks to the Chairman and Directors concluded the business of the meeting.

WOKING WATER AND GAS COMPANY.

The Ordinary General Meeting of this Company was held last Tuesday, at the Offices, 5 and 6, Great Winchester Street, E.C.—Lieut.-Col. E. GALT, J.P., in the chair.

The SECRETARY (Mr. W. G. Gribbon) having read the notice convening the meeting, it was agreed to take the Directors' report as read. This showed that the total expenditure to date on capital account had been £57,907. The revenue for the half year amounted to £1641; and the expenses on revenue account, including depreciation, to £728 7s. 6d. The Directors have decided to extend their mains to Ripley, at an estimated cost of £800. They state that there is urgent necessity for pure drinking water in that district; a large number of the surface wells from which the inhabitants now obtain their supply having already been condemned. A revenue of £80 to £100, it is said, may be anticipated from the extension.

The CHAIRMAN, in moving the adoption of the report, said the revenue had not shown the elasticity which might have been looked for by some of the shareholders during the past half year. But this was only because by Act of Parliament Guildford had taken over the supply of some of the houses in that neighbourhood, and their own Company had lost a certain sum of money; but in many ways they had gained advantages. The revenue was, however, quite sufficient to pay a dividend of 3½ per cent. on the capital expended, and to carry over a small balance to the next accounts. Referring to the new well at East Horsley, he mentioned that they had sent out adits in two or three directions in order to open the crevices of the chalk and to intercept the water as it poured through. This well was most satisfactory up to the present time; and the Engineer had reported that they were receiving from it alone 50,000 gallons of water daily, which was almost running to waste because it was not wanted. With respect to the purchase of the Act for supplying Farnborough, the North Camp, Frimley, and York Town, the Directors did not feel justified in expending from £10,000 to £20,000 in an enterprise which might not, without more guarantee or some assurance of support, have yielded a

sufficient revenue to pay a dividend. They were now waiting to hear from the Farnham Rural Sanitary Authority whether they were prepared to offer any guarantee to give them 5 per cent. on the outlay of capital. He concluded by moving the adoption of the report, and the declaration of a dividend of 3½ per cent.

Mr. R. HESKETH JONES seconded the motion, which was agreed to. On the motion of Sir H. E. CARTWRIGHT, seconded by Mr. QUILL, a vote of thanks was passed to the Chairman and Directors. The CHAIRMAN having briefly replied, the proceedings terminated.

THE SUPPLY OF OIL GAS AT COLINSBURGH.

It will be in the recollection of our readers that about this time last year some correspondence appeared in the Scotch press (extracts from which were re-published in the JOURNAL) relative to the question of manufacturing gas from oil. The Secretary of the Colinsburgh Gas Company (Mr. C. G. Dawson), who took a prominent part in the controversy, has lately communicated to one of the Edinburgh newspapers the results of a year's working of his Company, as recently submitted to the shareholders. Broadly stated, the results are these: The price of gas, as compared with the coal gas, has been reduced from 7s. 11d. per 1000 cubic feet to 5s.; and instead of the year's operations resulting—as the last year of the manufacture of coal gas did—in a loss, sufficient profit was earned to have paid a dividend of 8 per cent. on the capital of the Company. The Directors, however, only declared a dividend of 5 per cent. These very satisfactory results, he states, have been produced notwithstanding the enormous waste of oil and furnace coal which took place during the first quarter of the year, but which, under better management, has now been checked. Mr. Dawson then gives the statistics (which he says are carefully registered daily) of the working for a recent quarter:—

Gas made and put into holder	Cubic feet.
Gas consumed per meter	112,585
	95,400
	17,185
Deduct for street lamps, free	1,500
	15,685
Leakage	15,685
Or 14 per cent. of the total make.	
Oil made into gas	1,206 galls.
Gas yielded as above	112,585 cub. ft.
Or, per gallon	93½ "
Furnace coal used	12 tons.
Equal to 1 ton for	9,382 cub. ft.

Reverting to last year's correspondence, he remarks that an attempt was made to frighten the consumers by stating that the gas would be more costly; that it was smoky and impure; and that it would quickly choke the pipes with tar, &c. He thinks that the above figures effectually lay the spectre of "condensation;" and those of "impurity," "smokiness," &c., have, he asserts, proved equally groundless. Last year he predicted that the introduction of paraffin gas would prove remunerative to the shareholders and beneficial to the consumers; and he now ventures to say that the prophecy has been amply fulfilled.

Alluding to Mr. Dawson's statement that "the price of gas, as compared with the coal gas, has been reduced from 7s. 11d. to 5s. per 1000," a correspondent writes as follows in last Tuesday's Scotsman, under the *nom de plume* of "Colinsburgh":—"Sometimes the English language is used to conceal our meaning; it is clearly so (inadvertently, of course) in this case. Few, if not all, of your readers can take Mr. Dawson's statement to have any other meaning than this—that formerly in Colinsburgh consumers of coal gas paid 7s. 11d., and that now they only pay 5s. This is not so. It is true we formerly paid 7s. 11d., but last quarter we paid 12s. 6d. for this oil gas; and I am told this sum is arrived at by some wonder-working calculation of Mr. Dawson's, based on the idea that oil gas gives two or three times more light than coal gas, and thus we are called upon to pay 12s. 6d. per 1000 feet. As to its illuminating power, and its being free from smoke, all I know is, that if you use a small burner to save you from its smoke, you are not afforded sufficient light; and if you use a large burner, you must be content to live under blackened ceilings."

Subsequent correspondence has appeared, controverting the statement in the last sentence of "Colinsburgh's" letter. In one communication, signed by "The Manager of the Company," the writer remarks "that any gas would smoke if a burner too large for the pressure were used. At the same time, I assert with confidence that our gas is less smoky than most ordinary coal gas. I had special orders from the Directors to ascertain if there were any complaints in regard to the quality of the gas; and I am glad to say most all the consumers to whom I have spoken now express themselves satisfied with its quality."

Replying to "Colinsburgh's" letter on the 28th ult., Mr. Dawson states that the language he used was "plain and unvarnished." He said in his first letter, that the price of the oil gas "as compared with the coal gas," had been reduced from 7s. 11d. to 5s. per 1000 cubic feet; and further on gives an explanation of his meaning. To quote his own words:—"Having found, by very careful experiment and observation, that the paraffin gas was of such high illuminating power that 100 feet of it was equal in value to about 250 feet of coal gas, my Directors, in order to provide their consumers with an easy and accurate method of comparing the price of their new gas with what they paid for the coal gas they formerly used, and with the coal gas used in the neighbouring towns, charged and now charge the gas as if it were coal gas—converting it in the ratio above mentioned. It matters little, however, how it is charged; the point is, how far the price has been reduced. Now, take 'Colinsburgh's' own method, as he cannot or will not understand ours. By his system we were originally supplying the oil gas at two and a half times 7s. 11d. per 1000 feet, or 19s. 9½d.; now we are able to give it at two and a half times 5s., or 12s. 6d.—reduction in price of oil gas per 1000 feet, 7s. 3½d. The enlarged figures may possibly show the reduction better than the ones I supplied; but for purposes of comparison with coal gas, of course, they are useless, as they show the cost of a gas of over 60-candle power, while ordinary coal gas averages from 20 to 22 candles. For comparison, the figures I gave are accurate and reliable." In regard to smoke from the oil gas, Mr. Dawson says that it is the first time he has heard a complaint since their present Manager was appointed in October last; and he unhesitatingly affirms that the gas is very much freer from smoke and impurity, although it passes through no process of purification, than coal gas, which does. In a postscript to his letter he says: "I understand meters are now being made in Edinburgh to suit a certain kind of oil gas. These register 400 for every 100 feet passing through the meter, which is a much higher ratio than ours, of 250 to 100 feet."

SEVENOAKS WATER COMPANY.—This Company held their half-yearly meeting last Saturday week, when the balance of the profit and loss account submitted (£1133), allowed of the payment of dividends of 8 per cent. per annum on the consolidated stock, and £5 12s. per cent. per annum on the share capital—leaving a balance of £182, which it was agreed should go to form a depreciation fund.

SALFORD CORPORATION GAS SUPPLY.

ANNUAL REPORT OF THE GAS COMMITTEE.

In their report for the year ending March 25 last, the Gas Committee of the Salford Corporation state that the increase in the receipts from the sale of gas has been £1788; and there has also been an increase from the sale of residuals of £2624. These, together with the reductions in the cost of manufacture, distribution, and management, have yielded an additional profit of £5459 10s. 6d. compared with the previous year. There was a saving of nearly £1000 in wages for carbonization, chiefly, it is stated, in consequence of the adoption of stoking machinery at the Regent Road station. Careful attention has been given to maintain the works and plant in a thorough state of efficiency; and an extra expenditure of £500 was consequently incurred for repairs during the year. The provision of £1000 as an estimate for bad debts disappears from the accounts; and the actual amount sustained (£1148 17s. 5d.) is stated. This, however, includes arrears brought forward from previous years. The gross profit of the past year is £61,525 2s. 9d., appropriated as follows:—To interest to depositors and bank interest, £136 2s. 9d.; redemption fund, being principal and interest, £18,233 2s. 5d.; contribution to borough redemption fund, £2089 16s.; annuity to Salford district, £2530; depreciation fund, works and plant, at 3 per cent., £14,575 4s.; depreciation fund, hired meters, at 8 per cent., £3066 6s. The remainder constitutes the divisible profit. It amounts to the sum of £20,894 11s. 7d., which has been apportioned as follows, proportionately to the consumption of gas in each district:—To the Salford district, £11,673 1s. 7d.; Pendleton, £5005 0s. 6d.; Broughton, £4216 9s. 6d. The Committee remark that the new Engineer, Mr. Shoubridge, was appointed on Feb. 20; and they expect under his management that considerable further saving will be effected. They have to some extent anticipated this by reducing the price of gas 3d. per 1000 cubic feet in the borough, and 5d. per 1000 cubic feet in the out-districts.

ROTHERHAM CORPORATION GAS SUPPLY.

REPORT BY MR. THOMAS NEWBIGGING, C.E., ON THE WORKS.

In compliance with instructions received from the Rotherham Corporation, Mr. T. Newbigging, C.E., of Manchester, has recently presented to the members of the Gas Committee a lengthy report on the result of his inspection of the gas-works under their control. In this he states that the works are favourably situated as regards level for supplying the district; but they are in the midst of a considerable population, and owing to their distance from railway and canal, all the raw material of manufacture, and a large proportion of the residual products, have to be carted to and from them. The cost of this haulage, and the nuisance arising from it, are not inconsiderable. The difference in the money value between the site, and one in close proximity to a railway, with a siding connected with the works, he sets down at 2d. per 1000 cubic feet of gas sold, representing £1050 per annum, reckoned on the present gas consumption; and this sum capitalized at 4 per cent., or 25 years' purchase, amounts to £26,250. To remove the manufacturing portion of the works from the existing site to one contiguous to the railway (assuming there is such a site to be found in the district), would entail a sacrifice of two-thirds of the above-named amount of capital. It will be for the Corporation to decide the best course to adopt; but, he adds, there will come a time, when the gas consumption grows, when the Corporation will have no choice but to determine on a new site. In the meantime, it is possible to utilize the existing site so as to double the present gas production upon it, by the erection of a new retort-house in the position occupied by the large coal-shed, and by, at a later period, remodelling the present retort-house and coal-stores. In carrying out the proposed plan, the small 60-feet holder would have to be dispensed with. To put off the erection of the new retort-house, which is absolutely required, will entail an increased cost of working, and jeopardize the gas supply in mid-winter. The whole of the retorts were in action during the last heavy lighting season. He does not approve of the settings of nine retorts, of which the Corporation are just now erecting two double benches; and describes the charging of the two upper retorts, owing to the great height above the floor-line, from an elevated stage moveable along the retort-house floor, as a cumbersome expedient, which will be found costly if extended throughout the length of the building. He considers it is a mistake to expend money in this direction; but does not blame the Manager for suggesting this particular kind of setting under the circumstances, as the exigencies of the demand for gas required that provision should be made for a larger make during the coming winter. The new house should contain a retort-stack 20 feet in width. The present stack is only 18 feet wide; and consequently the production per mouthpiece (under 5000 cubic feet per day) is lower than desirable. With wider benches, and fitted with the best modern appliances, the labour cost and the fuel (coke) account per 1000 cubic feet of gas made and sold would be reduced. To enable the Corporation to use oxide of iron with lime in purifying, it would be necessary to put down two more purifiers, covered by an open shed, and also to erect a shed to cover the space required for revivifying the material, which course he recommends. He also advises manufacturing the ammoniacal liquor into sulphate of ammonia on the works, instead of selling it as at present. In order to obtain the full benefit from the conversion of the liquor into sulphate, the whole of the ammonia should be eliminated from the gas, and secured for sale. According to the Gas Examiner's reports, this is not done at present; the daily tests showing that from 3 to 4 grains of ammonia per 100 cubic feet are present in the purified gas. The fact of so much of this impurity being left in the gas is objectionable, both from the point of view of the loss of revenue, and also by reason of the complaints from consumers to which it gives rise. Mr. Newbigging recommends the erection of a washer-scrubber to remove this impurity. The large underground tank, which is of wrought iron, used for the storage of tar and ammoniacal liquor, he reports as defective, and should be replaced by a new cast-iron tank. New smithy and other workshops, with the necessary machinery and tools, are also required. The distributing mains and services are in good order. The gas-works and the gas department are well managed; and taking into account the disadvantages under which the Corporation labour in various respects, the selling price of gas, he thinks, is reasonably low.

GREENOCK CORPORATION GAS SUPPLY.

REDUCTION IN THE PRICE OF GAS—BALANCE-SHEET FOR 1887-8.

At the Monthly Meeting of the Greenock Police Board held recently, the Corporation gas accounts for the past year and the fixing of the price of gas for 1888-9 were discussed. In the minutes submitted by the Gas Committee, there was given an estimate of the probable revenue and expenditure and profits for the current year, terminating on June 30, 1889. It was estimated that the revenue would amount to £36,800, and the expenditure (including £300 for new meters and main and service pipes) to £25,180. To the latter sum would have to be added £5500 for interest, and £3000 for sinking fund—making the total expenditure £33,680; and leaving a profit of £3120. It was also stated in the minutes that, in view of the estimate of revenue and expenditure submitted to the meeting of the Gas Committee, Mr. Lang, jun., had moved that the Committee recommend that the price of gas be reduced 5d. per 1000 cubic feet (from 3s. 9d. to

3s. 4d.) to consumers by meter, as from May last. To this two amendments were proposed; but the original motion was ultimately carried.

Mr. McONIE moved the adoption of the minutes, with the exception of that portion where it was agreed to recommend a reduction of 5d. in the price of gas, which he said he proposed to challenge by a direct vote of the Board. Referring to the Committee's estimate of the revenue for the year, he said it was about £240 larger than for the year which had closed; but they expected their expenditure would be increased to a slight extent. However, putting all things together, they would find that if trade improved in the town, they would have profits to the amount of £3120, as against £3000 actually made last year. In regard to the proposed reduction, he thought that 2½d. per 1000 cubic feet would be equally just and fair. It would absorb £1600 of the profits which they expected if the price of gas were kept as it had lately stood; but by granting this reduction of 2½d., the profits would be secured. No one would be better pleased than himself if they could reduce the price by 5d. But if they reduced the charge to this extent, the inevitable result would be that the whole of the £3000 which they had in hand would be absorbed; and consequently the Board would not be able to make the two ends meet.

Baillie SHEAVER seconded the motion for the adoption of the minutes, with the exception mentioned by Mr. McOnie.

Mr. LANG then submitted the motion which stood in his name. He said that he had been asked whether he was anxious to press his motion; and his reply was that if he could get an assurance from the Board that the reduction of 2½d. per 1000 cubic feet, proposed by the amendment was an honest intention to sweep away for ever by instalment the unjust system of paying over the profits of the gas undertaking to general police purposes, he would be content with that in the meantime; but he feared that some of the old members were not yet prepared to give up the practice. As they knew, there was a large amount of property on the valuation roll which was valuable for police rates, and in which there was no gas consumed. Then there were manufacturers, shopkeepers, &c., whose consumption of gas was very large in proportion to their rateable rental for police purposes. He, therefore, thought it would be seen that there was an unequal incidence in the matter, as between paying a high price for gas in order that profits might be handed over for the purpose of keeping down police, &c., assessments. The Gas Act provided for the payment of all interest on borrowed money, the expense and maintenance of the works, and the laying aside of a sinking fund; and when all this had been done, it seemed to him that the consumers should get gas at what the outlay represented, and beyond that no profit should be exacted and handed over for the purpose of keeping down taxation in another quarter. When he mentioned that the sum paid over to the Police Board by the gas consumers from 1872 to July 17 this year amounted to £55,600, and in addition thereto, there was, or ought to be, a contingent fund of £4468, and a sinking fund, including the contribution made this year, of £28,012, and redeemed mortgages of £5400, he thought they would agree with him that the gas consumers had been during all that period an over-strained milch-cow, for the benefit of general police purposes, and the payment of a share at least of some most extravagant undertakings on the part of the Board. It appeared to him that it was now high time that the reduction which he had proposed should be granted.

Mr. McINNES said statistics showed that, on the average, after a reduction they recouped themselves every third year. He was quite sure no deficit would arise by taking 5d. off the present price; and he had much pleasure in seconding Mr. Lang's proposal.

A long discussion ensued; and on the voting taking place, fourteen members supported the motion in favour of a reduction of 2½d. per 1000 cubic feet, and the proposal to reduce the price 5d. per 1000 feet had eight supporters; so that the price for the current year will be 3s. 6½d.

The following is the balance-sheet of the Trust for the year to June 30 last. The figures for 1886-7 are also given for the sake of comparison:—

Revenue.			
	1886-7.		1887-8.
Consumers by meter	£24,508 6 10	..	£24,034 19 0
" by contract	2,217 12 10	..	2,220 4 5
Residual products	4,594 8 0	..	5,399 13 7
Town and harbour lamps	4,589 15 9	..	4,710 6 9
Property, Crawford Street	79 0 0	..	79 0 0
" West Blackhall Street . . .	63 7 10	..	56 14 10
Bad debts recovered	30 10 3	..	23 14 6
Rental from gas stoves	24 3 2	..	32 0 1
Interest on pipes	0 3 0	..	3 0 10
Oxide	—	..	2 10 9
	£36,107 7 8		£36,561 4 9
Expenditure.			
	1886-7.		1887-8.
Coals	£10,163 0 6	..	£9,713 18 9
Interest	5,767 10 6	..	5,411 7 4
Sinking fund	3,000 0 0	..	3,000 0 0
Wages and salaries	5,118 3 7	..	5,275 13 8
Repairs to retort-bench	1,445 11 11	..	1,810 15 5*
Fuel duties, taxes, insurance, &c. .	1,891 8 1	..	2,405 0 1
Lime	591 1 5	..	559 11 6
Oxide	112 13 4	..	—
Cartage of ashes	144 7 7	..	128 18 0
Stationery, printing, advertising, &c.	170 12 10	..	130 1 4
Repairs to buildings	290 11 3	..	210 11 0
" apparatus	184 2 4	..	85 12 2
" main and service pipes . . .	202 17 10	..	315 16 7
" meters	472 14 2	..	534 0 11
Town and harbour lamps	1,768 11 7	..	1,788 11 0
Working residual products	1,829 0 1	..	1,798 13 1
Income-tax	103 4 6	..	96 4 6
Incidental expenses	81 0 1	..	110 6 0
	£33,330 11 7	..	£33,375 4 4
Gas meters	276 16 1	..	114 12 6
Main and service pipes	—	..	71 7 11
	£33,607 7 8	..	£33,561 4 9
Balance	2,500 0 0	..	3,000 0 0
	£36,107 7 8	..	£36,561 4 9

* Including £1800 for the Kilmorie bench.

FATAL ACCIDENT AT THE BECKTON GAS-WORKS.—An inquest was held at the Poplar Town Hall, on Monday last week, by Mr. Wynne E. Baxter, on the body of John Stephens, aged 63, who met with his death at the Beckton Gas-Works on the previous Thursday. From the evidence, it appears that deceased was one of a gang engaged in unloading the steamship *Medway*, which lay alongside the works. As he went to get a drink of oatmeal and water, a huge tank which was hanging from the crane was moved by a man named Manning, and, catching the jib, it became unhooked, and fell down the hatchway on to Stephens, killing him almost instantaneously. A verdict of "Accidental death" was returned.

THE NEW VYRNWY WATER-WORKS OF THE LIVERPOOL CORPORATION.

AWARDS IN RECENT ARBITRATION PROCEEDINGS.

The awards in the arbitration proceedings between the Liverpool Corporation and Mr. T. Hawksley, C.E., and the Trustees of the River Weaver Navigation respectively, in respect to matters connected with the Vyrnwy water scheme, have recently been given.

First, in regard to the dispute between Mr. Hawksley and the Corporation, it will be in the recollection of the readers of the JOURNAL that when the Vyrnwy scheme was first adopted, the work of drawing the plans and carrying out the operations was entrusted to this gentleman. Subsequently a difficulty arose between Mr. Hawksley and the Corporation, which threatened protracted and expensive litigation. It was claimed by the Water Committee that Mr. G. F. Deacon, M. Inst. C.E., the Corporation Water Engineer, had been associated with Mr. Hawksley in the preparation of the plans and the carrying out of the work at Vyrnwy. Mr. Hawksley seems to have taken exception to any divided responsibility in the work between himself and Mr. Deacon; and after the works had progressed to a certain point, Mr. Hawksley objected to a dual responsibility, and practically withdrew from any further control. A difference arose between the Corporation and Mr. Hawksley as to his remuneration. On the one hand, it was stated that Mr. Hawksley was entitled to be paid a sum amounting to nearly £60,000; while on behalf of the Corporation, it was contended that he was really entitled to a far less sum. Mr. Hawksley, to enforce his claim, commenced legal proceedings. The matter was ultimately referred to the Board of Trade, to appoint an Arbitrator to decide between the parties. The Arbitrator selected was Mr. Bosanquet, Q.C.; and this gentleman has delivered his award. From this it appears he has awarded Mr. Hawksley £14,123, in addition to the sums already paid him by the Corporation—amounting to £20,617. He has also decided that the Corporation shall pay the costs of the award, which it is stated will amount to a very large sum—some lawyers estimating it at about £5000. The result of this arbitration will be the addition of a very substantial sum to the already large figure which the Vyrnwy works will cost above the amount originally intended.

The various stages of the arbitration proceedings between the Corporation and the Trustees of the River Weaver Navigation have been briefly reported in the JOURNAL; but we may here reiterate shortly the point at issue. The Trustees contended that the line of pipes should be conducted under the Weaver in a walled passage, culvert, or tunnel, at a sufficient depth in the strata to prevent the possibility of any interference with the navigation or future improvement of the water-way. Mr. Deacon, the Water Engineer, however, was convinced that a less costly and thoroughly trustworthy plan could be adopted without resorting to the construction of a tunnel. The method he proposed was a very simple one. He suggested placing flexible steel pipes at a good depth in the bed of the river, by means of excavating a trench, into which the pipes would fall upon being floated down the river after they had been jointed on the river bank. In his opinion, and in the judgment of eminent Engineers, this plan was far preferable, and not likely to have any prejudicial effect on the navigation, or be a source of danger to vessels using the river. Every effort was made to amicably arrange the matter in dispute, but without avail; and the Board of Trade, under the powers granted to them by the Liverpool Water-Works Act, 1880, appointed Sir Douglas Galton to hear evidence and determine the point at issue between the Engineers of the Trustees and of the Corporation. All the evidence, scientific and otherwise, which could be collected by both sides was presented; and the inquiry was of the most exhaustive character. This, of course, occasioned great expense; but when it is considered that it meant to the Corporation a difference of at least £10,000 in the cost of the works (according to Mr. Deacon's estimate), it is not surprising that their representatives declined to give way. The award of Sir Douglas Galton is in favour of the scheme proposed by Mr. Deacon; so that the cost of crossing the Weaver will be kept at the minimum.

THE PRESENT POSITION OF THE UNDERTAKING.

It is now seven years since a commencement was made with the new works which are destined in the near future to provide the major part of the water required for the supply of the City of Liverpool and the inhabitants within the water supply district of the Corporation; and the report of the Engineer of the works (Mr. G. F. Deacon, M. Inst. C.E.) for the past year, the issue of which is to be looked for within the next few weeks, is expected to announce that with two exceptions—the tunnel under the Mersey and the Norton water-tower—all the more important works, the great masonry dam, the Hirnant, Cynnyon, and Llanfôrda tunnels, the Oswestry filter-beds, the reservoirs at Parc Uchaf, Oswestry, and Malpas, nearly the whole of the aqueducts under railways, together with the intervening pipe-line, are completed. The Cotebrook reservoir, also, is two-thirds finished; and with the completion of the tunnel under the Mersey, Liverpool will have an abundant supply of pure and soft water. The tunnel has just been commenced; and the iron castings with which it is to be lined have been delivered. The achievement of the Vyrnwy scheme is therefore, says the *Liverpool Courier*, simply a question of months; and misconceptions on this point are due simply to a non-acquaintance with the facts.

After a rapid glance at the history of the local water supply from the year 1846-7 downwards, in order to show why the Vyrnwy scheme was entered upon at all, our contemporary proceeds to describe the artificial lake that has been formed by throwing a dam (4½ miles long) across the Upper Vyrnwy Valley. The area of the lake thus created will be 1121 acres; the greatest depth of water, 84 feet; and the area drained, about 22,000 acres, or 39½ square miles. To fill the valley will take, in the estimation of Mr. Deacon, less than an average year of minimum rainfall. "The whole configuration and position of the hills," he says, "is favourable to a high but very variable rainfall; and of the twenty rain-gauges which have been in operation over the drainage area for many years, one to the east of the valley has recorded as little as 49·73 inches in one year, whilst the other to the west has registered 118·51 inches in the same time, or more than three-and-a-half times the average rainfall at Liverpool." During the past year even this average has been considerably exceeded; so that there is no doubt that the estimate is on the right side. The present probabilities are that the lake will be full before next Midsummer, or even by the spring. Indeed, the process of closing the two discharge tunnels through which the compensation water is to flow has already been commenced. Each tunnel, 15 feet in diameter, will be walled up at either end; and a pipe, 30 inches diameter, laid in each. This, however, is slow work, and will not be concluded before October or November. Prior to passing from the lake, the water will have to flow through a huge straining tower built at the entrance to the Hirnant tunnel, and so leave behind all large floating particles. The process of clarification will be completed by the filter-beds at Oswestry; these (four in number) being so constructed that each can be cleaned in turn without interfering with the supply. All this portion of the works has been finished for some time.

A glance at the course of 68½ miles which the aqueduct follows from

Vyrnwy to the existing Prescot reservoir shows that it pursues a zigzag course, up hill and down dale, in what might at first seem a most erratic fashion. The Vyrnwy lake is 830 feet above the mean sea-level; the Prescot reservoir, 277 feet. There is, therefore, at Prescot a pressure of 553 feet of water; and to prevent a great overflow, it was necessary either to mount the reservoir on pillars 553 feet high, or to bring the water down from the lake in stages. Of course the latter method was the only practical one; and it has been carried out by means of relieving reservoirs, each having the same capacity, and built at regular intervals of height up to the level of an imaginary straight line drawn between the respective elevations of Vyrnwy and Prescot. This line is called the "hydraulic gradient." The relieving reservoirs are four in number—Parc Uchaf, in Wales; and Malpas, Cotebrook, and Norton, in Cheshire. Their effect is to make the pipe-line safer, by reducing the static pressure; whilst, because the slope is uniform, the discharge is not reduced in any way. Leaving Vyrnwy, the water passes through the Hirnant tunnel, 2½ miles in length. At the outlet in the valley of the Hirnant, it enters pipes; and for 7 miles flows underground, passing beneath the rivers and streams into the Parc Uchaf reservoir, built at 732 feet above the sea, and capable of containing 2 million gallons. After an undulating course of 4 miles more, the water runs through the Cynnyon and Llanfôrda tunnels, crossing the narrow and precipitous valley of the Morda, which separates them, by a bridge. The outlet of the Llanfôrda tunnel discharges into the Oswestry reservoir; and as the contour of the ground is here favourable to the construction of a large reservoir rising to the "hydraulic gradient" of the aqueduct, advantage has been taken of the fact to give that at Oswestry a capacity of more than 46 million gallons. By this means the remainder of the aqueduct to Liverpool can still be supplied, even though there may be a stoppage in the rugged and somewhat inaccessible mountain district towards Vyrnwy. Besides this, however, there are at Oswestry, in connection with the filter-beds, three clear-water reservoirs with a capacity of something over 12½ million gallons. From Oswestry to Malpas, a distance of 17½ miles, the pipe-line (except when carried on arches across the Wych-brook Valley, Cheshire) is entirely underground. It is almost completely underground also to a hill near the village of Cotebrook, which rises to the level of the gradient, and where there is now nearly completed the third balancing reservoir. At Norton, 11 miles farther on, a little to the south-east of Runcorn, it is necessary, in order to reach the gradient, to build the relieving reservoir on a tower 113 feet high. When built this tower will be one of the finest yet constructed. It will be twice as large as the one in Everton; being 90 feet in diameter, and of the same capacity as the reservoirs already mentioned. It is being proceeded with rapidly; but it is not necessary that it should be completed immediately, for until it be carried out there can be at this point an overflow into the Weaver.

The most difficult part of the entire scheme is the tunnel under the Mersey. At present it is impossible precisely to say when it will be completed. All that can be said is that the Water Engineer fully hopes to deliver water through it during next summer, or at all events next autumn. It is 900 feet long, 10 feet in diameter, and lined with cast iron. On the Cheshire side the water will descend in steel pipes down a shaft slightly larger than the tunnel, and 86 feet deep. On the Lancashire side it will ascend in similar pipes another companion shaft, 104 feet in depth. It will then flow on to Prescot.

The Vyrnwy works are designed to supply ultimately, should the city require it, 40 million gallons a day; but at the present moment they are being carried out only for a supply of one-third of that quantity. If at some future time the needs of Liverpool should demand it, the other two-thirds of the total supply can be obtained by the erection of additional relieving reservoirs, and various other minor works. The erection, again, of another set of reservoirs, and the laying of a further line of pipes, will enable the Corporation to obtain the maximum influx; and all this has been fully provided for.

TOTNES CORPORATION WATER SUPPLY.

INAUGURATION OF A NEW RESERVOIR.

The new reservoir at Bridgetown which has been constructed by the Totnes Town Council, on land leased to them by the Duke of Somerset, was formally inaugurated on Tuesday last by the Mayor (Mr. J. E. L. Lloyd). Among those present on the occasion were several members of the Town Council, the Town Clerk (Mr. E. Windeatt), the Borough Surveyor (Mr. S. Cumming), and the Contractors (Messrs. Brook and Ash). Alderman Kellock, Chairman of the Water Committee, commenced the proceedings by stating that he regarded that day as one which would be chronicled in the history of Totnes; the event being a very important one to the town. The water was supplied from the Bowden Spring, about a mile distant. There had been several ideas with regard to the best place from which the water needed for the reservoir could be derived; and in 1884 several experiments were tried. But it was due to Mr. Martin, of Exeter, who in 1885 recommended the Bowden Spring, that they had their supply from this source; his suggestion being adopted. He looked upon the extra supply of water as most beneficial to the inhabitants. Dr. Blyth, who had tested the water, had reported that it was good in every respect. In conclusion, he remarked that, when foundation-stones were laid, it was customary to present the person performing the ceremony with a silver trowel; but, on the present occasion, he had pleasure in presenting the Mayor with a silver cup, which had been subscribed for by members of the Town Council; and he asked him, in their name, and in that of the town, to accept it as a small memento of the opening of the reservoir. The Mayor, having turned on the water and drunk from the cup, which was handed round to the members of the Council, then formally declared the reservoir opened. Bridgetown, he said, had certainly been short of water in the past. It was gratifying to the town to see the beautiful building sites near them so rapidly taken up and built upon; and nothing was of greater benefit to the community than a plentiful supply of good water. It gave him great pleasure to accept the handsome cup so kindly presented to him. After the ceremony the company were entertained at the Seymour Hotel, by invitation of Mr. Jeffery Michelmores, Steward to the Duke of Somerset.

NORMANTON GAS COMPANY.—In moving the adoption of the Directors' report at the half-yearly meeting of this Company on Saturday, the 25th ult., the Chairman (Mr. Statter, J.P.) stated that they had earned sufficient profit in the past six months to admit of the usual dividend of 8 per cent. being paid. The reserve fund now stood at £1322. The quantity of gas made in the half year was 11,330,000 cubic feet, which was an increase of 401,000 feet over the corresponding period of last year, or about 5 per cent. The leakage was 13½ per cent.; and this was caused by the continual breakage of the mains, owing to the coal-mining operations in the district. The Chairman then went through the accounts in detail; nearly every item, to use his own words, showing "a slow, gradual, and steady progress." The motion was agreed to; and a dividend of 8 per cent., free of income-tax, was declared.

NOTES FROM SCOTLAND. (FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

After a good deal of delay, which may probably be accounted for by the reluctance of the Gas Commissioners of Edinburgh and Leith to show how inadequate an estimate they formed of the Edinburgh and Leith Company's works before the agreement, they have at last issued the reports which they received from Mr. Geo. Livesey, C.E., and Mr. Alfred Lass, F.C.A., respectively on the works and books of the Company. These reports you will probably publish in another column. Both of them are exceedingly favourable to the Company; and if procured in time, might have been made by the Directors the foundation for a higher price.

The abolition of meter-rents may be expected, after the remarks of Mr. Colston in the early period of the negotiations for the transfer of the gas-works, to be one of the leading topics of discussion at the ensuing municipal elections in Edinburgh. There is at present a vacancy in the Leith Town Council; and Mr. Douglas, one of the gentlemen who aspire to occupying the seat, at a public meeting on Tuesday night, put the subject forward. He denounced the present custom of charging a rent of 2s. 6d. a year per meter, no matter whether the consumer received 17s. per week as wages, or had an income of £500 a year. I observe that the Leith Company realized £4796 from meter-rents last year; and as Mr. Lass estimates an annual surplus from their business of £4820, the Commissioners should very soon be able, assuming the larger business of the Edinburgh Company to produce equally favourable results, to strike off the impost.

The inhabitants of Perth were subjected on Thursday night to some temporary inconvenience through an interruption of the gas supply—an occurrence which is so rare anywhere as to make the incident of outstanding interest. During the hours of the largest consumption, the outflow of gas is regulated by a large, and at other times by a small, governor. At eleven p.m., the small governor is brought into use; and on Thursday night, it failed to act. The large governor had been shut off, and the consequence was a stoppage in the gas supply, and the whole of the gas alight in the city, both public and private, went out. The foreman at the works, perceiving what had happened, at once turned on the gas to the large governor—a step which was fraught with more danger than the cutting off of the supply, because the unlighted gas then began to flow out of the open burners. Fortunately, no accident happened. In the streets the gas escaping from the public lamps smelt very strongly; and the hour being late, it was some time before the lamplighters could be assembled and started to re-light the lamps.

The oft-vexed question of the interference with public thoroughfares by gas companies, was raised at the meeting of the Haddington Town Council on Monday. The Town Clerk, it was stated, wrote to the Gas Company informing them that Sidegate Street was to be re-caused, and suggesting that the Company would have a good opportunity of examining their pipes. No notice was taken of this letter; but after the new causeway had been laid, the Company proceeded to open up the thoroughfare. It transpired that the town made no charge on the Company for damage done to the streets; and that nothing further than grumbling could be indulged in.

Though the Committee who are investigating the allegations of over-charges for gas in Aberdeen have not yet issued their report, it is announced that they have discovered the increases to have been generally of very small amount, and that, in a good many of the cases put before them, there had been a decrease in the amount charged.

At a meeting of the Elgin Gas Commissioners on Monday, it was intimated that the valuation of the gas-works and plant had been raised by the Assessor from £1043 to £1322; and a Committee was instructed to look into the matter. An offer was accepted for the surplus tar and liquor produced at the works during the ensuing year, at the rate of 2s. 6d. per 100 gallons.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

The annual meeting of the Partick, Hillhead, and Maryhill Gas Company was held yesterday. Mr. Henry Cowan, the Chairman of the Company, presided. The report of the Directors for the year ending June 30, a summary of which was given in the JOURNAL last week, was taken as read. The Chairman, in moving the adoption of the report, referred to the death of the late Secretary, Mr. J. C. Maccall, C.A., and to the appointment of his successor, Mr. J. Graham, C.A. In regard to the business of the Company, he was pleased to state that it exhibited a marked improvement. The make of gas for the year showed an increase of about 12 per cent.; and for the two months of the current year there had been a considerable increase in the make over that of the corresponding period of the preceding year. He trusted this would continue; and as there had been a great amount of building going on in the district, he had no doubt that it would bring into play much of the Company's distributing plant. The net balance at the credit of profit and loss account was, he remarked, £7445, of which the Directors proposed to apply £1942 in extinguishing the balance at the debit of the suspense account; and in accordance with the decision of the four Judges of the First Division of the Court of Session, they recommended that payment be made to the preference shareholders of a dividend for three years, less income-tax—thus absorbing £4950, and carrying forward a balance of £552 10s. 9d. to the present year's account. Notwithstanding the reduction in the price of gas from 3s. to 2s. 10d. per 1000 cubic feet, the revenue account showed an increase of about £3000 profit over that of the preceding year; and as the coal contracts had been made on very favourable terms, and additional prices had been obtained for the residual products, they hoped that the present year would show as favourable results. After referring to the efficient state in which their Manager (Mr. Levi Monk) was maintaining the works, he alluded to the debenture debt, which now stood at £50,500; showing a reduction of £10,310 in two years. With this reduced capital they were doing a much larger amount of business. He thought it proper to state that negotiations were at present pending with the Glasgow Corporation Gas Trust for the purchase of the works, in the event of the district in which they were situated being annexed to the city; and as soon as these were completed, a meeting of the shareholders would be called to consider the terms submitted. He concluded by moving the adoption of the report. The motion was seconded by Mr. J. King, and unanimously agreed to. It was subsequently resolved to vote a sum of 200 guineas to the Directors for their services during the past year; being an increase of 50 guineas.

A considerable amount of talk has taken place in the western and north-western suburbs of Glasgow within the past few days regarding the negotiations referred to in the previous "Note." Amongst "outsiders," it is generally understood that the negotiations originated with the Glasgow Corporation Gas Committee; and it is stated that the sum which it is proposed to offer for the works is £172,000, or £2000 more than I mentioned last week. It is evident that the Gas Committee mean business; but on the part of the Directors of the Company, there does not seem to be any

very marked desire to sell their property to the Corporation, more especially as the works have been put into a very healthy condition, and the demand for gas has greatly increased throughout Maryhill and the adjoining suburbs. Persons who have more or less interest in the proposed purchase are throwing out "feelers" in various directions as to the valuation which practical men put upon the works, and as to the abilities of the Manager, Mr. Levi Monk. On the point last mentioned there is not room for the shadow of a doubt, when the present position of the Company and of the works is compared with that a couple of years ago. In the event of the works being acquired by the Glasgow Corporation, there seems to be every probability that Mr. Monk will be asked to transfer his services to the new proprietors. In connection with this matter, it is worthy of mention that the shares of the Company have of late been dealt in almost daily on the Glasgow Stock Exchange. Last Saturday the ordinary shares changed hands at 90s. per share. On Monday the price was slightly advanced; and holders at the close wanted 91s. The preference shares were sold on Thursday at £6 10s. per share; and the ordinary shares were quoted at the close at 90s. Yesterday 89s. per share was paid, which was the sellers' quotation at the close.

At the meeting of the Kilsyth Police Commissioners on Monday, it was agreed that the price of gas should be reduced from 4s. 7d. to 4s. 2d. per 1000 cubic feet, the reduction to date from May 15 last. It was further resolved to supply the consumers with Bray's burners free of charge; and that those consumers who required Bray's "Special" burners should be supplied with them at 1d. each.

At a meeting of the Directors of the Biggar Gas Company yesterday week, it was resolved to reduce the price of gas 5d. per 1000 cubic feet as from May 26 last.

A parcel of 39 £5 shares in the Ayr Gas Company have recently been sold by auction at £5 12s. each; and on the same occasion 67 £2 shares in the Newton-on-Ayr Gas Company realized £2 17s. to £3 per share.

The Glasgow pig-iron warrant market has been buoyant all the week, with a large amount of business done from day to day. Prices have advanced during the week from 3d. to 4d. per ton; the finish yesterday at noon being about the best prices. A number of inquiries from America and the Continent have been reported during the week; and during next week a large quantity of special iron will be taken from store for shipment. Some of the special brands of makers' iron have been advanced in price during the past week or so, to the extent of 1s. to 2s. per ton.

The local trade continues to show an improvement. In some of the western districts, shipments are still in excess of the production, which has been curtailed by the policy of the miners taking an idle day at the end of the week. Slight advances are now being conceded for furnace coal, and at the Glasgow Terminus, main coal is quoted at 5s. 9d. to 6s. per ton; ell and splint coal also being firmer in price.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Sept. 1.

Sulphate of Ammonia.—The healthier tone apparent about a week ago has gradually changed to a very depressed feeling, due in great measure to the rapid reduction of the London quotations. This movement has created some surprise among country makers. The small quantities produced at the present time seemed hardly to call for a lowering of prices; nor are the cheaper rates likely to increase the immediate demand. Buyers generally now anticipate doing better during this month. The facts, as far as the country is concerned, are these: Very little offering, and immediate parcels scarce at nearly all the ports; hence consumers may be mistaken in reckoning upon very low prices in September, when the demand, although later (corresponding with the lateness of the season) may nevertheless set in sharply. To-day's market, however, closes very weak, with sellers at £11 7s. 6d., Hull and Leith.

LONDON, Sept. 1.

Tar Products.—There is more enquiry for benzole, and 90 per cent. has advanced 3d. to 4d. per gallon. Creosote is also scarce; and higher prices are asked for oil free from salts. But the market generally is slack; and both buyers and sellers are somewhat indifferent. The following prices represent the week's quotations:—Tar, according to position, 17s. 6d. to 22s. 6d. per ton. Benzole, 90 per cent., 3s. 1½d. per gallon; 50 per cent., 2s. 4½d. Toluol, 1s. 8d. per gallon. Solvent naphtha, 1s. 2d. per gallon. Crude naphtha, 30 per cent., 1s. per gallon. Light oil, 3½d. per gallon. Creosote, 2d. per gallon. Pitch, 12s. to 13s. 6d. per ton. Carbolic acid (crude), 3s. 4d. per gallon. Cresylic acid, 9d. per gallon. Tar salts, 15s. per ton. Anthracene, 30 per cent., "A" quality, 1s. 6d. per unit; "B" quality, 1s. 3d.

Ammonia Products.—Sulphate of ammonia is not only neglected, but buyers cannot be found, even with an inducement of 2s. 3d. per ton lower price. There can be no doubt that the market is in the hands of "bear" operators; and manufacturers would do well to withhold from selling in the meantime. Prices: Sulphate of ammonia, £11 to £11 5s. per ton, less discount. Gas liquor (5° Twaddell), 7s. 6d. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 1½d. per lb. Carbonate of ammonia, 3½d. per lb. Muriate of ammonia, brown, £18 per ton; white, £27. Sal-ammoniac, £30 per ton.

[From the Chemical Trade Journal, Sept. 1.]

Sulphate of Ammonia.—Values have improved all round; and to-day's price at Hull may be taken as £11 10s. per ton. At Liverpool prices are £11 10s. to £11 12s. 6d. per ton; and Beckton £11 5s. per ton. The market prospects are altogether brighter; and there is every reason to look for better prices than those which have been ruling latterly. Nitrate of soda, however, still offers freely at low rates; and this competitor must be borne in mind by those who may desire to force values of sulphate beyond a safe point.

Tar Products.—The position of the market for benzoles is without change; and prices remain at 2s. 4d. and 2s. 1½d. for 50's and 90's respectively, with very little business doing. Crude carbolic is decidedly weaker, at 3s. 1½d. per gallon for 60's at makers' works. Even lower offers have been refused by some buyers. Anthracene still commands good prices, both for "A" and "B" qualities. Pitch is without change. The demand for creosote continues; and makers realize for good qualities 1½d. per gallon at works, and 3d. per gallon in casks at ports of shipment.

The Rochdale Gas Committee have resolved to recommend the Council to increase the salary of Mr. Stenhouse, the Chemist at the gas-works, by £40 per annum. Mr. Stenhouse has filled his present position for six years. The Water Works Committee propose also to advance the salary of Mr. Tomlinson, the Manager of the water-works, by £50 per annum.

At the first ordinary meeting of Bell's Asbestos Company, Limited, last Wednesday week, the Chairman (Mr. J. Bell) announced that the profit exceeded £10,000, and the Directors thought they might prudently pay an interim dividend of 7s. 6d. per share, which would absorb £7500. He said they looked forward to rendering a satisfactory statement at the end of the year. The Company were trading vigorously and prosperously.

ST. MARY CRAY GAS COMPANY.—The report presented at the half-yearly meeting of this Company showed that the amount available for division was £1952; and from this it was unanimously resolved to pay dividends at the rate of 10 per cent. per annum on the original shares and 7 per cent. upon the additional capital.

EAST WARWICKSHIRE WATER-WORKS COMPANY.—The second half-yearly meeting of this Company was held last Saturday week. From the Directors' report, it appeared that during the past six months the supply of water had been nearly doubled; over 300 houses being now connected with the Company's mains. The Chairman stated that up to the present time more than nine miles of pipes were actually laid; and contracts had been entered into for upwards of 1000 yards more, so that in a very short time they would have laid over ten miles of pipes. The greater portion of Nuneaton was now covered by mains. The present yield of their well was 121,248 gallons per 24 hours. The report was unanimously adopted.

MAIDSTONE WATER-WORKS COMPANY.—The report presented by the Chairman (Mr. C. Ellis) at the half-yearly meeting of the shareholders of this Company on the 23rd ult., was not such a favourable one as those submitted in the two previous half years. This he attributed to the large number of houses now unoccupied in Maidstone, and the considerable decrease in building operations. The accounts showed that the water-rents amounted in the half year to £3545 3s. 2d.; and that there was a profit of £1486 19s. 6d. available for dividend—making a sum of £4613 at the credit of the profit and loss account. From this the Directors recommended the payment of a dividend of 3½ per cent. for the half year on the 10 per cent. shares, and 2 per cent. on the 7 per cent. shares. After some discussion, the report was adopted, and the dividends recommended declared.

ACCRINGTON GAS AND WATER COMPANY.—At the half-yearly meeting of this Company, held on Monday last week, the balance-sheet submitted for adoption, showed that the expenditure on capital account during the six months to June was £2232, of which £1434 was spent in the enlargement of the No. 1 reservoir at Mitchell's House, £621 for new main pipes, and the remainder for new service pipes and meters. There had been a decided increase in the revenue from both gas and water; and the balance consequently available for dividend was £8966. Out of this sum the Directors recommended the usual dividend of 10 per cent. per annum on the "A" stock of £10,500; and 8 per cent. per annum on the "B" stock and called-up shares—carrying forward the balance to the current account. The number of additional consumers during the half year was: Gas, 99; water, 272—total, 371.

BARNSTAPLE WATER COMPANY.—At the half-yearly meeting of the Barnstaple Water Company on Monday last week, it was reported by the Directors that the works were in a most satisfactory condition. During the last session of Parliament, the Royal Assent was given to the Company's Bill, which enabled them to raise additional capital and to construct new works. The Engineer (Mr. T. Hawksley, C.E.) had sent out specifications, and tenders were being solicited for carrying out the work. As soon as the Directors were furnished with an estimate of the cost, they would at once issue new shares to the public. The Chairman (Mr. E. Dennis), referring to the proposed new works, said that they had already entered into a contract for the supply of the pipes required. As soon as possible, the new shares would be put up to public auction. They would be £10 shares, and would be limited to 7 per cent. dividend. The Directors' report was adopted; and a dividend of 10s. per share was declared.

PORTSEA ISLAND GASLIGHT COMPANY.—At the half-yearly meeting of this Company, the report for the six months ending June 30, which the Chairman (Mr. T. S. Edgcombe), submitted, disclosed a very satisfactory state of affairs. The revenue for the half year amounted to £42,665 16s.; and the expenditure allowed a sum of £12,724 1s. to be carried to the profit and loss account. The Directors recommended the payment of dividends at the rate of 12½ per cent. per annum on the "A" and "B" shares, 11½ per cent. per annum on the "C" shares, and 5 per cent. per annum on the Company's stock, payable (less income-tax) on Sept. 1. The concluding recommendation in the report, "that the usual donation of coke to the value of £60 be distributed among the poor of the borough during the ensuing winter," is one that might receive consideration at the hands of the directors of other companies who have any surplus coke for disposal. The report was adopted, and the various recommendations were agreed to.

CREDITON WATER SUPPLY.—A special meeting of the Crediton Improvement Commissioners was held yesterday week, to consider a communication from the Local Government Board relative to the water supply. The letter stated that the Board had received a communication from the executors of Mr. S. Price, who work a tannery at Bow, saying that if the proposed scheme for obtaining water at Walson was carried out, it would have the effect of withdrawing the supply they had enjoyed from time immemorial. If it interfered with the water, they would be compelled to sue in the Courts for redress; if, on the other hand, it was abstracted through percolation, they would protect themselves by sinking a rival shaft. They, therefore, prayed the Board not to sanction the project; but to request the Commissioners to give further attention to the other schemes which had been brought forward. It was unanimously resolved that the Clerk should write, stating that the Commissioners had given the matter full consideration, and they hoped that the Local Government Board would grant the loan of £10,000, as desired, in order that the work might be carried out without further procrastination. The letter further stated that parties were protected from damage by section 308 of the Public Health Act, 1875.

REDUCTIONS IN PRICE.—The Directors of the *Sevenoaks Gas Company* announce a reduction in the price of gas throughout the whole of their area of supply of 2d. per 1000 cubic feet.—The *Airedale Gas Company* have decided to allow an additional discount of 1d. per 1000 cubic feet on all accounts paid within the usual time after they fall due.—The Directors of the *Isle of Thanet Gas Company* have reduced the price of gas to private consumers from 3s. 3d. to 3s. 1d. per 1000 cubic feet.—The *Kidderminster Gas Company* have notified to the Town Council a reduction in the charge for lighting the public lamps; the charge for "summer" lamps to be in future 13s. 6d., and for "winter" lamps 44s. 6d. per lamp.—It is reported that the Directors of the *Gloucester Gas Company* have decided to reduce the price of gas 2d. per 1000 cubic feet.—It has been intimated to the consumers of gas in the district of the *Barnet Gas and Water Company* that, on and after the 5th of January next, there will be a reduction of price to the extent of 3d. per 1000 cubic feet.—The *Farnworth and Kersley Gas Company* have reduced their price by 2d. per 1000 cubic feet; the charges in future to be: To consumers, when the quarterly consumption is under 150,000 cubic feet, 3s. 4d. per 1000 net; between 150,000 and 400,000 feet, 3s. 1d. net; 400,000 feet and upwards, 2s. 10d. net. The price charged to the Local Boards of Farnworth and Kersley for gas supplied to the street lamps will also be reduced to 2s. 8d. per 1000 feet net.—The Directors of the *Milnrow Gas Company* have decided to reduce the price of gas 3d. per 1000 cubic feet; the reduction to take effect from June 30. The price will now be 3s. 9d. per 1000 feet, subject to discount.

INCREASE IN THE PRICE OF COAL IN LANCASHIRE.—The coalowners of West Lancashire have resolved to advance the price of house coal, as from the 1st inst., by 1s. per ton; steam coal (other than slack), 6d. per ton; and slack, 3d. per ton. A similar advance is also to be made in the South East Lancashire district; but as regards engine fuel it is to date from the 1st of October.

NEGLECT TO PROVIDE CONSTANT SERVICE WATER-FITTINGS.—At the Greenwich Police Court last Thursday, a fine of £5, with £2 2s. costs, was imposed on the owner of several houses in Deptford Lower Road, for neglecting to comply with the usual statutory notices to provide proper fittings in order to render such houses suitable for receiving a constant supply of water. The matter had several times been before the Court, and adjourned so as to give defendant an opportunity of complying with the requirements of the Southwark and Vauxhall Company.

PORTISHEAD DISTRICT WATER COMPANY.—During the half year ending June 30 last, the income of this Company from domestic services was slightly in excess of that for the corresponding period of last year; and the Directors anticipate some further improvement in the current half year, owing to the recent activity of the trade in the Portishead Docks. During the past half year the Directors accepted a tender for the construction of a storage reservoir at Carter's Springs, which, they now report, is nearly completed. It is believed that the reservoir will prove of considerable advantage to the Company in the future.

FALMOUTH GASLIGHT COMPANY.—In their annual report, the Directors of this Company state that during the past year some unexpected and heavy repairs had been carried out, chiefly to the new purifiers; and these, together with the additional cost of coal, had considerably added to the expenses. The Assessment Committee raised the rating of the gas-works £200; but the Directors appealed against any addition being made. After considerable negotiations, it was agreed to settle the matter by arbitration; Mr. Morgan Howard, the County Court Judge, being appointed arbitrator. His Honour has heard the case, but has not yet given his decision. Reference is made to the appointment as Manager, in August last, of Mr. J. W. Buckley, formerly of the Southport Corporation Gas-Works, and to the retirement of Mr. F. M. Harris. Although the profit was not as large as in some former years, the Directors paid the usual interim dividend of 5 per cent. in February last; and they now recommend the payment of 5 per cent. for the second half of the year, together with a bonus of 6d. per share, to pay which they had had to draw from the suspense account.

NORTHERN COAL TRADE.—The movement in the coal trade of the north still continues; and there is a decided improvement in the demand for gas and manufacturing coal. Steam coal continues fairly active; best qualities being sold at about 7s. 6d., whilst the demand shows as yet no sign of falling off. In gas coal, the event of the week has been the tendering for the supplies of the Newcastle and Gateshead Gas Company. As yet the result has not been declared; but it is believed that the bulk of the tenders are at an advance on the prices of the past year, of from 3d. to 4½d. per ton. Still, the prices are low; for most of the coal offered is comparatively near to the works, and thus the cost of carriage is limited. It is expected that the contract will be allotted at about 6s. to 6s. 1½d. per ton delivered; so that it will be seen that the coal is obtained at a low price, owing to the favourable situation of the works. Manufacturing coal is also dearer this week; and there is a disposition to contract ahead for coal of this class for some time, and that at prices from 3d. to 6d. per ton above the rates which are now current. Household coal is still depressed; the demand being limited.

CANTERBURY GAS AND WATER COMPANY.—In moving the adoption of the report of the Directors of this Company (which was noticed in the last number of the JOURNAL), at the half-yearly meeting of the shareholders yesterday week, Colonel Horsley, who presided in the absence of the Chairman, said he considered the statement was in every way satisfactory. The estimate they formed when they made a reduction in the price of gas to 2s. 10d. was found to be correct; and they had continued to pay their usual dividend. The large gasholder which had been erected from the plans of Mr. H. E. Jones, M. Inst. C.E., had been fully tested, and was now in working order. It had cost £8499 18s. 5d.; and they were told it was one of the cheapest holders that had been built. It had cost £13 per 1000 cubic feet; whereas the usual charge, he believed, was about £18. As regards the water-works, no capital expenditure had been required during the half year. All was in good order, and working well. The balance on the profit and loss account to be carried forward, subject to the half-yearly dividends, was £5908 11s. 2d. The report was approved; and a dividend at the rate of 8 per cent. was agreed to.

SUNDERLAND GAS COMPANY.—The revival in trade, which has to some extent prevailed during the last twelve months, has had (we learn from the Directors' annual report) a favourable effect upon the revenue of this Company; the gross receipts for gas and residuals showing an increase of £2947 for the year ending June 30 last, while the make of gas exceeds that of last year by 5·61 per cent. The Directors, in anticipation of still further demands upon them, have entered into contracts for the erection of four new purifiers at Hendon, which, with other necessary extensions, will be completed in time to meet the requirements of the coming winter. The revenue account shows that £41,920 11s. 5d. was received for gas and meter rentals; £11,383 18s. 2d. for residuals; and £169 19s. 8d. under the head of "sundries"—making a total of £53,474 9s. 3d. Adding to this the sum of £8929 brought forward, gives a total to the credit of the revenue account of £62,403 9s. 11d. On the other side, the total expenditure amounts to £41,019 5s. 9d., which leaves a divisible balance of £24,384 4s. 2d. An interim dividend was paid in March last; and the Directors now recommend the declaration of a like dividend—5 per cent. on the original stock, and 4½ per cent. on the additional capital stock of the Company.

THE LIGHTING OF THE ABERDEEN MUSIC-HALL.—Messrs. J. Milne and Son, of Edinburgh, having been requested to report as to the adaptability of the Wenham lamp for the lighting of the Aberdeen Music-Hall, have submitted a plan substituting three groups of these lamps for the three sun-burners at present in use. One group of seven Wenham lamps was fixed in position, and tested on Monday last week. Each lamp is supplied with flash-light tubes; and the lamps are simultaneously lit by turning on a single tap in the gallery. The difficulty hitherto experienced, of providing a ready means of manipulating the lamps in such a lofty interior, has in this case been successfully overcome; an ingenious apparatus having been devised by Messrs. Milne, by which the whole group can be easily lifted for cleaning or repairing purposes. The seven lamps tested on Monday are of the largest size—No. 4—and each consume 15 cubic feet of gas per hour—rather more than 100 feet in all. The sunlight superseded contained 297 burners, and consumed fully 400 cubic feet of gas per hour; so that the saving involved by the adoption of the Wenham system is thus about 75 per cent. Much satisfaction was expressed with the light afforded; and it is probable other sun-burners will be replaced with these lamps.

MANCHESTER CORPORATION WATER-WORKS ACCOUNTS.—For the year ending March 31 last, the Water-Works Department of the Manchester Corporation shows a surplus income (after providing for the necessary payment to the sinking fund) of £4378, from which has to be deducted the adverse balance brought forward, of £1393; leaving an amount to the credit of the revenue account at date, of £2984.

LEWES WATER COMPANY.—The receipts of this Company for the year ending June 24 last amounted to £3935 8s. 10l., and the expenditure to £1083 16s. 6d. The balance allowed of dividends being paid of 10 per cent. upon the original share capital, and of 7 per cent. upon the new share capital, and also a bonus of £1 5s. on the original shares, in part payment of the arrears due to the holders thereof. At the annual meeting of the shareholders on Wednesday, general satisfaction was expressed at the growing prosperity of the Company.

THE NORWICH TOWN COUNCIL AND ELECTRIC LIGHTING.—At the quarterly meeting of the Norwich Town Council last Tuesday a resolution was passed—"That a Committee be formed to be called the Lighting Committee, and that it should forthwith inquire into the cost and method of Electric Lighting in Brighton, Taunton, Eastbourne, Poole, Bradford, and any other towns in which electric lighting is in use, and report to the Council at its next meeting." The mover of the resolution said his object in bringing the question before the Council was that they might be posted up with the fullest information as to the improvements and progress of electric lighting. Since they tried an experiment with the electric light in Norwich, he believed great improvements had been made in this method of lighting; and the Council ought, he considered, to have ample information on the subject.

THE BOROUGH AUDITORS AND THE MANCHESTER CORPORATION GAS DEPARTMENT.—The report of the Auditors (Messrs. Lees and Graham, Chartered Accountants), on the accounts of the Manchester Corporation for the year ending March 31, will be submitted to the Council at their meeting to-morrow (Wednesday). The report contains the following paragraph in regard to the gas-works property of the Corporation:—"The Gas Department, after providing for sinking fund and contributing to the city fund the sum of £22,331, shows a surplus on the year's working of £17,925 13s.; which, deducted from the adverse balance on revenue account of previous years, leaves the present deficiency at £27,931 14s. 3d. During the year we have called the attention of the Committee to the question of depreciation, which is charged against the income of this department, in addition to the amount set aside for sinking fund; and we have represented that this is unnecessary, seeing that the sinking fund ultimately provides for the entire cost of works out of revenue. In effect, the revenue account is charged with depreciation twice over; and the city fund deprived of an amount which it would otherwise be entitled to receive as a contribution towards the rates. We understand the Committee have this subject under their serious consideration. The profits of the department, which were formerly handed over to the Improvement Committee, are now placed to the general credit of the city fund."

WEST SURREY WATER COMPANY.—The half-yearly meeting of this Company was held last Tuesday. From the report and statement of accounts we see that the income for the half year, after making provision for empty houses, irrecoverable rates, &c., amounted to £2137, and the expenditure to £873. Compared with the corresponding half of last year, the income exhibits an increase of £157 17s. There were laid 3031 yards of 3-inch and 4-inch mains; and 65 new supplies were connected, representing a future rental of rather more than £196 per annum. The new filter-bed, which is in course of construction, will shortly be completed. Referring to the Bill which the Company promoted in the last session of Parliament, the Directors report that it received the Royal Assent on July 24. It will be remembered that the object of the Bill was to increase the share capital by £40,000 and the borrowing powers by £10,000. It is intended to issue £12,500 of debenture stock as soon as practicable, in place of the £12,500 of mortgage bonds outstanding, £9125 of which fall due in January next. As it may be necessary soon to acquire land, under the powers of the new Act, for the construction of a subsiding reservoir, it is proposed to issue further ordinary or preference share capital, as the capital authorized under the Company's Acts of 1869 and 1877 has now all been issued and paid up. The report and accounts were adopted; and the payment of a dividend at the rate of 3 per cent. per annum upon the ordinary shares was agreed to.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.
(For Stock Market Intelligence, see ante, p. 411.)

Issue.	Share	When ex-Dividend.	Dividend of Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon invest-ment.
£			p. c.					£ s. d.
GAS COMPANIES.								
590,000	10	12 Apr.	10½	Alliance & Dublin 10 p. c.	10	18-19	..	5 10 6
100,000	10		7½	Do. 7 p. c.	10	13-14	..	5 7 1
800,000	100	2 July	5	Australian (Sydney) 5% Deb.	100	110-112	..	4 9 3
100,000	20	30 May	10	Bahia, Limited	20	23-25	..	8 0 0
200,000	5	11 May	7½	Bombay, Limited	5	7-7½	..	5 0 0
40,000	5		7½	Do. New	4	5-5½	..	5 9 1
380,000	Stock.	23 Aug.	11½	Brentford Consolidated . . .	100	220-225	+1	5 4 5
110,000			8½	Do. New	100	161-166	+½	5 5 5
220,000	20	14 Mar.	10½	Brighton & Hove, Original .	20	44-46	..	4 11 3
320,000	20	12 Apr.	11	British	20	45-47	..	4 15 9
50,000	10	14 Mar.	11	Bromley, Ordinary 10 p. c.	10	20-22	..	5 0 0
39,000	10		8	Do. 7 p. c.	10	134-144	..	5 10 4
328,750	10	30 May	8	Buenos Ayres (New) Limited	10	134-142	..	5 10 4
200,000	100	2 July	6	Do. 6 p. c. Deb.	100	108-110	..	5 9 1
150,000	20	10 Aug.	7	Cagliari, Limited	20	25-27	..	5 3 8
50,000	Stock.	12 Apr.	13½	Commercial, Old Stock . . .	100	268-273	+2	5 0 8
130,000	5		10½	Do. New do.	100	211-216	+3	4 19 6
121,234		28 June	4½	Do. 4½ p. c. Deb. do.	100	123-128	+3	3 10 3
557,320	20	14 June	12	Continental Union, Limited	20	454-464	+½	5 1 0
212,680	20		12	Do. New '69 & '72	14	204-209	..	5 10 0
200,000	20		9	Do. 7 p. c. Pref.	20	35-37	..	1 17 3
75,000	Stock.	28 Mar.	10	Crystal Palace District . . .	100	205-215	..	4 13 0
234,060	10	27 July	13	European, Limited	10	274-284	..	4 18 1
120,000	10		13	Do. New	7½	184-194	..	5 0 0
374,000	10		13	Do. do.	5	124-134	..	4 16 3
5,468,350	Stock.	29 Aug.	13	Gaslight & Coke, A, Ordinary	100	253-257	+2	5 1 2
100,000			4	Do. B, 1 p. c. max.	100	98-103	..	3 17 8
665,000	"		10	Do. C, D, & E, 10 p. c. Pf.	100	258-263	..	3 16 1
30,000	"		5	Do. F, 5 p. c. Prf.	100	125-130	+½	3 16 11
60,000	"		7½	Do. G, 7½ p. c. do.	100	182-187	+½	4 0 2
1,300,000	"		7	Do. H, 7 p. c. max.	100	167-172	+½	4 1 4
463,000	"		10	Do. J, 10 p. c. Prf.	100	256-261	..	3 16 7
1,061,150	"	14 June	4	Do. 4 p. c. Deb. Stk.	100	120-123	..	3 5 0
294,850	"		4½	Do. 4½ p. c. do.	100	125-130	..	3 9 3
650,000	"		6	Do. 6 p. c. do.	100	175-178	..	3 7 5
3,600,000	Stock.	11 May.	10	Imperial Continental	100	246-249	..	4 15 8
75,000	5	14 June	5	Malta & Mediterranean, Ltd	5	5-5½	..	5 9 1
560,000	100	3 Apr.	5	Met. of Melbourne, 5 p. c. Deb.	100	114-116	..	4 6 2
541,920	20	14 June	6	Monte Video, Limited	20	20-21	..	5 14 3
150,000	5	30 May	10	Oriental, Limited	5	94-94½	..	5 2 7
60,000	5	28 Mar.	7	Ottoman, Limited	5	6-7	..	5 0 0
People's Gas of Chicago—								
420,000	100	2 May	6	1st Mtg. Bds.	100	107-110	+2	5 9 1
500,000	100	1 June	6	2nd Do.	100	95-100	..	6 0 0
100,000	10	26 Apr.	10	San Paulo, Limited	10	16-17	..	5 17 8
500,000	Stock.	29 Aug.	15½	South Metropolitan, A Stock	100	308-313	+½	4 19 0
1,350,000	"		12	Do. B do.	100	241-246	..	4 17 6
141,500	"		13	Do. C do.	100	245-255	+½	5 1 11
550,000	"	28 June	5	Do. 5 p. c. Deb. Stk.	100	135-140	..	3 11 5
60,000	5	29 Aug.	11	Tottenham & Edm'ton, Orig.	5	11-13	+½	4 4 0
* Ex div								
WATER COMPANIES.								
717,467	Stock.	28 June	9	Chelsea, Ordinary	100	256-261	+2	3 9 0
1,720,560	Stock.	12 Apr.	7	East London, Ordinary . . .	100	197-202	..	3 9 4
700,000	50	14 June	9	Grand Junction.	50	124-128	..	3 10 4
708,000	Stock.	10 Aug.	10½	Kent	100	269-274	..	3 16 7
1,043,800	100	28 June	9	Lambeth, 10 p. c. max.	100	258-263	..	3 8 5
406,200	100		7½	Do. 7½ p. c. max.	100	204-209	..	3 11 9
200,000	Stock.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	118-122	..	3 5 7
500,000	100	27 July	12½	New River, New Shares . . .	100	347-352	..	3 8 10
1,000,000	Stock.		4	Do. 4 p. c. Deb. Stk.	100	123-127	..	3 3 0
902,300	Stock.	14 June	6	S'hwk & V'xhall, 10 p. c. max.	100	162-167	..	3 11 10
126,500	100		6	Do. 7½ p. c. do.	100	157-162	..	3 14 1
1,155,066	Stock.	14 June	10	West Middlesex	100	264-269	..	3 14 4

† Next dividend will be at this rate.

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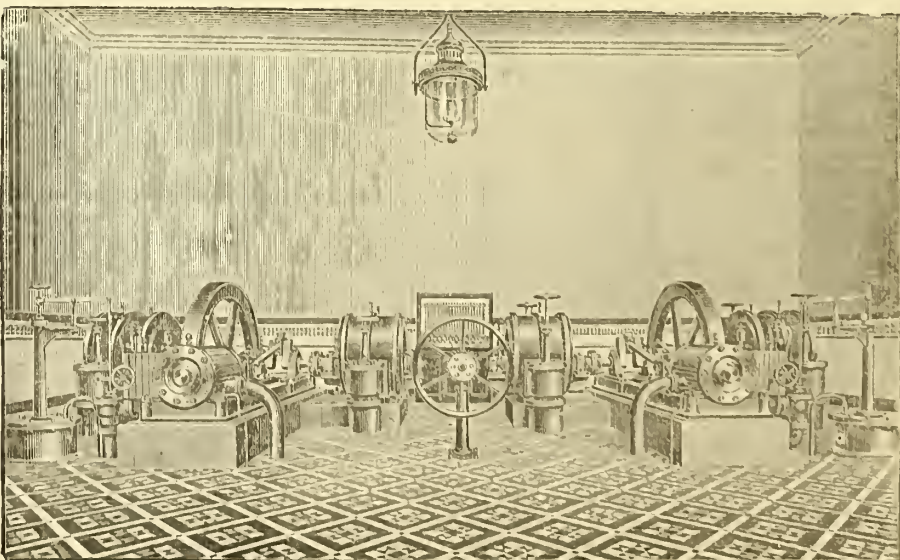
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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, SEPTEMBER 11, 1888.

SIR FREDERICK BRAMWELL'S PRESIDENTIAL ADDRESS. THE British Association for the Advancement of Science met last week at Bath; and Sir Frederick Bramwell, the President for the year, delivered an inaugural address which has by this time gone the round of the press, and evoked hundreds of commentaries. Most of these newspaper critics are attracted by the peculiar description with which Sir Frederick Bramwell prefaced his address. He said that his remarks

would be divided into two sections, the first of which would be devoted to the "next-to-nothing;" while the second would be a eulogium of civil engineers and their works. Sir Frederick Bramwell, eminent as he undoubtedly is, has his detractors; and there are many who do not believe in him. To these irreverent ones the thought will occur that this is not the first time that the great Engineer, who is in such demand as an expert witness in patent-law cases, has made good use of next-to-nothing. The address as a whole has not made a deep impression on the public; being generally regarded as heavy, and lacking novelty. The scheme of it is good; but the execution is certainly disappointing. There are two extremes into which Presidents of the British Association are apt to fall. Some of them set the semi-popular character of their audience entirely at naught, and discourse hour after hour upon the most abstruse refinements of their own speciality; while others think chiefly of this and of the still shallower newspaper readers who will peruse the reports of their address, and shun everything but trivialities which they think will be understood by the veriest skimmer of news who at any time would prefer a murder to a monologue. There is plenty of scope for a really interesting and instructive address between these extremes; but it requires a man of real genius for exposition to make the best use of the opportunity. The President of the British Association occupies an exceptional position. He is regarded by his countrymen as the spokesman of contemporary science. What the public want to hear from his lips is an intelligible account of the work of scientific men—an exhibition of the fruit of the laboratories—for the year. They do not expect him to know everything; but as a specialist with scientific sympathies not wholly restricted to his own department, they look to be guided by him over his own scientific domain, and to enjoy the view therefrom over the surrounding country. If one judges Sir Frederick Bramwell's address upon this principle, it will be found decidedly disappointing. It did not even fulfil the author's own description; for the exposition of the value of apparently small facts which was promised by the fantastic sub-title already mentioned, is by no means so striking as it might have been in any part of the composition. The only point in which it comes up to the author's promise is in respect of the laudation of the civil engineer as a servant of humanity and a hastener of human progress in the way of material civilization. It does this with all unction; but somehow the subject lacks novelty and interest. Civil engineering is a noble study, which has for its objects not merely the direction of the great sources of power in Nature for the use and convenience of man, as Thomas Tredgold defines it, but also the correction, for man's convenience, of the conditions under which he exists upon this planet. It is the province of civil engineering to smooth man's way upon the earth and over the sea; to facilitate his communications with his kind, and so to improve the distribution of goods and ideas among the nations; and to enable man to escape in many respects from the tyranny of natural influences. All this is patent; and engineers are not at all likely to fall short of a due appreciation of their own worth. To the student of humanity at large, however, many of the triumphs of engineering sometimes appear of only questionable value in the great valuation of human blessings and burdens. Sir Frederick Bramwell talks of a steam-engine as though it were an unmixed good; but a philanthropist does not regard the factory system of manufacture, which is the direct outcome of steam-power machinery, as an undoubted blessing of civilization. It is doubtless a great thing for an engineer to make a machine of iron and brass to do the work of men's hands; but when the converse happens as a consequence of his triumph, and generations of men are reduced to work as mere machines, the result is not so pleasant to contemplate.

General considerations of this order are not for us, however; and we must turn to the portions of the address that treat of subjects in which we are specially interested. Of course, Sir Frederick Bramwell had a good deal to say about steam-engines; but he said nothing new. Referring to the wastefulness of steam-engines, even of the best construction, he followed the late Sir William Siemens in holding out great expectations respecting the gas-engine as a substitute for the steam motor. He gave a brief history of the gas-engine, from the project of M. de Rivaz in 1807 to the present day, which reads like an abstract of evidence tendered for the guidance of the Court in the last gas-engine patent lawsuit. In stating, however, that gas-engines have become a great commercial success "by the attention given to small

"things, in popular estimation—to important things in fact"—Sir Frederick Bramwell strains the truth in order to make it fit his own temporary requirements. Of course, a good deal of study of detail has gone to the production of the highest type of the modern gas-engine; but the success of this motor is due to insight on the part of the makers into the true conditions of their economy. The discovery of the benefit of the compression of the charges, and of the practicability of the "Otto" cycle, cannot be classed among those apparent trifles which the practical man alone knows to be important. Sir Frederick Bramwell thinks that great things are possible for vapour-engines utilizing the expansive force of vapours given off from petroleum spirits more volatile than water; but Mr. Yarrow's petroleum-vapour launches are the chief support of this idea, which has been worked upon by many skilled mechanics without much encouragement. The address also touched upon the distribution of power in towns by gas, high-pressure water, and compressed air, although in a very cursory way.

As we expected, Sir Frederick Bramwell had something to say about electric lighting; and especially in abuse of the Electric Lighting Act. He appeared in opposition to this Act when his connection with the Edison and Swan Company, which entitled him to describe himself to the Parliamentary Committee as an electrician, was a novelty; and he has never forgiven Parliament for ignoring his advice upon that occasion. He now goes so far as to assert that science has suffered from the passing of the Act in 1882, which practically forbade the lighting of districts from a central distributing station—as though it lay in the power of the British Parliament to stop the advance of science all over the world! The modification of the Act last session did not satisfy Sir Frederick; for he still regards the measure as "a great discouragement of free enterprise, and a bar to progress." There is evidently much sympathy between the two eminent brothers Bramwell; for Lord Bramwell himself could not more strenuously advocate the divine right of all persons to do just as they please without communistic reservations, than Sir Frederick Bramwell does when complaining that electricians are not in this country allowed to do what they like, as they are in the United States. Not only does he fall foul of Parliament, but the local authorities also come in for censure, because they are prone to protect themselves against the meritorious electricians who would seek to monopolize towns for their own benefit. He calls the new law a "boa-constrictor" of an Act, and waxes very indignant over the way in which it enables Englishmen to obstruct English progress in electric lighting. It is rather remarkable that he does not say one word respecting the existence of any real impediments in the path of electric lighting engineers, whether due to the low price of gas in England or otherwise. Also, as we expected, Sir Frederick Bramwell never mentioned gas lighting during the whole of his address, although, when speaking of the poetical, political, or social aspects of engineering, he might have referred (without going out of his way) to what gas has done for civilization by facilitating public meetings, rendering streets safe after nightfall, and, in short, converting the long nights of winter from their primeval gloom into opportunities for study, discussion, and social intercourse such as Rome or Athens never possessed. We do not, however, wish to find fault with Sir Frederick Bramwell for anything he did not say; for it must be generally acknowledged that the amount of information which cannot be compressed into a single address of practicable length is very voluminous. If we are to criticize the address at all, it must be on the score that what it contains is not new, and is not recounted in a very entertaining manner. Whatever explanation of Sir Frederick Bramwell's contemporary reputation is to be conveyed to posterity, his memory will owe nothing to his Bath address.

THE HALIFAX CORPORATION AND MR. W. CARR.

The attention of the Halifax Town Council is at present absorbed by what is known locally as "the gas scandal;" and there is no very clear indication as to when the end of this peculiar business is likely to be reached. The matter came before the Council at their last monthly meeting, when the Mayor (Alderman James Booth) made a statement some part of which we cannot do better than follow, almost *verbatim*, in order to show the actual state of affairs. About two months ago certain statements appeared in the *Pall Mall Gazette*, and certain letters were received by the Town Clerk, imputing the existence of malpractices in Halifax, especially in connection with the management of the Corporation gas-works. These

insinuations naturally created considerable commotion; and a Sub-Committee of the Corporation was appointed to deal with the matter. Mr. T. Fox, of the Silkstone Coal Company, came forward as the accuser, and said that he "could a tale unfold" if he were indemnified by the Corporation for the consequences of publishing his allegations. The required indemnity was readily promised; but it was subsequently discovered that the Town Council had not the power to give it, and that it must be given, if at all, by the Mayor, acting for the Corporation. When the matter was thus brought down to a semi-personal issue, however, the Mayor and his advisers of the Sub-Committee appear to have suddenly changed their minds as to the method of procedure; and instead of giving Mr. Fox the safeguard for which he had stipulated, and which was all he professed to require in order to make good his aspersions upon the management of the Gas Committee, they turned upon Mr. W. Carr, the Engineer to the Gas Department, and suggested that, as he was directly implicated in the affair, he should personally bring an action against the *Pall Mall Gazette*. Mr. Carr did not see the point thus laid before him, and "did not seem disposed to take action," as the Mayor put it. Whereupon the Mayor brought the question before the Town Council, who have unanimously agreed that Mr. W. Carr should be ordered to choose immediately between bringing his action and sending in his resignation. The Mayor was good enough to promise that, in the event of his being able to prove his innocence of the misconduct imputed to him, or fail in his case upon any merely technical point, Mr. Carr should not lose money by the proceedings. It was artfully—there is no other term for it—suggested that the circumstances connected with Mr. Carr's application for the Nottingham appointment placed a peculiar responsibility upon him in this respect. Thus the position taken up by the Mayor and the Town Council had an air of fairness imparted to it by these two considerations which, when stated in all its bareness, it conspicuously lacks. We trust that it is scarcely necessary for us to disclaim any intention to pronounce judgment in this delicate case, which in fact, if not in form, must be regarded as *sub judice*. We think it only common fairness, however, as all the Town Council of Halifax have declared against their own officer, that whatever can be advanced upon his behalf by a disinterested observer, with no more knowledge of the facts than such as may be gleaned from published reports, should be stated. The Mayor and Town Council of Halifax have ordered their Gas Engineer to choose between taking action and resignation. It is a host against one; but we declare, without reference to the merits, that the Corporation are not acting rightly in this matter. In calling upon Mr. Carr to move at this time of day, after they have dallied for months with his accuser and theirs, they have executed a manœuvre which is apparently inspired as much, if not more, by desire to save themselves money and trouble as by anxiety for a proper inquiry. We fail to find any justification now for the attempt to "put the boot upon the other leg" that would not have been more weighty in the first place than after all this coquetting with Mr. Fox. The libel printed by the *Pall Mall Gazette* remains unaltered, and to argue, as the Town Clerk did at the Council meeting, that it is made any worse or more definite because "the Committee had been told in confidence that Mr. Carr's name was 'one of three which would be mentioned,'" is a very hollow excuse for the Committee's change of front. We hold that, having begun with Mr. Fox, the Committee should either have gone on with him or have dropped him altogether, and not have trafficked with him until they got a name—it might have been of the Chairman of the Gas Committee, or of anybody else, as well as Mr. Carr—and then abandoned all idea of indemnity—because it "seemed simpler" to turn upon the individual named. Nothing that Mr. Fox or other any other informer can tell the Halifax Committee "in confidence" can implicate Mr. Carr more deeply than he was from the first by the publication of the *Pall Mall* article. If the Town Clerk said, as is reported, that at the time when the Council consulted by the Corporation gave his opinion that there was not sufficient ground for anybody to take action against the newspaper named "the world did not point to Mr. Carr, but it did now," he made a grave blunder and seriously misled the Town Council. Mr. Carr would be quite justified in declining to recognize the validity of the resolution of the Council, if his health, which is notoriously bad, permits him to take up a strong position in opposition to the Corporation. He may decline to commence an action which the legal adviser of the

Corporation has declared would be futile; and he may decline to resign his office. If the Corporation were then to remove him compulsorily, he would have his remedy in an action for wrongful dismissal. It appears to us, therefore, that the position into which the Mayor has led the Corporation is a false one, from which they should try to extricate themselves as speedily as possible.

THE ABANDONMENT OF THE PROPOSED AUTUMN MEETING OF THE GAS INSTITUTE.

A MEETING of the Council of The Gas Institute was held this day week, at which, as we are informed, it was finally decided not to hold the extraordinary general meeting in the course of the autumn which was promised in the circular issued by the President a month ago. Upon the faith of this announcement, we have lived for the past few weeks in the expectation of such a gathering of the members of the Institute to be convened some time before the winter sets in. It appears to the President and Council, however, upon fuller consideration, that much inconvenience and expense to the members generally will be saved by postponing the matters which the proposed extraordinary meeting would have had to deal with to the ordinary meeting next year. It was feared that there might be a difficulty in getting together a really representative meeting of members at the beginning of the winter season, when the responsibilities of gas managers are most harassing. This idea seems, indeed, to have prevailed extensively at the time of the previous Council meeting at which Mr. Woodall's circular was discussed; and if so, it must have been owing to some misunderstanding that the proposal to hold an extraordinary general meeting appeared as a definite promise in the circular in question. This, however, is a small matter, which affects only the President and Council. The President could call the extraordinary meeting if he chose; but he has no desire to act otherwise than with those who now share with him the responsibility of administering the affairs of the Institute. We are not disposed to question the wisdom of the decision arrived at last Tuesday; for we should be very loth to put any additional difficulty in the way of Mr. Woodall and his colleagues of the Council, who will have as much as they can do to right the Institute by next June. They must be credited with having weighed the arguments for and against an extraordinary meeting, not only from their own individual standpoints, but also with due regard to the wishes of such of their fellow-members as they have been able to confer with; and it is to be hoped that they have decided for the best. All the same, we retain our view that it would have been much better, for the sake of having a pleasant and profitable meeting in June, if the members could have then met with a clean slate before them, and all the constitutional troubles into which the Institute has drifted behind them. In deciding against this view, the President and Council have deliberately reserved a vexatious and delicate business for the general assembly, where it may possibly be disposed of with ease and celerity, or, on the other hand, may effectually wreck the meeting. They have taken the risk, however, and must now abide by the issue. There is one aspect of the subject which requires a word of comment. The President has asked those members who sympathize with the retired office-bearers, to abstain from following them until he can bring out his plans for dealing with the emergency. If this had been the programme for an autumn meeting, the business would have been settled one way or the other during the current year; and members would have been able to express their contentment with the solution, or the reverse, by renewing their subscriptions or notifying their intention to withdraw. Now, as it appears to us, the President must trust still more to the goodwill and confidence of members by asking them—in fact, if not in words—to continue their membership for another year, in the faith that he will be able to propound a cure for the evil under which the Institute now languishes. Another meeting of the Council is to be held in November, after which it is, of course, possible that a statement of policy will be issued. It may be said, indeed, that in discountenancing a general meeting before present subscriptions have run out, the Council owe to their constituents an explanation of what they propose should be done in June, in order that members may determine whether to renew their subscriptions or not. Nobody outside the Council, it may be presumed, knows what is likely to be recommended; and although members may agree to wait until November, by that time the Council should have their policy ready, and publish it in order that the proceedings at the meeting in June may be well considered and final in their effects.

Water and Sanitary Affairs.

Just before concluding his presidential address at the meeting of the British Association at Bath last week, Sir Frederick Bramwell made reference to the water supply of towns, as forming one of the topics available for the "Eulogy of the Civil Engineer." Certainly, a matter so important in its bearing on the public health could not be classed as one of the "Next-to-Nothing" series, constituting the other part of the presidential harangue, unless attention were limited to the presence of the micro-organisms, to which, as it happened, no allusion at all was made. The remarks offered by Sir Frederick showed that he considered the skill of the engineer to be specially taxed when a volume of rain water had to be stored for the supply of a large town. Meteorological considerations entered into the problem, and "huge reservoirs" had to be provided, so as to meet the contingency of three dry years occurring in succession. Fortunately, London makes no such demand on engineering skill, and is independent of any deficiency of rainfall. Whether the summer be a wet or a dry one, the Metropolitan consumer has perfect confidence that the requisite supply of water will reach him. If the water-works of the Metropolis are less imposing in their appearance than those belonging to some of our northern towns, they have the merit of meeting an enormous demand, created by a population of nearly $5\frac{1}{2}$ millions. Such an achievement, we think, might have met with a more distinct acknowledgment from Sir F. Bramwell, unless this distinguished Engineer bears in mind that London refused the benefit of his own particular scheme, proposed some years ago, whereby a second set of mains was to be placed in the streets, for the purpose of laying-on a special drinking supply. No doubt, the great engineers of the day would very much like to construct enormous reservoirs and gigantic aqueducts, to take the place of the existing works. But the humbler means may suffice. Certainty is essential in respect to the water supply of a great city; and this guarantee will be altogether wanting in the case of the Metropolis, if London is to be made dependent on a flow of water along an artificial conduit traversing a considerable stretch of open country.

Passing from the presidential address at Bath to the sectional papers, we find Mr. J. Bailey Denton proposing to replenish the underground waters of the permeable formations of England, by means of shafts to be sunk down to the line of saturation in the water-bearing strata. As concerns London, it is proposed that, whenever the Thames rises above a certain height, the superfluous water shall be diverted out of the river course on to filter-beds formed near at hand. After being freed from flocculent matter, the water is to pass down through steined shafts or sumps, so as to reach the water-level beneath. If this scheme would prevent floods, it would be a blessing to a good many owners and occupiers of land in the Thames valley above London. Otherwise it seems very like throwing away good water on the merest chance of ever seeing it again. So far as the underground waters are concerned, we think they might be left to take care of themselves. But if the project is to prevent floods in the Thames valley, let it be understood as such, though we rather fear the floods will prove too much for the sumps. As for the Metropolitan Water Supply, the probability of its being benefited by the proposed arrangement seems rather remote. Mr. Bailey Denton expects by his plan to store the flood waters—or some part thereof—underground, so as to replenish the river at Kingston when it has a tendency to run low. The propounder of this scheme is a clever Engineer; but it seems to us that the extra dose given to the subterranean regions will have gone out of reach by the time the river at Kingston stands in need of it. No doubt, a large quantity of water runs to waste in the Thames Valley during periods of heavy and continuous rain. For the mischief done by the Thames floods, we fear Mr. Bailey Denton himself, or others in his profession, must be held somewhat responsible; the extension of agricultural drainage having the effect of hastening the passage of the rainfall to the river and to the sea. First to create a flood, and then to cure it, may accordingly enter into "the eulogy," or otherwise, of the civil engineer.

A VACANCY has been created in the managership of the Maryport Gas-Works by the appointment of Mr. D. Irving to be Engineer of the Stapleton Road works of the Bristol United Gas Company. There were more than 70 applicants for the post. Mr. Irving was formerly under Mr. J. Hepworth at the Carlisle Gas-Works.

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(FOR STOCK AND SHARE LIST, see p. 478.)

DURING the past week there has been quite a revival of business on the Stock Exchange—to an extent unusual in the dead season; and the general tendency has been good all round. The Funds have been fairly steady; the Foreign Market undisturbed by forebodings as to a rupture of the peace on the Continent; and Railways have been buoyant upon improved returns. Even Transatlantic Rails have had a better time. The Money Market shows no change; and the existing rate seems good enough to last some while longer yet. The Gas Market has been only moderately active; but several changes in the quotations have taken place, and they are all in the upward direction—with the one exception of Gaslight "A." It opened firmly enough, and was marked on Monday at 257—the top price; but from that it gradually eased off to 254, the nominal quotation showing a drop of 1 for the week. The 10 per cent. preferences, however, have been in good demand, and exhibit an improvement of 2. South Metropolitan have been very quiet. The "B" stock has improved $1\frac{1}{2}$; but the "A" has been left standing. At existing prices it will bear a rise; and the "C" is decidedly too low. If there were any business in it, it should stand 5 higher. The prospect of the improved dividend has worked a further advance in Commercial; the old stock gaining 6, and the new stock 3. Some little business has been done in them at good figures. Of the Provincial Companies, Alliance and Dublin old has recovered the slight abatement it suffered three weeks ago; but the new stock is unchanged. British has gained 1 more; and it can hardly be bought to return $4\frac{3}{4}$ per cent. for money. All the Provincial and Suburban Companies, in fact, are well up in price. Of the Foreign undertakings, Imperial Continental is a little firmer, and marks an advance of 1. Buenos Ayres has been in good demand, and has risen 1, which is a 10 per cent. improvement on the £10 shares. All other issues dealt in show general firmness; but their quotations remain unchanged. The Water department has been very quiet, but all the Companies stand very firm; and though the old quotations are left undisturbed, the transactions marked have been at high figures.

The daily operations were: Moderate business in Gas on Monday, with firmness throughout. Commercial old rose 5; and the new, 2. Business in Water was confined to Lambeths. Tuesday's Gas business was mostly in Gaslight "A," which began to get easier. The 10 per cent. preferences, however, rose 2; South Metropolitan "B," $1\frac{1}{2}$; Commercial 1 more each; and Buenos Ayres, $\frac{1}{2}$. Nothing was done in Water. On Wednesday, Gaslight "A" and Imperial Continental were the most dealt in. The former fell 1, and the latter rose 1. Buenos Ayres advanced another $\frac{1}{2}$. Water business was all in West Middlesex, which was done at top price. Thursday was very quiet. British Gas rose 1, and Alliance and Dublin, $\frac{1}{2}$. In Water, West Middlesex again marked top price. Gas was more active on Friday, without any further change; and Water presented nothing for remark. Very little business on Saturday was done in Gas, and none at all in Water. All quotations remained unvaried.

ELECTRIC LIGHTING MEMORANDA.

ELECTRIC LIGHTING AT THE BRITISH ASSOCIATION MEETING—MR. PREECE'S ESTIMATE OF THE COST OF ELECTRIC LIGHTING—THE ELECTRIC LIGHTING OF BARNET: FANCIES ILLUSTRATED BY FACTS.

ELECTRIC lighting has had very good advertisement at the British Association meeting. Sir Frederick Bramwell, the President, dragged a condemnation of the Electric Lighting Act into his Inaugural Address; but he did not say anything very definite about the application of electricity to lighting purposes. This topic was left to the inevitable Mr. W. H. Preece, the President of the Mechanical Section, who discussed it with ardour. Everybody knows who and what Mr. Preece is—or it is not his fault—and we know in advance the tenor of what he is likely to say about electric lighting. We are compelled to state, however, that if Mr. Preece's latest utterances upon the subject of electric lighting are of the character that was to have been expected from him in his self-appointed office of high-priest of the new *cultus*, their quality shows a sad falling off even from that of the papers and speeches of a year or two ago, in which the Chief Electrician to the Post Office used to narrate how he had triumphantly adapted electric lights for the decoration of a doll's house. One paragraph of the Presidential Address with which Mr. Preece regaled his section may be cited to prove the truth of this allegation. He said that "electric lighting has become popular, not alone from the beauty of the light itself, but from its great hygienic qualities in maintaining the purity and coolness of the air we breathe. The electric light need not be more brilliant than gas; but it must be more healthy. It need not be cooler than a wax candle; but it must be brighter, steadier, and more pleasant to the eye. In fact, it can be rendered the most perfect artificial illuminant at our disposal; for it can illumine a room without being seen directly by the eye; it can be made absolutely steady and uniform without irritating the retina; it does not poison the air by carbonic acid and carbonic oxide, or dirty the decorations by depositing unconsumed carbon; it does not destroy books or articles of vertu and art by forming water which absorbs sulphur acids; and it does not unnecessarily heat the room." Mr. Preece's multitudinous labours evidently prevent him

from paying attention to the refinements of literary style, for more slipshod diction than this is seldom found in the pronouncements of English men of science. Apart from the demerits of the composition, however, its matter is illogical and for the most part rubbishy. How can electric lamps possess "hygienic qualities," for example, which assist it in "maintaining the purity and coolness" of air? They are neither made of ice, nor of disinfectants. Why, again, "must" electric lamps be more healthy than gas? And are these the only lights that can "illumine a room without being seen directly by the eye, or can be made" absolutely steady and "uniform"? What has the "irritation of the retina" to do with the precautions for rendering lights steady? Here Mr. Preece's method of expression is desperately at fault; for his words read as though he meant to say that the retina is so interested in having lights jerky and irregular, that it is difficult to make them steady without "irritating" it, except only in the case of electric lamps. Mr. Preece talked a good deal more nonsense about electric lighting, which we cannot follow in detail. He declared that in the Central Post-Office Savings Bank in London, electric lighting has saved £640 a year in the improved health of the staff. As he was compelled to admit that the installation cost £3349 to lay down, and £1034 a year in working, against £700 a year previously paid for gas, it is easy to see why he was anxious to show a saving somewhere.

Perhaps the most interesting part of Mr. Preece's address, however, was his statement of the cost of electrical and other forms of power. He said that the actual cost of production of one candle light per annum of 1000 hours is at present, for London, as follows:—Sperm candles, 8s. 6d.; gas, 1s. 3d.; petroleum, 8d.; electricity (incandescent), 9d.; electricity (arc), 1½d. This is an amazing computation; and we do not hesitate to characterize it as misleading. It is prefaced by a hasty sort of explanation, in which it is asserted that the cost of producing electricity for lighting purposes by steam is 3d. per Board of Trade unit. The charge for supplying current by the Grosvenor Gallery Company is stated at 7½d. per unit, which at the usual valuation of a unit being equal to 100 cubic feet of common coal gas, is equivalent to a charge for the same gas of 6s. 0¾d. per 1000 cubic feet. Seeing that gas is to be had in the Grosvenor Gallery district for less than half this rate, it is a mystery how Mr. Preece can bring out his calculation that gas is 75 per cent. dearer in use than incandescent light. Taking his statement in another way, by his own showing in another part of the address a candle power developed in an incandescent electric lamp absorbs 3 watts of current. A 16-candle lamp will, therefore, require 48 watts of current—say 50 for the sake of simplicity of calculation. Twenty of these lamps may be supplied for an hour, at the rate of charge of the Grosvenor Gallery Company, for 7½d. Twenty gas lamps of equal power would consume, if Argands of the standard pattern, 100 cubic feet of gas in the same time; and this would cost, including meter-rent, rather less than 3½d. Or, as Mr. Preece of course takes the best possible results for electric lighting, although he does not say where the figures given in his statement may be proved by examination of actual working, we will claim the liberty of accommodating the calculation to the results of burning gas in regenerative lamps, which can now be had of any respectable gas-fitter; and it will then appear that the consumption of gas falls to one-half, as compared with the London Argand. Hence we say that what the Grosvenor Gallery Company charge 7½d. for, can be supplied by gas consumed by means of regenerative lamps for something like 1½d., or rather less. If we are wrong, we can be corrected. Mr. Preece perhaps thinks that he occupies a position that enables him to say anything he pleases. So he may, provided that he does not look to be believed.

The local magnates of Barnet are pluming themselves greatly upon at last seeing the electric light in their streets. The drum electrical has been industriously thumped once more; and in various newspapers Barnet is held up as an example of "progress," which all the other benighted towns of the kingdom that retain gas in their highways should first admire, and then copy. It is ludicrous as well as sorrowful, to see how all experience goes for nothing with newspaper reporters when it is a case of a town adopting electric light for its streets. There is held to be something meritorious in the mere alteration from one system of lighting to the other; and such trivial details as questions of cost and efficiency are held to be irrelevant to the merits of the case. How else can one explain the fact that Barnet is loudly proclaimed in a London daily paper to have "shown a bold lead, and set an honourable example worthy of extensive imitation," merely because the Local Board have done over again what the great majority of local authorities all over the country have done before them at different times during the last six years, and have repented of sooner or later. One would think, from all the crowding of the electricians and their faithful friends of the press over little Barnet, that this is the first experiment in electric lighting that was ever heard of in the land, instead of being the last. Meanwhile, local opinion is greatly exercised upon the point whether the Local Board have done wisely or made a foolish exchange of old lights for new ones. The electrical contractor has replaced 104 gas-lamps, costing £342 per annum, with 71 electric lamps costing £383, and an extra charge for all-night lighting not yet ascertained. The people are asking themselves where is the gain of the exchange; and the local newspaper declares it to be "questionable whether the general effect of the electric light in our streets is such as to entitle it to claim superiority over that which it has replaced." It is further remarked that the ratepayers "welcomed

the electric light because they were led to believe that gas could be replaced lamp for lamp by electric light of equal power and at less cost. The fallacy of that belief is now apparent." Poor rate-payers of Barnet! They should turn for comfort to the declarations of Mr. Preece above cited, where they will learn that electric lighting ought to be cheaper than gas, if unfortunately it is not as a matter of fact. What a commentary, however, is this experience of the Barnet people upon electricians' promises; and how it shows up the real value of electrical "progress" when brought down to the level of hard cash.

THE DISTRIBUTION OF MOTIVE POWER.

THE distribution of motive power from central stations to subscriber's houses forms the subject of an interesting article by M. Ph. Delahaye in a recent number of the *Revue Industrielle*, in which the writer comments upon the various systems whereby this service is effected. The topic is one that constantly reappears in the pages of scientific journals; being, like technical education, something that can be talked and written about without fear of injury to theories by contact with too many inconvenient facts. It is a question that is capable of being regarded from different standpoints. The social reformer looks at it as offering a promise of the gradual abolition of the factory system (which may be described as that of bringing the workpeople to the centre of power) by distributing the power to the workpeople in their homes. More practically, it is regarded as a plan whereby certain undertakings for the public supply of fuel and force in different forms may supplement their principal sources of revenue. It is between these extremes that there is a wide range of debateable land, upon which the general question may be discussed from all sides.

As M. Delahaye remarks, the proposal to distribute power from house to house has been reinforced of late, as a practical question, by two or three new processes, which increase to at least six the number of systems available for the purpose in towns of any importance. The most extended of all these is certainly gas; for it is applicable wherever there is a great or a little gas-works. Water, M. Delahaye thinks, may render analogous services in certain privileged countries, as, for example, in Switzerland. Compressed air he only knows of in Paris; and the same is remarked of rarefied air. But it is stated that the existing installations of these systems are not likely to find imitators. Steam is employed in New York, and hot water in Boston; or at least there exist in these places systems of distribution of steam and hot water capable of being utilized for the production of power. And, finally, electricity is beginning to appear as a rival to the gas-engine, and may be made to serve a great number of industrial uses. M. Delahaye observes that means are therefore not lacking for the solution of a problem to which certain philosophers are pleased to attribute considerable importance in respect of its bearing upon the lot of the workman. It would be possible to say a great deal upon this part of the subject, in which praiseworthy intentions take the place of reasons; but it will be better for the immediate purpose to take note of the results of experience. American electric lighting companies are endeavouring to foster the general use of electric motors to utilize during the daytime the resources of their lighting stations. In most of the principal cities of the United States, there are to be found workshops, warehouses, and private residences, lit by electricity, in which electrically-driven tools, lifts, pumps, &c., are found to be very convenient indeed. Considering American habits, M. Delahaye thinks that these small installations are likely to multiply, since electricity is more convenient to use in this way than either steam or gas. It only requires a very small space, spares the trouble and dangers of coal or gas, and reduces the amount of supervision required to the lubrication of the journals. Those electric lighting stations that are already organized, therefore, find among their subscribers a new field for expansion which they are not likely to neglect. It appears that this example is probably soon to be followed in Berlin, where some electric lighting speculators are offering special terms to those of their subscribers who will use electro-motors. They offer supplies of current for machines of this type varying in power from 5 kilogramme-metres to 12-horse power; and thus meet the requirements of many industries. The smallest motors are to be supplied with one ampère of current; while the largest will take 105 ampères. Calculating upon the basis of a working year of 3000 hours, the cost of a horse power per hour under this system would vary from 0.575 franc with the smallest motors to 0.325 franc with the largest. For 2-horse power motors, which may be taken as the mean, the horse power would cost about 0.35 franc (3½d.) per hour.

M. Delahaye proceeds to state the comparative cost of power obtained from gas, after an experience of at least twelve years with good and economical motors. Last year the Paris Gas Company estimated that they sold 2,300,000 cubic metres of gas for the production of power. The number of engines and their power are not stated; but M. Delahaye thinks this may be safely taken at about 2500-horse power in all. The average consumption of gas per horse power per annum is, therefore, from 900 to 1000 cubic metres (35,315 cubic feet). Taking account of the average daily production of gas from the works of the Company, it does not appear that the demand for motive power exceeds 1 per cent. of the total output, or 4 per cent. of the day sales. At Marseilles, in 1887, it is reckoned that gas-engines amounting to 308-horse power were in use; consuming nearly the above stated average of 1000 cubic metres of gas per horse power per annum. Upon the total production of gas, the proportion required for motive power was a

little more than 2 per cent. At Brussels 134 gas-engines are returned as being in use; but their power is not given. They consume about 2.5 per cent. of the total production. With regard to these large towns, therefore, M. Delahaye concludes that the benefits of the distribution of power from house to house have not been much appreciated, to judge from the small proportion of consumers for this purpose. It is remarked that particulars relating to small towns are wanting; but that from such as are available it is proved that the general estimate of a consumption of 1000 cubic metres of gas per horse power per annum, is not far out of the way. Substituting English equivalents for these figures, it follows that in the ordinary way every horse power of energy developed by gas-engines, taking one with another, demands the consumption of about 35,000 cubic feet of gas per annum, bringing in, at the very common price of 2s. 6d. per 1000 cubic feet, a revenue of £4 7s. 6d. a year to the gas undertaking. Thus every horse power of energy developed by a gas-engine in regular work means as much rental to the suppliers of the gas as a large gas kitchen.

Thus far M. Delahaye, who, having brought out the facts of the average consumption of gas by a gas-engine, carries the subject no further. The question is, however, if with the twelve years' experience with the good machines of which he speaks, the results signalized by the Paris Gas Company are to be taken as representing what the electrical distribution of force may amount to in as many years. If, in short, electric lighting companies can only expect, after a dozen years' experience, to sell 1 per cent., or at most (as in Brussels), 2.5 per cent. of their output for motive power, it is hardly worth while for them to take any trouble in this matter. It is practically impossible in most English gas undertakings for the supply of motive power gas to be distinguished from that for gas cooking and heating stoves and for other industrial purposes; but we are of opinion that, if correct particulars could be ascertained, the average rate of Brussels would not be exceeded in many English towns—that is to say, we do not expect that many English gas undertakings send out much more than 2½ per cent. of their total production to be consumed in gas-engines. It may be said, therefore, from the bare figures, that the demand for gas for motive power is insignificant from a commercial point of view; and some people might be disposed to argue therefrom that, consequently, the whole question of distributing power from house to house is hardly worth talking about under present conditions.

This would be, however, a hasty and misleading conclusion from the evidence. There is a good deal to be done in the matter of distributing power in towns, the possibilities of which have only as yet been very superficially tested. When a matter of this kind is once started, nobody can tell what developments are given to it in the fierce competition of modern commercial and industrial life. The manager of a large gas undertaking may flatter himself that he knows a great deal about the capabilities of the commodity which he sells; but he would be astonished at some of the uses to which his gas is put after it leaves a few of the consumers' meters in the district. The indirect results of some of these industrial uses of gas are extraordinary as well as weighty. It is the same with other kinds of power distribution. An experienced person remarked only a short time ago, with regard to the proceedings of the companies that are now engaged in distributing hydraulic power in London and other English centres of population and trade, that they had materially enhanced the value of house property in the areas served by them. This somewhat striking result of power distribution is traceable to several causes; prominent among them being the facility afforded by a handy supply of safe motor power for carrying on a greater variety of trades in a given district than could be possible without this advantage. There are many modern callings for which a reliable, if small, supply of power is either absolutely necessary or of great advantage; and without hydraulic or gas power, it would be impossible to carry on these resources in some crowded city-districts. With these, however, manufacturers requiring power are able to compete with others for central situations in which to carry on their business; and this competition forces up rents. It is profitable for a gas company to serve a gas-engine belonging to a manufacturer of this stamp, moreover; for although the consumption of gas in the engine itself may not be large, it entails the consumption of a great deal more gas in workshops kept going by means of this power. From this single illustration, it will be seen how difficult it is to set bounds to the influence of a development in the direction of the utilization of power distributed from a central source.

American experience has been cited by M. Delahaye; but there are many reasons why the demand of householders in the United States cities, especially of the Northern States, for a supply of electrical power, chiefly as being more convenient than gas or hydraulic power, is to be regarded as exceptional. In England and on the Continent of Europe, it will be a very long time before mechanical power is required for anything but industrial and mercantile purposes, with the exception, of course, of such domiciliary establishments as hotels, clubs, and similar communistic interiors. In the States, on the other hand, progress in the direction of the domestication of machinery is marked. There are many causes for this. The great domestic servant difficulty, which dominates so much of the inside of American life, is largely instrumental in favouring the substitution of machine for hand labour for blacking boots, washing dishes, and other domestic work. If an inventor could bring out a machine which would do all the drudgery of a household by merely pulling out a series of knobs which could be reached by the mistress from her rocking-chair, he would make a

rapid fortune in the States, however high-priced his machines. There is plenty of money over there; but very little home comfort, according to the old-fashioned standards of European nations. So far have matters gone already in the way of remodelling manners of living, to suit the conditions imposed by the domestic servant difficulty, and the trouble-hating disposition of householders, that a description of a typical American house and the way of living in it generally appears utterly strange to English readers, who find their own language made unintelligible by fresh meanings imported into it with relation to common things. The wealthier class of Americans have tried to return to the soil, and to copy the peculiarly English institution of the "county family;" but have failed. They find nothing pleasing in the country, after spending much money in the establishment of country seats; and so they return to the towns, flying to the seaside, the mountain, or the lake only for a brief holiday in summer, like any worker. This peculiar feature of American life comes out very strikingly in a lecture on "Sanitary Science" recently delivered by Mrs. R. H. Richards, before the Franklin Institute. The lecturer remarked, "If the question were put to us now and here, Would you rather live to three-score and ten, but live half a mile from any neighbour, and twenty miles from any city, or would you rather take the chance of losing one-third of the time, and live in the midst of the dust and confusion which necessarily attend the passage of the rapidly-rolling wheels of modern progress?" who of us would not say 'Let me live while I do live.' The utter unconsciousness herein displayed of any possibility of living comfortably away from towns strikes an English reader with painful emphasis. Without going into the discussion of this question, however, for which these columns are unfitted, we are justified in citing Mr. Richards' remarks as evidence of a tendency to crowd into towns, which (with other things) makes Americans more suitable customers for electrical power suppliers, steam heating companies, and other agencies for relieving people of trouble and responsibility in the management of their households than can be found on this side of the Atlantic.

With this observation, we bring the present article to a close, repeating the main argument which we have desired to enforce—namely, that the consumption of gas for motive power should not be despised because it may appear a small thing in itself. It may have large incidental results, and its developments are too wide even now to be comprehended at a glance by the best informed expert.

THE GLASGOW INTERNATIONAL EXHIBITION. NINTH ARTICLE.

SUCH persons as use malleable iron and steel tubes for carrying gas, steam, or water will doubtless be much interested by the extensive and splendid collection of exhibits at the stand of Messrs. A. and J. Stewart, of Glasgow and Coatbridge. It occupies a prominent position at the end of the Machinery Court, just at the outlet to the open grounds. The collection is of a miscellaneous character, and, in every sense of the term, eminently instructive. Here one may obtain an excellent idea of the various purposes to which iron and steel tubes of the kind displayed are applied. Lap-welded tubes made of steel are placed on end; some of them measuring as high as 18 feet. Then there are some ranged horizontally, varying from 20 inches diameter and $\frac{1}{4}$ inch thick, and 8 $\frac{1}{2}$ inches diameter and $\frac{1}{4}$ inches thick, downwards. These tubes are used chiefly for hydraulic purposes, especially on board large ships of war. Amongst the fittings for boilers, there are stay-tubes, with the ends "upset" to preserve the thickness at the bottom of the thread, ferruled tubes, "Field" tubes, and tubes with copper ends; together with samples of tubes expanded and crushed cold, so as to show the quality of material used, and the soundness of the welding. There are numerous varieties of screwed and coupled tubes, such as are used for gas-services, &c., as also tubes with special screwed joints, which are tested up to a pressure of 1800 lbs. per square inch. Tubes of this kind are shown which were supplied by Messrs. Stewart to the British Government for the Suakim-Berber water pipe-line, and for the Russian and other mineral oil-fields. Numerous fittings are also exhibited from 12 inches diameter downwards, including several of Stewart's patent and other flanged joints; also a steel tube 9 $\frac{1}{2}$ inches diameter, $\frac{3}{4}$ inch thick, with expanded faucet formed on the end for a lead joint. These pipes are used for water-mains, where there is great pressure to be resisted. Tubes for boring purposes in water-sinking operations are seen in considerable variety, up to 12 inches in diameter, with screwed, flush, and other joints. Numerous coils of tubing are shown, one of which is square in section, and 260 feet long; another is of round section, and 200 feet long. Another is a flat coil of $\frac{1}{2}$ -inch tubing, 145 feet long; and there is a round coil of 1-inch tubing, 150 feet long. In all cases these coiled tubes are without screw joints. A very interesting feature of Messrs. Stewart's stand is a collection of specimens of water-piping in use at, and since, the time of the Roman occupation. They are of lead, stone, wood, and clay. One of the specimens is a 4-inch Roman lead water-pipe made in the year 90 A.D., and found at the villa of the Emperor Trajan, near Rome. The stone water-pipe which is exhibited is of 6 inches internal diameter, and was obtained at Manchester, where it was brought into use in the year 1808; the pressure borne by it being equal to 50 feet. An Edinburgh water-pipe, which was introduced in 1762, is of elm wood; and it had a pressure-bearing capacity of 100 to 150 feet. The pipes in the system to which this belonged were taper-jointed; and this

particular specimen has an internal diameter of 5 inches. Beside this pipe, there is a branch formed of red clay—like an ordinary drain-tile; and this is also 5 inches diameter. Lastly, close by and in comparison with these, there is shown a 9-inch steel tube, such as has been laid across the Tay Bridge, to carry water from Dundee into the village of Newport on the south side of the Tay. It has a pressure-bearing capacity of 2700 feet.

In the same department of the exhibition, there is another capital display of malleable iron and steel tubing chiefly for boiler purposes; the exhibitors being Messrs. J. Marshall and Sons, of Glasgow. It includes some of the greatest lengths that have yet been made in this country, rolled out of one strip. These specimens are shown in different diameters, and up to 30 feet in length. In addition to the usual boiler-tubes, there are also wrought-iron galvanized tubes for gas, steam, water, &c. There are likewise displayed a number of flange joints, of which Messrs. Marshall are making large quantities. By way of illustrating the character of the work done by this firm, there is on view a simple screw and socket joint, which has been tested up to a pressure of 6050 lbs. per square inch, without any kind of jointing material whatever being used. Among the other things exhibited at this stand are bends of very thin tubes, a variety of sections of tubes, and some good examples of boiler stay-tubes, which have been thickened out of the solid at the ends by staving, so that, when screwed, they have the same effective thickness at the bottom of the thread as the body of the tube.

Immediately adjoining Messrs. Marshall's stand is that of the Broughton Copper Company, of Manchester, at which there are exhibited numerous fine specimens of copper and brass manufactures. Amongst these there are brass pump and piston rods; iron rods covered with copper and brass for engineers' use; and copper and brass rods, &c. The stand is chiefly remarkable, however, for the excellent show of seamless drawn copper and brass tubes. Some of the former are 10 inches in bore; and 24 feet long. Larger diameters, but in shorter lengths, are also shown. In seamless brass tubes there are likewise specimens of unusual diameter and length. In all respects this collection of exhibits never fails to attract attention from visitors; and it is stated that it represents a sum of about £3000.

In a different part of the exhibition buildings, but in the same branch of manufactures, there is an excellent display from the works of Messrs. Wilkes and Sons, of Birmingham. Seamless and brazed copper tubes are shown ranging from $\frac{1}{8}$ inch up to 8 inches diameter; and there are also some very large copper tubes at the same stand. At a short distance from this stand, Messrs. R. Heaton and Sons, of Birmingham, have a fine collection of tubes in brass and copper, made by an entirely new process—the patent of a Glasgow engineer. The system of manufacture, it is said, is such as to impart to the tubes a greater amount of resisting power than is possessed by ordinary tubes. There are also on show brazed brass and copper tubes, and a variety of gas-fittings. The Birmingham Battery and Metal Company show the same class of goods; and in this connection special mention may be made of their steam and gas tubing, both in brass and copper. Muntz's metal and copper tubing in considerable variety, both seamless and brazed, are to be seen at the stand of Messrs. Kidston and Co., of Glasgow. Some of the tubes are of great length without joint, and are arranged as coils, being made by Sharp's patent process.

Tubing composed of other metals is shown by Messrs. W. Stevenson and Co., of Glasgow; among their exhibits being lead pipes, composition tubes, block-tin tubes, and lead-encased block-tin tubes. Messrs. T. B. Campbell and Sons, of Glasgow, show a great variety of gas, water, and steam fittings, and lead, copper, and block-tin tubing. Lead pipes are also shown at the adjoining stand of Messrs. Locke, Blackett, and Co., of Newcastle-on-Tyne.

THE PROPOSED GAS MANAGERS' ASSOCIATION FOR THE EASTERN COUNTIES.—Mr. H. Winhurst, Gas-Works, Sleaford, the issue of whose circular suggesting the formation of a District Association of Gas Managers for the Eastern Counties was noticed in the JOURNAL for the 28th ult. (p. 369), asks that those who have not yet replied to the circular will do so by Thursday next, as it is necessary to make arrangements for the preliminary meeting at the end of the present month. We are pleased to learn of the measure of success so far assured for the scheme; and, knowing that there is a large amount of useful work to be done in the district, would urge all who are in a position so to do so, to accord their support to Mr. Winhurst and those who are working with him in the formation of the Association.

A SOUVENIR OF THE LAST MEETING OF THE GAS INSTITUTE.—The Committee of the Société Technique du Gaz en France have just forwarded to Mr. William Sugg (who rendered such signal service, in the capacity of interpreter, to the party of French gas engineers who visited England last June) six silver medals commemorative of the occasion; and have asked him to present them to Mr. Charles Gandon, as President of the Institute, to Sir Julian Goldsmid, Bart., M.P., and Mr. H. M'L. Backler, the Chairmen of the Imperial Continental Gas Association and the European Gas Company respectively (by whom the French guests were so hospitably received at the Crystal Palace banquet), to Messrs. G. C. Trewby and Geo. Livesey, in token of the pleasant and instructive visits paid by the party to the Beckton and East Greenwich Gas-Works, and to Mr. Sugg himself, not only for his services as interpreter, but for the time and trouble he devoted to conducting M. Edissen and his *confrères* from place to place about London.

Notes.

A BURNER FOR NATURAL GAS.

At length, according to the *American Manufacturer*, a burner has been brought out that will satisfactorily burn natural gas. As an illuminant hitherto, this gas has been comparatively a failure, owing to the fitfulness of its light, and the low illuminating power given by ordinary burners. The inventor of the new burner is Mr. Todd, of the Campbell Burner Company, Pittsburgh. The object to be achieved was to construct a good and simple burner for a bright and steady light, out of a gas poor in carbon. The ordinary regenerative lamps are not applicable for this purpose, because natural gas is of very unstable composition, readily decomposing with heat, and depositing its carbon in the gas-ways of the burners as hard graphite. Natural gas has been found to burn best when the air supply is heated and restricted in quantity, and the gas is kept cool. Mr. Todd's lamp is constructed upon this principle: The burner is of the Argand class, with a brass shield fixed concentrically round the body of the burner, forming an air-deflector. This shield is continued down below the ordinary chimney gallery, and terminates in a double disc of perforated brass, through which all the air for the outside and inside of the flame must pass. The air going to the outside of the flame also passes through another perforated plate at a higher level; making three plates in all, which are found sufficient with most varieties of natural gas, although more may be added if required. The object of the perforated plates is to warm the air, as well as to check its flow, by means of heat conducted down to them through the outer brass shield, which encloses the burner. Murrysville gas is poorer than that from other fields in the natural gas region; and it is burnt in a Todd lamp with four perforated rings. Under these conditions, it is claimed that it gives as much light as ordinary coal gas, or twice as much as it does when consumed in an ordinary Argand burner. It is apparently only made in one size—burning 4 cubic feet per hour, and giving a light of about 15-candle power. The lamp is reported to have had great success; 25,000 of them being in use in the natural gas region.

THE COMPOSITION OF GOOD AND BAD MORTARS.

A writer to the *Builder* remarks, with reference to the superiority of ancient to modern mortar, that in many building specifications there is no reference to the exact composition of the mortar intended to be used. The writer urges that not only should the proportions of lime and sand be stated, but also that the sand should be required to be rough and sharp; and the nature and condition of the lime should be specified, with a limit to the quantity existing in the state of carbonate. The object of this latter restriction is to ensure the lime being well burnt. As an example of good mortar is cited that used in the building of St. Mary's Church, Illingworth, Halifax, where the walls, 2 feet thick, are built with the faces only in mortar, the interior of the wall being in dry stone, with a through header at intervals. These walls were built in 1777; and the composition of the mortar is compared with that of a soft and crumbling mortar taken from a garden wall said to be 200 years' old.

	Good Mortar.	Poor Mortar.
Water, lost at 212° Fahr.	1.64	1.66
Loss on ignition	2.59	3.06
Lime	28.50	24.75
Magnesia . . . . .	.61	.19
Oxides of iron and alumina	3.45	2.35
Potash . . . . .	.33	.09
Soda . . . . .	.25	.16
Carbonic acid	18.80	17.13
Sulphuric acid . . . . .	.73	.65
Chlorine . . . . .	.05	.04
Silica (present as silicate of lime)	11.30	2.80
Insoluble siliceous matter.	31.75	47.12
	100.00	100.00

Equal to carbonate of lime 42.72 .. 38.93

It will be noticed that in the good mortar there is 11.30 per cent of silica present as silicate of lime, such as occurs in good Portland cement; whereas in the other sample there is only 2.80 per cent. The former is very hard, and difficult to separate from the stone; while the latter is soft and friable. Microscopic inspection showed that the sand in the good mortar is rough, with sharp edges; while in the other sample it is round, like sea or river sand.

THE PERMEABILITY OF CEMENT MORTARS.

In a recent number of the *Annales des Ponts et Chaussées* appears an article, by Messrs. L. Durande-Claye and P. Bebray, upon the permeability of Portland cement mortars. While conducting some experiments upon samples of cement mortar taken from various marine works in England, France, and Belgium, these Engineers discovered that all these mortars were permeable. A block of the material placed in such a position in an earthenware dish as to divide it into two compartments was rapidly penetrated by a 6 per cent. solution of magnesium sulphate poured into one of the compartments; all leakage past the block being prevented. As fast as the salt solution filtered through, it was constantly removed by a syphon, and more poured into the first compartment. After sixteen days, a crack 3 or 4 centimetres long appeared in the block of mortar; and next day another crack manifested itself—the block meanwhile swelling in the process. It was then determined to institute a number of experiments upon concrete with

clean water, chloride of magnesium solution, and magnesium sulphate solution. The arrangement finally adopted was to plug one end of a glass tube about 1½ inch diameter with the cement mortars under examination, the other end of the tube being closed with an india-rubber stopper, through which passed a tube about 40 inches long, connected with a flask of the testing solution. The cement mortar employed was composed of one of cement (by weight) to four of sand, gauged with quantities of water varying in different samples from 0.07 up to 0.12 per cent. of the total weight of the mixture. The rate of filtration in all the experiments was very rapid at first, but diminished as time went on; and finally became extremely slow. The glass tubes invariably cracked after a few days, from the swelling of the cement plugs; so that the experiments could not be long continued. Three sets of experiments were completed, in the first of which the mortar gauged with the least addition of water proved to be the least permeable. The effect of the magnesium chloride solution was much less than that of magnesium sulphate of the same strength. Analyses showed that the mortar, after having been acted upon by the latter solution, contained from 0.75 to 0.80 per cent. of sulphuric acid; and to this fact the authors are led to ascribe the occasional failure of cement concrete when saturated by salt water, for the acid combines with the lime to make solid sulphate of lime in the interior of the mass, the crystalline formation of which gives rise to considerable internal stresses, whilst the magnesia is washed out in the form of a thin, non-coherent cream.

BRICKLAYING IN FROST.

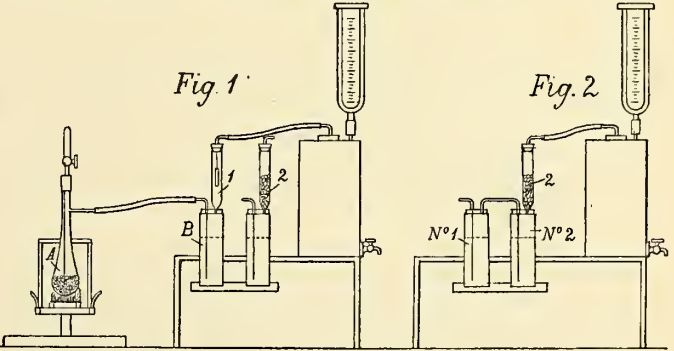
The possibility of carrying on bricklaying and mason's work in frosty weather is occasionally discussed in engineering journals, wherein it is generally regarded as a question only applying to emergency work. A statement has recently been published in the *Engineering and Building Record*, taken from a report that first appeared in a St. Louis newspaper, which goes to show that, although bricklaying is sometimes done in the latitude of St. Louis during the winter, it is much more costly than work done in milder weather. The upper part of the St. Paul *Globe* building was completed in December while the temperature ranged from - 15° to + 15° Fahr.; and the builders are of opinion that that part of the work is as sound as the rest. The bricklayers used salamanders, slaked their lime with hot water, heated the bricks, and laid them in the hot mortar. Thus good adhesion was secured before the frost could take hold upon the work. A man can only lay half as many bricks under these conditions as he can when the precautions against freezing are not required; and it is considered that alternations of frost and thaw would be more detrimental to newly-laid brickwork under any circumstances than a period of long-continued frost.

Communicated Article.

MODIFICATION OF HARCOURT'S COLOUR TEST.

By WILLIAM G. HICKS, Assistant Engineer of the Ramsgate Corporation Gas-Works.

As promised in my article appearing in last week's *JOURNAL*, I will now give a description of the modification of Harcourt's colour test which I have used with great success.



Referring to the illustrations, A is the platinized pumice bulb; B is the test-glass for sulphuretted hydrogen, with acetate of lead paper suspended in the tube 1; C is a test-glass, to be placed second in testing for ammonia and carbonic acid. It is provided with a tube 2 partly filled with beads. The rest of the apparatus is the same as Mr. Harcourt's, except the measures, which are divided into cubic centimetres.

Test for Ammonia.—Place a measured amount of standard solution of sulphuric acid (the same as is used with the bottle described in my previous communication) into the test-glasses—about two-thirds into No. 1, and one-third into No. 2 (see fig. 2). The solution put into No. 2 should be passed through the beads in the tube 2; fill up, with distilled water, if necessary; connect to the aspirator as shown; then attach the inlet of No. 1 test-glass to the tube from which the gas is issuing; and turn on the tap of the aspirator to give a very thin stream. Having allowed one litre of gas to pass, note the amount of exhaust shown by the gauge on the top of the aspirator. Now disconnect from the gas supply, and pass about 20 c.c. of air; disconnect the test-glasses; wash down the beads of No. 2; and titrate with standard solution of potash. The corrections, &c., are the same as described in the last article,

except that the exhaust in the top of the aspirator affects the volume of gas, and should be corrected for as described below.

Test for Sulphuretted Hydrogen.—A measured quantity of standard solution of acetate of lead is placed in one test-glass (B), as indicated in fig 1; and gas is aspirated through until the solution is saturated with sulphuretted hydrogen, which is shown by the lead paper suspended in the tube (Fig. 1) just turning brown at the lower edge. The amount of water let out of the aspirator having been noted, the calculation is as follows:—Say, 10 c.c. of standard lead solution was placed in the test-glass, and it required 1385 c.c. of gas to saturate it with sulphuretted hydrogen, then as 1385 : 1000 : 10 = 7.22 c.c. of sulphuretted hydrogen per litre. Now correct for temperature and pressure. A small piece of wool should be placed in the bottom of the tube 1, so as to prevent the solution from soiling the lead paper.

Test for Carbonic Acid.—Standard barium hydrate solution is placed in the test-glasses, in the same manner as described in the test for ammonia; and one litre of water is let out of the aspirator. Then 200 c.c. of air (which has been previously freed from carbonic acid by being sent through a small quantity of barium hydrate solution) is forced through. A piece of wool or other material should be placed in the outlet of the vessel containing the barium hydrate, so as to prevent any being carried forward into the test-glasses. Colour with phenol phthalein, and titrate with standard hydrochloric acid.

Carbon Bisulphide.—This test is the same as that given for sulphuretted hydrogen, only the gas is drawn through the platinized pumice bulb of Harcourt's colour test, to convert the bisulphide of carbon into sulphuretted hydrogen. The result in cubic centimetres, after correction, should be divided by two, and will then equal the volume of bisulphide of carbon in the gas.

Corrections for Exhaust, &c.—For example, suppose that we found 12.5 c.c. of carbonic acid in one litre of gas (as measured by the water let out), with the thermometer at 68° Fahr., and the barometer at 29.8 inches; and that the gauge on the aspirator showed 6½ inches exhaust on a column of water: Subtract ½ inch from the height of the barometer for this 6½ inches exhaust; then as the tabular number 956 : 1000 : 12.5 = 13.07 c.c. per litre, or 1.307 per cent.

The test solutions used for absorbing ammonia and carbonic acid should be at least 10 c.c. in excess of the amount actually required to combine with the quantity of these gases that are likely to be present.

For sulphuretted hydrogen, I find about 10 or 15 c.c. a convenient amount of acetate of lead solution; passing gas until it is saturated, as mentioned above.

The bottle described in my last communication makes a very convenient litre measure for the above tests, especially when used in conjunction with a smaller measure with finer divisions. It will be noted that the bisulphide of carbon test can be performed most accurately in a few minutes; and that, by adding 6 or 7 grains to the bisulphide of carbon found (after converting it into grains per 100 cubic feet), the operator will have the total sulphur compounds present in the purified gas.

In conclusion, I may say that this apparatus is portable, and in my opinion far superior to the old form; and I consider that the methods of using it described in this article will give the operator most accurate results.

THE South Milford Gas Company recently advertised for a Manager for their works in place of Mr. Patrick, resigned; and, out of some fifty candidates for the position, have selected Mr. W. Lister, Manager of the Denby Dale Gas-Works.

By a unanimous vote, the Rochdale Town Council last Thursday decided to increase the salaries of Mr. Tomlinson (Manager of the water-works) and Mr. Stenhouse (Chemist at the gas-works) as recommended by the Committees—the former by £50 a year, and the latter by £40.

A RECEIVING order was made by the Registrar of the Salford County Court last Friday against the late Town Clerk of Salford (Mr. John Graves), whose whereabouts are still unknown. The petitioning creditor was a lady. The sum owing—viz., £800—was trust money, which had been placed in the debtor's hands.

THE Parkes Museum have arranged for a course of twelve lectures to be delivered between Sept. 25 and Nov. 2 on subjects of special interest to those who are desirous of obtaining knowledge of the duties of Sanitary Inspectors. Only a nominal fee of 5s. will be charged for the series; the lectures are to be given on Tuesdays and Fridays at 8 p.m., at No. 74A, Margaret Street. Among the lecturers are Dr. G. V. Poore, Professor Henry Robinson, Sir Douglas Galton, Mr. Wynter Blyth, Mr. H. P. Boulnois, and Dr. Louis Parkes, who takes for his subject: "Water Supply, Drinking Water, and Pollution of Water."

In a recent issue of *Der Gastechner*, Herr E. Grahn describes a process for treating gas liquor and other ammoniacal liquids. Instead of boiling off the ammonia from the liquor by direct fire or injection of steam, the author proposes to inject a stream of air or chimney gas through the liquor, with or without simultaneous heating; and by this means to obtain the ammonia in a condition for absorption without the inconvenience caused by the presence of water of condensation. The absorption substances may be solid or liquid; and it is claimed that the process is applicable to the impregnation with ammonia of solid manures, such as superphosphate,

Technical Record.

THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

ANNUAL MEETING IN BATH.

The Annual Meeting of the above Association commenced in Bath on Wednesday last. The proceedings opened with the usual meetings of the Council and the various Committees; and the first general meeting was held in the evening in the large Drill Hall, which was very nearly filled. Sir HENRY ROSCOE, the retiring President, occupied the chair; and after briefly addressing the assembly, resigned it to the President for the year, Sir FREDERICK J. BRAMWELL, who at once proceeded to deliver his Inaugural Address. Such portions of the address as are of special interest to our readers are given below.

The President commenced by saying that he proposed, as one of the two sections of his address, to discourse on the importance of the "next-to-nothing." The other section would embrace a eulogy of the civil engineer; and the value to science of his works. The two subjects would be mixed up in the most illogical and haphazard way throughout his address; but when he had finished it, he hoped to have convinced his hearers that there was no man who more thoroughly appreciated the high importance of the "next-to-nothing" than the civil engineer of the present day. He justified the selection of a civil engineer occasionally for the chair he occupied, because their Association was for the "advancement of science;" and for the advancement of science, it was absolutely necessary that there should be the application of science, and therefore the section which, in the Association, applied science was doing a very large share of the work of advancing science, and was fully entitled to be periodically represented in the presidency of the whole Association. Applications of science, and discoveries in pure science, acted and re-acted the one upon the other. To take an illustration: Electricity—known in its simplest form to the Greeks by the results arising from the friction on amber, and named therefrom, but afterwards produced from glass cylinder machines or from plate machines, and produced a century ago by the "influence" machine—remained, as did the discoveries of Volta and Galvani, the pursuit of but a few; and even the brilliant experiments of Davy did not suffice to give very great impetus to this branch of physical science. Ronalds, in 1823, constructed an electric telegraph. In 1837 the first commercial use was made of the telegraph; and from that time electrical science received an impulse such as it had never before experienced. Further scientific facts were discovered; and fresh applications were made of these discoveries. Few would be prepared to deny the statement that pure electrical science has received an enormous impulse, and has been advanced by the commercial application of electricity to the foregoing and to purposes of lighting. Since this latter application, scores (he might say hundreds) of acute minds had been devoted to electrical science; stimulated thereto by the possibilities and probabilities of this application. In this country, no doubt, still more would have been done if the lighting of districts from a central source of electricity had not been, since 1882, practically forbidden by the Act passed in that year. This Act had in its title the facetious statement that it was "to facilitate electric lighting," although it was an Act which, even modified as it had been this year, is still a great discouragement of free enterprise and a bar to progress. The other day a member of the House of Commons said to him: "I think it is very much to our discredit in England that we should have allowed ourselves to be outrun in the distribution of electric lighting to houses by the inhabitants of the United States and by those of other countries." Looking upon him as being one of the authors of the "facetious" Act, he (the President) thought it pertinent to quote the case of the French paricide, who, being asked what he had to say in mitigation of punishment, pleads, "Pity a poor orphan"—the paricide and the legislator being both authors of conditions of things which they affect to deplore.

Quitting electricity, Sir Frederick made an extended reference to (so-called) prime movers—considering the subject first "in the comparatively humble function of replacing that labour which might be performed by the muscular exertion of human beings." It must, he said, be agreed that all honest and useful labour is honourable; but when that labour can be carried out without the exercise of any intelligence, one cannot help feeling that the result is likely to be intellectually lowering. The introduction of prime movers as a mere substitute for unintelligent manual labour was in itself a great aid to civilization and to the raising of humanity, by rendering it very difficult, if not impossible, for a human being to obtain a livelihood by unintelligent work. In order to illustrate how a prime mover may not only be a mere substitute for muscular work, but may afford the means of attaining an end that could not by any possibility be attained by muscular exertion, no matter what money was expended, he compared a vessel propelled by oars with the modern Atlantic liner. He also took the case of a railway locomotive. Here, he remarked, we have from 400 to 600 horse-power developed in an implement which, even including its tender, does not occupy an area of more than 50 square yards, and that draws us at the rate of 60 miles an hour. Here, again, the prime mover succeeds in doing that which no expenditure of money or of life could enable us to obtain from muscular effort. Those meritorious prime movers were due to the application of science and to the labours of the civil engineer—using that term

in its full and proper sense as embracing all engineering other than military.

Having quoted the definition of the term "civil engineering" as given in the Charter of the Institution of Civil Engineers—viz., "The art of directing the great sources of power in Nature for the use and convenience of man," he asked, among all secular pursuits, could there be imagined one more vast in its scope, more beneficent, and therefore more honourable, than this? He maintained that the pursuits of civil engineering were worthy of occupying the highest intelligence, and that they are elevating and ennobling in their character. "Remember," he continued, "the kindly words of Sir Thomas Browne, who said, when condemning the uncharitable conduct of the mere bookworm, 'I make not, therefore, my head a grave but a treasury of knowledge, and study not for mine own sake only, but for those who study not for themselves.' The engineer of the present day finds that he must not make his 'head a grave,' but that, if he wishes to succeed, he must have, and must exercise scientific knowledge; and he realizes daily the truth that those who are to come after him must be trained in science, so that they may readily appreciate the full value of each scientific discovery as it is made. Thus the application of science by the engineer not only stimulates those who pursue science, but adds him to their number. Holding, as I have said I do, the view that he who displaces unintelligent labour is doing good to mankind, I claim for the unknown engineer who, in Pontus, established the first water-wheel of which we have a record, and for the equally unknown engineer who first made use of wind for a motor, the title of pioneers in the raising of the dignity of labour, by compelling the change from the non-intelligent to the intelligent. With respect to these motors—wind and water—we have two proverbs which discredit them, 'Fickle as the wind,' and 'Unstable as water.' Something more trustworthy was needed—something that we were sure of having under our hands at all times. As a result, science was applied, and the 'fire' engine, as it was first called, the 'steam' engine, as it was re-named, a form of 'heat' engine, as we now know it to be, was invented. Think of the early days of the steam-engine—the pre-Watt days. The days of Papin, Savory, Newcomen, Smeaton. Great effects were produced, no doubt, as compared with no 'fire' engine at all; effects so very marked as to extort from the French writer, Belidor, the tribute of admiration he paid to the 'fire' engine erected at the Fresnes Colliery by English engineers. A similar engine worked the pumps in York Place (now the Adelphi) for the supply of water to portions of London. We have in his work one of the very clearest accounts, illustrated by the best engravings, of the engine which had excited his admiration. These drawings show the open-topped cylinder, with condensation taking place below the piston; but with the valves worked automatically. It need hardly be said that, noteworthy as such a machine was, as compared with animal power, or with wind or water motors, it was of necessity a most wasteful instrument as regards fuel. It is difficult to conceive in these days how far years it could have been endured that at each stroke of the engine the chamber that was to receive the steam at the next stroke was carefully cooled down beforehand by a water injection. Watt, as we know, was the first to perceive, or at all events to cure, this fundamental error, which existed prior to his time in the 'fire' engine. To him we owe condensation in a separate vessel, the doing away with the open-topped cylinder, and the making the engine double-acting, the parallel motion, the governor, and the engine indicator, by which we have depicted for us the way in which the work is being performed within the cylinder. To Watt also we owe that great source of economic working—the knowledge of the expansive force of steam; and to his prescience we owe the steam-jacket, without which expansion, beyond certain limits, is practically worthless. . . . I think it is not too much to say that engineers who, since Watt's days, have produced machines of such marvellous power—and, compared with the engines of Watt's days, of so great economy—have, so far as principles are concerned, gone upon those laid down by Watt. Details of the most necessary character—necessary to enable those principles to be carried out—have, indeed, been devised since the days of Watt. Although it is still a very sad confession to have to make, that the very best of our steam-engines only utilizes about one-sixth of the work which resides (if the term may be used) in the fuel that is consumed, it is nevertheless a satisfaction to know that great economical progress has been made, and that the 6 lbs. or 7 lbs. of fuel per horse power per hour consumed by the very best engines of Watt's days, when working with the aid of condensation, is now brought down to about one-fourth of this consumption; and this in portable engines, for agricultural purposes, working without condensation—engines of small size, developing only 20 horse power. In such engines the consumption has been reduced to as little as 1·85 lbs. per brake horse power per hour, equal to 1·65 per indicated horse power."

Sir Frederick then alluded to the trials of engines at the Royal Agricultural Society's meeting at Newcastle last year, and went on to say that the engineer of the present day appreciates the value of the "next-to-nothings." Improvement in the working of engines must be sought by paying attention to the "next-to-nothings"—the farthings and pence of economic working. In the case of one engine, at the trials referred to, an excess of air was supplied, causing a percentage of loss of 6·34; and in another engine there was a deficiency of air, resulting in the production of carbonic oxide, involving a loss of 4 per cent. This was an admirable instance of the need of attention to apparently small things.

Continuing he said: I have already stated that we now know the steam-engine is really a heat-engine. At the York meeting of our Association, I ventured to predict that, unless some substantive improvement were made in the steam-engine (of which improvement, as yet, we have no notion), I believed its days for small powers were numbered, and that those who attended the centenary of the British Association in 1931 would see the present steam-engines in museums, treated as things to be respected and of antiquarian interest to the engineers of those days, such as are the open-topped steam cylinders of Newcomen and of Smeaton to ourselves. I must say I see no reason, after the seven years which have elapsed since the York meeting, to regret having made that prophecy, or to desire to withdraw it. The working of heat-engines, without the intervention of the vapour of water, by the combustion of the gases arising from coal, or from coal and from water, is now not merely an established fact, but a recognized, undoubted, and commercially economical means of obtaining motive power. Such engines, developing from 1 to 40 horse power, and worked by the ordinary gas supplied by the gas-mains, are in most extensive use in printing-works, hotels, clubs, theatres, and even in large private houses, for the working of dynamos to supply electric light. Such engines are also in use in factories, being sometimes driven by the gas obtained from "culm" and steam; and are giving forth a horse power for, it is stated, as small a consumption as 1 lb. of fuel per hour. It is hardly necessary to remind you—but let me do it—that, although the saving of $\frac{1}{2}$ lb. of fuel per horse power appears to be insignificant when stated in that bald way, one realizes that it is of the highest importance when that $\frac{1}{2}$ lb. turns out to be 33 per cent. of the whole previous consumption of one of those economical engines to which I have referred. The gas-engine is no new thing. As long ago as 1807, a M. de Rivaz proposed its use for driving a carriage on ordinary roads. For anything I know, he may not have been the first proposer. It need hardly be said that in those days he had no illuminating gas to resort to; and he proposed to employ hydrogen. A few years later a writer in *Nicholson's Journal*, in an article on "flying machines," having given the correct statement that all that is needed to make a successful machine of this description is to find a sufficiently light motor, suggests that the direction in which this may be sought is the employment of illuminating gas to operate by its explosion on the piston of an engine. The idea of the gas-engine was revived, and formed the subject of a patent by Barnett, in the year 1838. It is true this gentleman did not know very much about the subject, and that he suggested many things which, if carried out, would have resulted in the production of an engine which could not have worked; but he had an alternative proposition which would have worked. Again, in the year 1861 the matter was revived by Lenoir, and in the year 1865 by Hugon, both French inventors. Their engines obtained some considerable amount of success and notoriety, and many of them were made and used; but in the majority of cases they were discarded as wasteful and uncertain. The Institution of Civil Engineers, for example, erected a Lenoir in the year 1868 to work the ventilating-fan, but after a short time they were compelled to abandon it, and to substitute a hydraulic engine.

At the present time, as I have said, gas-engines are a great commercial success; and they have become so by the attention given to small things in popular estimation—to important things, in fact, with which, however, I must not trouble you. Messrs. Crossley Brothers who have done so much to make the gas-engine the commercial success that it is, inform me that they are prosecuting improvements in the direction of attention to detail, from which they are obtaining greatly improved results. But, looking at the wonderful petroleum industry and at the multifarious products which are obtained from the crude material, is it too much to say that there is a future for motor engines worked by the vapour of some of the more highly volatile of these products—true vapour, not a gas, but a condensable body, capable of being worked over and over again? Numbers of such engines, some of as much as 4-horse power, made by Mr. Yarrow, are now running and are apparently giving good results; certainly excellent results as regards the compactness and lightness of the machinery. For boat purposes they possess the great advantage of being got rapidly under way. I have seen one go to work within two minutes of the striking of the match to light the burner. Again, as we know, the vapour of this material has been used as a gas in engines; the motive power has been obtained by direct combustion. Having regard to such considerations, was I wrong in predicting that the heat-engine of the future will probably be one independent of the vapour of water? And, further, in these days of electrical advancement, is it too much to hope for the direct production of electricity from the combustion of fuel? As the world has become familiar with prime movers, the desire for their employment has increased. Many a householder could find useful occupation for a prime mover of $\frac{1}{4}$ or $\frac{1}{2}$ horse power, working one or two hours a day; but the economical establishment of a steam-engine is not possible until houses of very large dimensions are reached, where space exists for the engine, and where, having regard to the amount of work to be done, the incidental expenses can be borne. Where this cannot be, either the prime mover, with the advantages of its use, must be given up as a thing to be wished for but not to be procured, or recourse must be had to some other contrivance—say, to the laying on of power, in some form or another, from a central source. I have already incidentally touched upon one mode of doing this—namely, the employment of illuminating gas as the working agent in the gas-engine; but there are various other

modes, possessing their respective merits and demerits—all ingenious, all involving science in their application, and all more or less in practical use—such as the laying on of special high-pressure water, as is now being extensively practised in London, in Hull, and elsewhere. Water at 700 lbs. pressure per inch is a most convenient mode of laying on a large amount of power through comparatively small pipes. Like electricity, where, when a high electro-motive force is used, a large amount of energy may be sent through a small conductor, so with water under high pressure, the mains may be kept of reasonable diameters, without rendering them too small to transmit the power required through them. Power is also transmitted by means of compressed air—an agent which, on the score of its ability to ventilate and of its cleanliness, has much to recommend it. On the other hand, it is an agent which, having regard to the probability of the deposition of moisture in the form of “snow,” requires to be worked with judgment. Again, there is an alternative mode for the conveyance of power by the exhaustion of air—a mode which has been in practical use for over 60 years. We have also the curious system pursued at Schaffhausen, where quick-running ropes are driven by turbines, these being worked by the current of the River Rhine; and at New York and in other cities of the United States steam is laid on under the streets, so as to enable domestic steam-engines to be worked without the necessity of a boiler, a stoker, or a chimney, the steam affording also means of heating the house when needed. Lastly, there is the system of transmitting power by electricity to which I have already adverted. I was glad to learn, only the other day, that there was every hope of this power being applied to the working of an important subterranean tramway. These distributions from central sources need, as a rule, statutory powers to enable the pipes or wires to be placed under the roads; and, following the deplorable example of the Electrical Facilities Act, it is now the habit of the enlightened corporation and the enterprising town clerk of most boroughs to say to capitalists who are willing to embark their capital in the plant for the distribution of power from a central source—for their own profit, no doubt, but also, no doubt, for the good of the community: “We will oppose you in Parliament, unless you will consent that, at the end of 21 years, we may acquire compulsorily your property, and may do so, if it turns out to be remunerative, without other payment than that for the mere buildings and plant at that time existing.” This is the way English enterprise is met; and then English engineers are taunted by Englishmen—often by the very men who have had a share in making this “boa-constrictor” of a “Facilities Act”—that their energy is not to be compared with that which is to be found in the United States and other countries.

The next section of the address was devoted to heat-withdrawing engines, or “cold producers;” reference being made to the arrangement devised by Mr. Loftus Perkins. This gentleman, the President said, had lately taken up the mode of producing cold by the evaporation of ammonia; and, by improvements in detail, had succeeded in making an apparatus which, without engine or pumps, produced cold for some hours in succession, and required to put in action the preliminary combustion of only a few pounds of coke or a few feet of gas. Sir Frederick then pointed out how, as the work of the engineer grew, his needs increased. New material, or better material of the old kind, had to be found to enable him to carry out these works of greater magnitude. At the beginning of the present century, stone, brick, and timber were practically the only materials employed for standing engineering work—i.e., buildings, bridges, aqueducts, and so on; while timber, cast iron, and wrought iron were for many years the only available materials for the framing and principal parts of moving machines and engines, with the occasional use of lead for the pipes, and of copper for pipes and for boilers. As regards the cast iron, it was judged of largely by the eye. Wrought iron was also judged of by its results. Steel, again—that luxury of the days of his youth—was judged by the eye. The consequence was that anomalous results every now and then arose, to confound the person who had used the steel; and falsifying the proverb “true as steel,” steel became an object of distrust. Bessemer’s great invention of steel made by the converter, and Siemens’s invention of the open-hearth process, reacted on pure science, and set scientific men to investigate the laws which regulate the union of metals and of metalloids; and the labours of these scientific men had improved the manufacture, so that steel was now thoroughly and entirely trusted. By its aid engineering works were accomplished which, without that aid, would have been simply impossible. The Forth Bridge, the big gun, the compound armour of the ironclad with its steel face, the projectile to pierce that steel face—all equally depend upon the “truth” of steel as much as did the barely visible hair-spring of the chronometer, which enabled the longitude of the ship in which it was carried to be ascertained.

Referring to the work of the civil engineer as contributing directly to the prevention of disease, he said that in one town, about which he had full means of knowing, the report had just been made that, in the year following the completion of a comprehensive system of sewerage, the deaths from zymotic diseases had fallen from a total of 740 per annum to a total of 372—practically one-half. Had the engineer no inward satisfaction who knew that such results as these accrued from his work? “Again,” he said, “consider the magnitude and completeness of the water supply of a large town, especially a town that has to depend upon the storing-up of rain water; the provision which takes into account, not merely the variation of the different seasons of the

year, but the variation of one year from another; that, having collated all the stored-up information, determines what must be the magnitude of the reservoirs to allow for at least three consecutive dry years, such as may happen; and that finds the sites where these huge reservoirs may be safely built. All these, and many other illustrations which I could put before you, if time allowed, appear to me to afford conclusive evidence that, whether it be in the erection of the lighthouse on the lonely rock at sea; whether it be in the crossing of rivers or seas, or arms of seas, by bridges or by tunnels; whether it be the cleansing of our towns from that which is foul; whether it be the supply of pure water to every dwelling, or the distribution of light or of motive power; or whether it be in the production of the mighty ocean steamer, or in the spanning of valleys, the piercing of mountains, and affording the firm, secure road for the express train; or whether it be the encircling of the world with telegraphs—the work of the civil engineer is not of the earth earthy, is not mechanical to the exclusion of science, is not unintellectual, but is of a most beneficent nature, is consistent with true poetical feeling, and is worthy of the highest order of intellect.”

On the motion of the Mayor of Bath, seconded by Sir William Thomson, a vote of thanks was accorded to the President for his address.

MR. PREECE ON ELECTRIC LIGHTING.

At the Opening Meeting of the Mechanical Science Section of the British Association last Wednesday, the PRESIDENT (Mr. W. H. Preece, F.R.S., M. Inst. C.E.) delivered an address on the capability of electricity to minister to the wants of mankind. In his opening remarks he drew attention to its power of instantaneously transmitting intelligence to a distance by means of the telegraph and telephone; and then went on to refer to its use as a lighting agent. As this portion of his address will be of special interest to our readers, we give it *in extenso*, as follows:—

Electric lighting has become popular, not alone from the beauty of the light itself, but from its great hygienic qualities in maintaining the purity and coolness of the air we breathe. The electric light need not be more brilliant than gas; but it must be more healthy. It need not be cooler than the wax candle; but it must be brighter, steadier, and more pleasant to the eye. In fact, it can be rendered the most perfect artificial illuminant at our disposal; for it can illumine a room without being seen directly by the eye; it can be made absolutely steady and uniform without irritating the retina; it does not poison the air by carbonic acid and carbonic oxide, or dirty the decorations by depositing unconsumed carbon; it does not destroy books or articles of vertu and art by forming water which absorbs sulphur acids; and it does not unnecessarily heat the room. In our Central Savings Bank in London, it has been found, after two years’ experience of electric lighting, that the average amount of absences from illness has been diminished by about two days a year for each person on the staff. This is equivalent to a gain to the service of the time of about eight clerks in that department alone. Taking the cost at the “overtime” rate only, this would mean a saving in salaries of about £640 a year. The cost of the installation of the electric light was £3349; and the annual cost of working £700 per annum—say, a total annual cost of £1034. The cost of the gas consumed for lighting purposes was about £700 a year; so that on the whole there was a direct saving of something like £266 a year to the Government, besides the material advantage of the better work of the staff resulting from the improved atmospheric conditions under which their work is done.

The production of light by any means implies the consumption of energy; and this can be measured in watts, or the rate at which this energy is consumed. A watt is $\frac{7}{12}$ part of a horse power. It is a very convenient and sensible unit of power; and will in time replace the meaningless horse power.

One candle light maintained by tallow			absorbs	124 watts
"	"	wax	"	94 "
"	"	sperm	"	86 "
"	"	mineral oil	"	80 "
"	"	vegetable oil	"	57 "
"	"	coal gas	"	68 "
"	"	oannel gas	"	48 "
"	"	electricity (glow)	"	55 "
"	"	electricity (arc)	"	3 "

The relative heat generation of these illuminants may be estimated from these figures.

Though the electric light was discovered by Davy in 1810, it was not until 1844 that it was introduced into our scientific laboratories by Foucault; it was not until 1878 that Jablochhoff and Brush showed how to light up our streets effectually and practically; and it was not until 1881 that Edison and Swan showed how our homes could be illuminated softly and perfectly. Unpreparedness for such a revolution produced a perfect panic among gas proprietors; inexperience in the use of powerful electric currents resulted in frequent failure and danger; speculation in financial bubbles transferred much gold from the pockets of the weak to the coffers of the unscrupulous; hasty legislation in 1882 restricted the operations of the cautious and the wise; and the prejudice arising from all these causes has, perhaps fortunately, delayed the general introduction of electricity. But now legislation has been improved, experience has been gained, confidence is being restored; and in this beautiful town of Bath fifty streets are to be lighted. We see everywhere around and about us in our English homes the pure glow lamp replacing filthy gas and stinking oil. The economical

distribution of the electric current over large areas is annually receiving a fresh impetus. The expensive systems defined in the Act of Parliament of 1882 have entirely disappeared. Hopkinson in England and Edison in America showed how a third wire reduced the weight of copper needed by 66 per cent. Gaulard and Gibbs in 1882 showed how the conversion of alternative currents of high electro-motive force to currents of low electro-motive force by simple induction coils would enable a mere telegraph wire to convey sufficient electricity to light a distant neighbourhood economically and efficiently. Lane Fox in 1879 showed how the same thing could be done by secondary batteries. Planté, Faure, Sellon, and Parker have done much to prove how batteries can be made to solve the problem of storage; while King and Edmunds have shown how the distribution by secondary batteries can be done as economically as by secondary generators. The Grosvenor Gallery Company in London have proved the practicability of the secondary generator principle by nightly supplying 24,000 glow lamps scattered over a very wide area of London. The glow lamp of Edison, which in 1881 required 5 watts per candle, has been so far improved that it now consumes but 2½ watts per candle. The dynamo, which in the same year weighed 50,000 lbs., absorbed 150-horse power, and cost £4000 for 1000 lamps, now weighs 14,000 lbs., absorbs 110-horse power, and costs £500 for the same production of external energy—in other words, its commercial output has been increased nearly six times; while its prime cost has been diminished eight times.

The steam-engine has received equal attention. The economy of the electric light when steam is used depends almost entirely on the consumption of coal. With slow-speed low-pressure engines one kilowatt—1000 watts, 1½-horse power—may consume 12 lbs. of coal per hour. In high-speed high-pressure triple-expansion engines, it need not consume more than 1 lb. of coal per hour. Willans and Robinson have actually delivered from a dynamo one kilowatt by the consumption of 2 lbs. of coal per hour, or by the condensation of 20 lbs. of steam. There is a great tendency to use small economical direct-acting engines in place of large expensive engines, which waste power in countershafting and belts. Between the energy developed in the furnace in the form of heat, and that distributed in our rooms in the form of light, there have been too many points of waste in the intermediate operations. These have now been eliminated or reduced. Electricity can now be produced by steam at 3d. per kilowatt per hour. The kilowatt-hour is the Board of Trade unit, as defined by the Act of 1882, for which the consumer of electric energy has to pay. Its production by gas-engines costs 6d. per kilowatt-hour, while by primary batteries it costs 8s. per kilowatt-hour. The Grosvenor Gallery Company supply currents at 7½d. per kilowatt-hour. A 20-candle power lamp consuming 3 watts per candle, and burning 1200 hours per annum, expends 82,000 watt-hours or 82 kilowatt-hours, and its costs, at 7½d. per unit, 50s. per annum. If the electricity be produced on the premises (as is the case in the Post-Office, in the House of Commons, and in many large places), it would cost 20s. 6d. per annum. I have found from a general average under the same circumstances, and for the same light, in the General Post-Office in London, that an electric glow lamp costs 22s., and a gas-lamp 18s. per annum. The actual cost of the production of one-candle light per annum of 1000 hours is as follows:—

Sperm candles	8s. 6d.
Gas (London)	1 3
Oil (petroleum)	0 8
Electricity, glow	0 9
„ arc	0 1½

The greatest development of the electric light has taken place on board ship. Our Admiralty have been foremost in this work. All our war-ships are gradually receiving their equipment. Our ocean-going passenger ships are also now so illumined, and perhaps it is here that the comfort, security, and true blessedness of the electric light is experienced. Railway trains are also being rapidly fitted up. The express trains to Brighton have for a long time been so lighted; and now several Northern railways—notably the Midland—are following suit. Our rocky coasts and prominent landfalls are also having their lighthouses fitted with brilliant arc lamps; the last being St. Katherine's Point in the Isle of Wight, where 60,000 candles throw bright beams over the English Channel; causing many an anxious mariner to proceed on his way rejoicing.

In the final portion of his address, Mr. Preece, among other matters, dealt with the transmission of energy by currents, the use of electricity for working tram-cars, in electro-plating, and in the fusion of metals with a high-melting point; and concluded by saying: "Five million people upon the globe are now dependent on the electric current for their daily bread. Scarcely a week passes without some fresh practical application of its principles; and we seem to be only on the shore of that sea of economy and beneficence which expands with every new discovery of the properties of electricity, and spreads already beyond the mental grasp of any one single worker."

It is stated that three million feet of gas is the lowest estimate of the flow of natural gas every twenty-four hours from the well recently finished at Sparta, Illinois. It is said that the escape is attended by a roar that can be heard at Marissa, ten miles away; and in the immediate vicinity the force exerted gives the earth a vibration similar to that noticeable in a factory building when the machinery is in motion. How to derive practical benefit from the well has not yet been decided.

THE VALUE OF GAS AS A FUEL.

Mr. J. Emerson Dowson, M. Inst. C.E., read a paper on Saturday before the Mechanical Science Section of the British Association at Bath, upon "Gaseous Fuel." In 1881, Mr. Dowson said he explained to the Association an apparatus for making cheap heating gas by passing steam and air through incandescent fuel. Since then the apparatus had been much improved, and had come into wide application for driving engines and other industrial processes. The composition of the gas necessarily depended somewhat on the quality of the coal used, and the condition of the fire; but it averaged much the same. The cost varied from 6d. to 1s. per 1000 cubic feet, according to the price of the coal. He believed he was justified in saying that gas-power was now fairly launched in competition with steam-power, and the use of gas was yearly increasing. Returns by users of "Otto" gas-engines worked by Mr. Dowson's gas showed a fuel consumption of 18 lbs. per indicated horse power per hour, which was less than half that required for the best steam-engines of equal power. Sir F. Bramwell thought it was clear they were tending in the direction of an engine in which water would not be used. To produce an arrangement which gave so low a cost per horse power as had been named was a great thing. The waste of fuel which should be the inheritance of their successors was very serious. Replying to a question, as to the danger of the poisonous carbonic oxide which formed 30 per cent. of the gas in question, Mr. Dowson said it was useless to deny that the gas was poisonous; and in that sense dangerous. But like other things, it must be used accordingly. Where preferred, as an additional precaution, a smell could be given to the gas (by which its escape might be detected) by passing it over trays of sublimed naphthalene.

COMPRESSED OIL GAS AND ITS APPLICATIONS.

In April last we published* an abstract of a paper on this subject read before the Institution of Civil Engineers by Mr. A. Ayres. By the recent issue of the usual quarterly volume of proceedings, we are now put in possession of the full text of the discussion and correspondence that followed the reading of the paper; and as it comprises a great deal of information that is both interesting and useful to gas engineers in a general sense, we propose to lay before our readers a few abstracts and comments upon the same. The appendix attached to the paper gives several statistics respecting the cost of oil gas to eight of the principal railway companies who use it, from which it appears that the annual production for the lighting of railway carriages is more than 30 million cubic feet, and the actual cost varies a great deal, but may be said to range from 8s. up to 13s. per 1000 cubic feet as delivered at the burners. There is a remarkable difference in the returns for residuals, which range from 3½d. to 1s. 10d. per 1000 cubic feet of gas made. With two exceptions, however, this item is less than 1s. The yield of gas per gallon of oil ranges from 72 to 81 cubic feet per gallon.

In the course of the discussion, Mr. Joseph Tomlinson stated that the illuminating power of gas made on the Pintsch system, speaking from the results of several years working, was 51 candles; but this was reduced by compression to the extent of 150 lbs. per square inch, to 38 candles. The compression was accompanied by the deposition of one gallon of hydrocarbon per 1000 cubic feet of gas, which he was able to sell for 2s. The average yield was 81 to 83 cubic feet per gallon. He exhibited a table showing that a great saving had been effected by introducing the Pintsch system, as compared with the uncompressed coal gas and oil-lamps formerly used; the cost being 0·21d. per lamp per hour. He introduced a small chamber of gas between the regulator and the burner, which prevented the lights being extinguished by accidental shock, &c., and enabled him to reduce them when running in open spaces by day. Mr. James Keith spoke about the apparatus bearing his name, saying that it had been designed to obtain a maximum yield of gas with a minimum consumption of fuel, and a cool and permanent gas that might be used as fast as it was made without leaving any deposit. His original single-retort apparatus with one fire, making at least 200 cubic feet of gas per hour could be heated from the cold state in 60 to 90 minutes; and a more recent four-retort apparatus, making at least 1000 cubic feet per hour, could be similarly heated up in from 3 to 4 hours. The fuel account should be much less in an oil than in a coal gas apparatus. His system was decidedly different from that of other makers; he believed in rapid making, thorough washing, and quick and thorough atmospheric cooling. The quality of the oil was an important point, and he had used a thickish blue oil that gave about 50 per cent. more gas to the gallon than ordinary paraffin oil at a less price would give; the temperature of distillation and the quality of the gas being practically the same in each case. The practicability of running gas-engines successfully by rich oil gas was first proved at the oil-gas works erected at Langness Point, Isle of Man, nine years ago. Another feature was the admixture of the 50 or 60 candle gas with air before consumption. By means of a meter-mixer a proper quantity of air was introduced to bring the quality down to the Scotch canal gas standard, which enabled it to be employed either for lighting, heating, or power, with far better results. The air-mixing apparatus could be adjusted to dilute the gas down to any desired quality, so that it could be used with any burners or fittings suitable for ordinary coal gas. The result of the dilution was a whiter, clearer, and better diffusible light, with no smoke; and when used for gas-engines the

* See JOURNAL, Vol. LI., p. 686.

air-mixing arrangement was indispensable, where regularity and reliability in running were essential.

Mr. W. H. Preece thought the discussion would not be complete without some reference to the application of electricity to some of the purposes mentioned, and believed that it would be found far more satisfactory in the future than either coal gas or oil gas. His remarks, however, consisted more of assertions than of actual practical statistics, the only reference he made to figures being the unsupported statement that electricity was cheaper than gas. If it was desired to obtain 10,000 candles by the consumption of gas, he said, it would cost 10s.; but a similar amount of light could be produced by electricity for 7s. 6d. It is surprising that Mr. Preece should have shown ignorance of the recent improvements in gas-burners, which admit of a duty of 8, 9, or 10 candles per cubic foot of gas being obtained. As a matter of fact, the cost of producing 10,000 candles by means of gas would be much less than one-half of his estimate, or about one-half of the price given by him for electricity; and this, by the way, is very much lower than other estimates, based on actual working, that have been published. Mr. Killingworth Hedges followed with some particulars of a trial of electricity on the Glasgow City District Railway, on Carswell's system, in which a central rail between the ordinary rails was provided which carried the current, and contact could be made with it any time, producing the light. The present cost was 0.4d. per lamp per hour with the engine and plant not working up to its full capacity, though if this was done it would be a great deal cheaper; while the cost of the gas supplied to the North British Railway by the Pintsch Company was 0.16d. per lamp per hour.

Mr. Charles Ingrey remarked that the paper dealt with three distinct applications of hydrocarbon oil; firstly, the generation of gas by means of gas-works, the mechanical compression of the gas so produced, and storage of the same in hermetically-sealed vessels, which could be conveyed to a distance; secondly, to the storage of the gas in gasholders, whence it could be used on the spot; and, thirdly, the supply of oil by gravitation to the burner itself. He thought that the use of compressed gas for buoys, beacons, and the like was the best system that could be adopted for that purpose, as it enabled a large quantity of light-giving power to be stored in a small compass; but it was worth consideration whether the system of generating gas from heavy oil by means of expensive gas-works was the best for driving engines or giving light. At Ailsa Craig the gas-works had cost from £3000 to £4000, and their main purpose was to drive 8-horse power engines; so it might be taken that there was a production of 32-horse power by apparatus which cost that large sum of money. Taking the author's figures, he calculated that 80 per cent. of the coal used as fuel at the oil-gas works, applied directly under a steam boiler, would give a similar amount of power without the oil and without the gas-works. He exhibited a small and comparatively cheap apparatus for producing gas on the spot, from light petroleum spirit, which he considered would prove more economical than ordinary gas-oil works.

Mr. W. Foster had examined several samples of oil gas produced under various circumstances. He found that oil gas made at low temperature contained a considerable amount of carbon vapour. By heating the oil in retorts, gas was obtained which was as high, if not higher, in illuminating value, but contained much less carbon vapour, and therefore yielded much less carbonic acid on combustion; 100 volumes of low-temperature gas would give 150 volumes of carbonic acid gas; the high-temperature gas would give considerably less. If gas were obtained by saturating air in the way intended by the use of the apparatus exhibited, the amount of carbon vapour would be very high, but the illuminating power would not increase in proportion. By the action of heat in the destructive distillation of oil, unsaturated hydrocarbons were obtained, the energy of which, as an illuminating agent, was considerable. Berthelot had shown that benzene vapour, naphthalene, acetylene, and other bodies increased the illuminating power considerably; that 3 per cent. by volume of benzene would raise a non-luminous but combustible gas to a power of 20 candles. In the case of low-temperature gas, the total amount of carbon vapour was high, and it existed largely in the form of paraffins; and by heating in a retort at still higher temperatures, such paraffins could be made to yield other substances which had a high illuminating power. With regard to the petroleum vapours, he had no doubt that the amount of carbon vapour would be found much greater than even the low-temperature gas. Connected with this subject was the question of getting more illuminating value by the action of heat in the retorts. The question had been raised whether it was worth while to use high temperatures and expensive plant. He inclined to it would be expensive to work an automatic air-machine of the kind shown, as a great deal of carbon would have to be burnt into such gas to produce anything like the high illuminating value known to obtain in the case of gas made by destructive distillation proper. He could not see how "gas" was made in such a machine. No tar was produced, and if petroleum vapour was merely passing forward without the production of tar, the first products were not being differentiated, but the spirit was merely caused to vaporize into a measured quantity of air.

Mr. Harland had worked a small oil-gas factory abroad, and experienced difficulty in the wear and tear of the wrought-iron retorts, due to the dropping of the oil. The retort speedily became pitted at the point where the oil dropped in, a hole was eaten through in a short time, and the retort spoiled. He thought that it was not necessary that tar should result from the dissociation of low-gravity oil if gas was really produced in the automatic machine,

because the oil used had been refined at least half-a-dozen times. It was a pure hydrocarbon; and whether it was destructively distilled, or merely evaporated at a high temperature, no tar could possibly result, because there were no chemical compounds in the substance likely to produce tar. So the gas produced from refined oils of low gravity was richer in illuminating power and contained less residual products than gas produced by destructive distillation in retorts at high temperatures. It appeared to him that it only required an automatic machine, or one on that principle, to produce gas not necessarily from gasoline, but from shale spirit, and other products that were drugs in the market. Mr. Rickman pointed out that no system of electricity at present known could offer the advantages secured by the compressed gas—viz., a light of not less than 10-candle power, each vehicle containing a supply for 30 to 36 hours independent of others, capable of being charged in a reasonable time, say two or three minutes, and apparatus not excessive in weight. The trials at Glasgow with the electric light referred to certain tunnels only, and if continuous illumination was wanted at night, some other system of lighting had to be used in addition. Some speakers had referred to the use of light oils; but if this meant hydrocarbons flashing at a low temperature, the use of such was dangerous and objectionable for several reasons. Mr. A. J. Hill said that the rate of production named by the author— $6\frac{1}{2}$ to 7 cubic feet per minute—was very low; but perhaps the size of the retort used would explain that statement. In his experience 20 cubic feet per minute could be produced with 10-inch retorts. He was surprised that nothing had been said in the paper or the discussion about the use of the residual products, especially tar as a fuel. At the Great Eastern works it was used under the boilers as a fuel, in combination with coal and other solid fuel, and it was a great convenience to be able to use all the tar which could not be sold as it was made.

Mr. S. R. Barrett said that the railway companies had tried gas as supplied by the gas companies, in a compressed form, enriched by means of gasoline to a quality of 40 to 50 candles; but at present only one British gas company was using it, though it had been largely adopted in Germany and America. The Jersey City Gas Company received £2000 per annum for gas supplied in a compressed form to the New York and Quaker City railways. Probably the improved systems of Messrs. Pintsch and Mr. Pope had caused its discontinuance in this country; but since then great improvements had been made in burners, and a duty of 5 candles or more per hour could be obtained from 16 candle gas. The fishtail burner was necessary for oil gas, and it obtained a very low duty from it. The gas had been improved to meet the deficiencies of the burner, rather than an endeavour made to secure a burner that would give good results with ordinary gas. The cannal gas supplied in several towns in Scotland was cheap compared with the oil gas quoted by the author, and afforded the means, in conjunction with improved burners, of obtaining a good light at a small cost. Gas of 30-candle power compressed to 90 lbs. per square inch would be reduced to 20-candle quality. Such compressed gas burnt in a regenerator burner at the rate of 3 cubic feet per hour, would give a light of 20 candles—a greatly improved light, at a cost of 0.12d. per lamp per hour, or not much more than one half of the cost of oil gas as given by Mr. Tomlinson. Ordinary coal gas had been tried with much success on the Belgian railways, in carriages adapted for the oil-gas system. It was compressed in the usual way, and each lamp was fitted with a carburetting cylinder containing naphthalene, somewhat on the principle of the alba-carbon gas-light. The gas was raised to 50-candle quality, and the carburetters only required changing once in 20 days. The consumption of the gas was 1.5 cubic feet per hour, and of naphthalene 40 grains, the light yielded being 8-candle power; and the cost, with gas at 2s. 6d. per 1000 cubic feet, was 0.05d. for gas and 0.01d. for the naphthalene, or a total of only 0.06d. per lamp per hour.

Mr. Ayres replied at length to the various observations of the speakers. He could not agree with Mr. Keith that it was advantageous to dilute gas with air before combustion. The mixture should take place at the point of combustion. He referred to the numerous precautions necessary to ensure the safe storing of even very small quantities of petroleum spirit, and did not think it admissible for ordinary lighthouse illumination. The durability of the retorts referred to in his paper was fully six months, and the oil was dropped upon sheet-iron trays and not received directly upon the floor of the retorts.

In addition to the discussion, there was also a lengthy "correspondence" on the paper. Mr. G. Beilby stated that, some years ago, he undertook a series of tests to determine the most suitable oils, and the best temperatures at which to decompose them into illuminating gas. His results were generally in accord with the conclusions of the author; and it was found that the so-called intermediate oils were very suitable. These were so called because in boiling point and specific gravity they ranked between burning oils on the one hand and lubricating oils on the other, and owing to the very limited demand for them, their price was very low, and this had no doubt helped to bring about the adoption of oil-gas lighting by the railway companies. With oils at from 3d. to 6d. per gallon, the cost of oil gas would be from 3s. to 6s. per 1000 cubic feet. Mr. C. E. Botley did not agree that the illuminating power of the gas depended more on the temperature of distillation than on the quality of the oil. Both the quality and quantity of the gas were effected by the temperature at which it was distilled from the oil; and every oil required a different treatment to obtain the best results. A fair comparison of the quality of the oil could be obtained by

multiplying the ascertained illuminating value of 1 foot consumed in a flat-flame burner, by the number of cubic feet produced from one gallon of oil. If only the actual consumption in the retort was mentioned it would give too high a result, as in practice there was a loss of about 6 lbs. per cask due to absorption, besides leakage from tanks, loss in pumping, &c. In practice he had found that the yield of gas was about 75 cubic feet per gallon of oil, and the quality after compression, from 36½ to 45 candles. The cost, with oil ranging from 3½d. to 6d. per gallon, was from 4s. 5d. to 6s. 9d. per 1000 cubic feet. After efficient condensation and scrubbing he did not consider that the gas required purifying. The loss due to compression, he said, should not exceed 10 per cent., instead of 20 per cent. as quoted by the author; and referred to results of a long series of experiments, communicated to the Southern District Association of Gas Engineers,* which showed that the lower the quality of the gas, the greater was its capacity for re-absorbing the hydrocarbon deposited in the process of compression, as the pressure was reduced, so that coal gas did not lose so much in proportion as oil gas. The value of the hydrocarbon and tar had fallen so much that the cost of producing oil gas was seriously affected. A few years ago the hydrocarbon realized 1s. 3d., and the tar over 2d. per gallon. Now only about 6d. per gallon was obtainable for the former, and the tar was unsaleable; but he had successfully applied the latter as a fuel under boilers. There would always be a loss on the gas available for lighting as compared with that measured by the station meter, due to leakage in various ways. Although oil gas on a fairly large scale was undoubtedly the best means for lighting railway carriages, still there were instances where compressed coal gas could be successfully applied. Where the cost price of the gas was taken as a comparison, there was no doubt of its being cheaper, light for light; and any system of gas lighting was more satisfactory than oil. Mr. G. Bower said that 25 years ago he supplied an oil-gas apparatus to the Indian Government, that produced continuously, in the regular course of working 100 cubic feet of gas per gallon of oil. Then in 1866 he published a description of a mode of compressing gas and applying it to the lighting of railway carriages. His son had invented a regulator that gave a constant pressure of 1 inch at the burner, no matter to what extent the pressure in the regulators might vary. Mr. H. Leicester Greville had had considerable experience in the experimental manufacture of oil gas, and found that 50-candle gas could be easily and continuously made, by the simple expedient of allowing the gas to flow down a wrought-iron pipe, carried through the mouthpiece and continued to within 6 inches of the back of the retort. (A somewhat similar plan has been tried and recommended by Mr. N. H. Humphrys).† The oil vaporized in this pipe and the vapour were decomposed in passing back in contact with the heated sides of the retort to the ascension pipe. The best heat was the ordinary temperature used at gas-works—viz., a “cherry red,” and the oil was ordinary common American petroleum. The yield was about 90 cubic feet of gas per gallon of oil, and it was improved by using a little water or steam with the oil. The quality and quantity depended on the heat of the retort and the rate at which the oil was run in; the best results following with least back pressure on the retort. The best plan for testing the rich gas was to consume it at the rate of from 1½ to 2 cubic feet per hour in a fishtail burner with fine holes, such as a No. 0 or No. 1 Bray, and then to calculate the result with a consumption of 5 cubic feet. Mr. G. M. Hunter said he thought that under ordinary circumstances the loss by compression did not exceed 10 per cent. of the illuminating power. He insisted on the necessity of a purifier, as the gas contained varying quantities of sulphur compounds and of carbonic acid. An advantage of the Pintsch system was that every stage of the manufacture was mechanically controlled, and nothing in the way of stoppage could occur without the attention of the attendant being directed to the place. He objected to the arrangement in Pope’s apparatus, which allowed the oil to enter the hotter retort first, and the gas to pass out through the colder retort. The gas could not be benefited by passing through the colder retort, and a larger consumption of fuel would also be necessary. In the Pintsch apparatus a contrary course was followed; the gas passing through a length of 11 ft. 8 in. of heated retort, and thus being thoroughly fixed. Mr. F. J. Rowan was more particularly interested in the application of oil gas without compression, as it afforded an outlet for intermediate oils and other products, and also being intimately connected with the subject of liquid fuel. He referred to the system of manufacture adopted by Mr. Rogers, at Watford, which consisted of injecting oil into red-hot retorts by means of steam jets. This prevented to a great extent the deposition of solid carbon in the retorts; and the steam could conveniently be raised by means of the waste heat from the retort furnace. The result was a much higher yield than that afforded by the Pintsch or other systems. Mr. J. R. Wigham preferred gas from rich cannel coal to oil gas, and believed it would be more advantageous, for all the purposes named by the author, to compress ordinary coal gas, which was much cheaper and more easily obtained than oil gas. The same illuminating power could be obtained by the aid of modern improved burners. He regarded the method adopted at Ailsa Craig, of making oil gas and then diluting it with air, as a clumsy and extravagant mode of procedure.

MR. LEWIS T. WRIGHT left England last Wednesday to take up his new appointment as Engineer and Manager of the Buenos Ayres New Gas Company.

* See JOURNAL, Vol. XLV., p. 291.

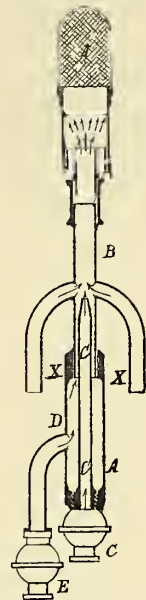
† See JOURNAL, Vol. L., p. 15.

Register of Patents.

PLATINUM-GAUZE INCANDESCENT GAS-BURNERS.—Lewis, J., of Tottenham.

No. 13,511; Oct. 5, 1887. [8d.]

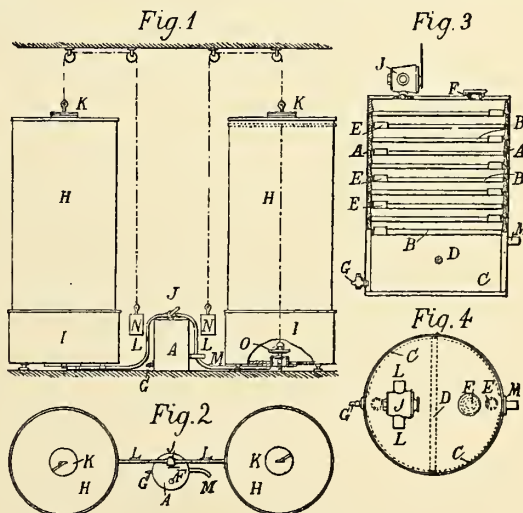
This invention relates to the arrangement and construction of gas-burners for consuming a mixture of gas and air supplied to the burner under pressure; the combustion of the gas and air causing a cap of platinum-wire gauze or other suitable metal on the end of the burner to become incandescent.



In the illustration, A is the cap of wire gauze (made of platinum or other suitable metal or mixture of metals) mounted upon a tube filled with a number of smaller tubes through which the mixture of air and gas passes from the space or chamber below into the cap for combustion. These small tubes merely serve to prevent the gas-flame from firing back into the chamber, and thus causing explosion. Below this again is a ring of metal, so inserted as to fill up the space between the inner surface of the top tube and the end of the supply-pipe B, upon which it fits so as to conduct the mixture of gas and air to the burner. A reel or sleeve of steatite or other suitable non-conducting material connects the top end of the supply-pipe B to the lower portion thereof, and prevents the transmission of heat from the burner to the pipe. Each end of the reel is formed slightly conical internally; and the ends of the pipes inserted therein are formed with a corresponding male cone, so arranged as to leave a space between the two ends where they approach one another. X are branch-tubes, through which induced currents of air are drawn in by the current of compressed air as it issues from the nozzle of the pipe C. The main pipe is connected to the end of the pipe D, into which gas is admitted by the branch-pipe E, from which it passes through the annular space around the pipe C, and is mixed with the air from the pipes X and C in its passage to the burner. The end of the pipe C is fitted into, and surrounded by the end of the pipe D.

CARBURETTING AIR AND ENRICHING GAS.—Herzog, C., of Queen Victoria Street, London. No. 1018; Jan. 23, 1888. [8d.]

The apparatus shown in the engraving is intended for carburetting air for lighting and heating purposes, and for enriching gas poor in carbon—figs. 1 and 2 being an elevation and plan of the general arrangement; and figs. 3 and 4, a vertical section and plan of the carburetting chamber.



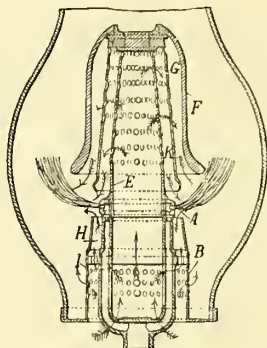
In the chamber A (preferably of cylindrical shape) there are placed a number of superposed trays or dishes B to contain gasoline or other hydrocarbon fluid. The trays are supported within the cylinder upon two semicircular pieces C, held in their proper relative positions by the rod D; and they are provided with openings E at opposite sides of the trays, so that the air or gas is caused to pass through the apparatus in a circuitous direction, and is thus brought into contact with a large surface of hydrocarbon. The upper tray is provided with a filling

opening F; or it is connected with a reservoir of hydrocarbon located outside the building in which the apparatus is fixed. The hydrocarbon as it overflows from the upper tray falls into those below it; and the surplus flowing from the bottom tray of the apparatus is drawn off from time to time through a cock G.

The means for causing the passage of air or gas through the chamber A comprise two collapsible chambers, H, secured at their lower ends to circular bases I, and at their upper ends to the discs J; the interiors of the casings being adapted to be placed in communication with the carburetting chamber through a three-way cock J. The chambers (preferably constructed of waterproofed cloth) when expanded are adapted to be filled with air or gas from any suitable source. Then, as the casing collapses or becomes shorter—owing to its weight or to auxiliary weights K—the air or gas therein is forced through the pipe L into the carburetting chamber; and from the latter the carburetted air is forced through the pipe M to the points where it is required for use. N are counterweights connected by chains to the tops of the collapsible chambers, so as to facilitate their expansion. The object of employing two collapsible chambers is, of course, to allow the filling of one chamber while the other is being emptied. O are valves arranged one in the base of each collapsible chamber, and which are adapted to allow the admission of air into the latter when extended. Each valve is connected by a chain to the top of the chamber, so as to be positively lifted when the chamber has been extended to a given point.

GAS-LAMPS.—Fletcher, T., and Clare, A., of Warrington. No. 2058; Feb. 10, 1888. [8d.]

This is the gas-lamp referred to in the JOURNAL for April 10 last, p. 637—the claim for the invention (in the words of the patentees) being for “a regenerative gas-lamp in which the whole of the air supply enters through a casing below the burner; in which the whole of the air for the upper side of the flame is derived from the hood or regenerative chamber above the burner in two streams, one of which is directed upon the root, and the other upon the body or tips of the flame; and in which the whole of the air supply for the under side of the flame is derived from the casing in two streams, one of which is directed upon the root, and the other upon the body or tips of the under side of the flame.”



The lamp consists of a burner A, preferably circular in cross section; a perforated casing B below the burner, and open at the top and bottom; a flange round the lower end of the casing, employed as a gallery for the chimney, and which prevents access of air to the flame except through the passages provided for the purpose; a perforated or reticulated chamber E mounted upon and above the burner, closed at the top and open at the bottom to the interior of the casing B; and a hood F (surrounding the perforated cylinder and the chamber E) closed at the top and open at the bottom, enclosing the air space G, and preferably having its lower portion shaped so as to form a deflector and reflector to the flame. There is an air space H between the burner and the casing B; and at a short distance below the top of the casing, there is a perforated plate or ring I through which the air can pass.

The whole of the air supply for the lamp enters by the lower end of the casing, within which the current is divided into two main portions, of which one passes directly upwards and through the openings in the chamber E into the air space G in the hood F, when it becomes heated, and from the lower end of which it issues in two separate streams to supply the upper side of the flame. The other portion of the current is also subdivided—one part of it ascending through the annular part H of the casing, to supply the root of the flame; while the other part passes through the perforations in the casing into the space between the casing and the chimney, to supply the under side of the flame. The perforated cylinder or ring K in the air space of the hood serves to divide the air supply to the upper surface of the flame, and to steady the currents.

APPLICATIONS FOR LETTERS PATENT.

- 12,530.—PARKINSON, A. H., “Improvements in gas-engines, whereby a double-acting compressing gas-engine can be made.” Aug. 31.
 12,534.—BALBIRNIE, J., “The combined gas-cooking and gas-lighting stove.” Aug. 31.
 12,544.—LYON, J. H., “Improvements in pipe connections for gas, water, or other purposes.” Aug. 31.
 12,592.—HAMILTON, C., “An improved means or method of attaching incandescent electric lights to gas-brackets or other gas-fittings.” Sept. 1.
 12,647.—LEISNER, H., “Improvements in gas-regulators.” Sept. 3.
 12,719.—WHITERHEAD, J., “Improvements in regenerative gas-lamps for lighting railway and other vehicles.” Sept. 4.
 12,733.—REW, H. C., “Improvements in the art of manufacturing illuminating and fuel gas.” Sept. 4.
 12,740.—FAIRWEATHER, W., “Improved apparatus for electrically indicating variations of water-level in rivers, aqueducts, mines, and the like.” A communication from Spohr, H. C. Sept. 4.
 12,816.—WORTHINGTON, J., “Improvements in gas cooking stoves and boilers.” Sept. 5.
 12,837.—CHANDLER, S., JUN., and CHANDLER, J., “Improvements in and relating to lamps.” Sept. 5.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

SPIRAL FRAMED GASHOLDERS.

SIR,—On reading the report of the discussion that took place upon the paper recently read by Mr. Newbigging upon Mr. Gadd's invention for the construction of gasholders without guide-framing, it struck me that, if the order of things were reversed, several of the objections raised would be at once removed. If, instead of the spiral guides being placed in the tank, they were attached to the sides of the holder, and the rollers fixed at the top of the tank for the outer lift, and upon the cup for the inner lift, they would always be come-at-able; and, in my opinion, would tend to the better working of the holder. Admitted it would add considerably to the weight; but at the same time it would, I think, add considerably to the strength, and possibly it may be so arranged that the usual stiffening on the roller plates, usually placed on the inside, may be dispensed with, and partially meet this objection.

Sept. 7, 1888.

D. W.

GAS ANALYSIS.

SIR,—The apparatus used by Mr. William J. Hicks for the purpose of gas analysis is unquestionably interesting to chemists engaged on gas-works; more especially as, from his description, it is somewhat difficult to understand what advantage it possesses over the better class of apparatus already in general use. The colour tests of Harcourt and Greville, and the gas volumetric apparatus of Hempel and Lunge, surely give superior results as regards accuracy, speed, and simplicity. I do not wish to be considered as unduly criticizing a method giving evidence of so much ingenuity; but there are a number of points which appear to me to require explanation, and which I will endeavour to enumerate as succinctly as possible.

Is not the gas-bottle employed too large? A litre flask or bottle offers a considerable surface to the confining liquid; the runnings from the sides take some time to collect; and if not allowed to do so, cause appreciable errors in reading. These errors would be increased by the introduction of the absorbents direct into this vessel, as the solutions employed adhere much more to the sides than water, and require a longer time to collect. To facilitate this collection, the confined gas is usually kept at a slight under-pressure; but it is doubtful whether the apparatus in question would allow of this being done.

As regards the graduation of the gas-bottle, Can the constituents of a gas be determined which form collectively more than 25 per cent. of its bulk? If not, Mr. Hicks's statement that his apparatus “answers admirably for analysis of chimney or furnace gases” would seem, from the two following examples, to require some modification.

Analyses of Two Samples of Furnace Gases.

Nitrogen	60·7	..	61·1
Hydrogen	1·3	..	8·6
Carbonic oxide	28·0	..	24·3
Carbonic acid	10·0	..	6·0
	100·0		100·0

With respect to the construction of the apparatus, the gas-bottle very closely resembles that of Mr. Wanklyn; and there is an equally close resemblance between the vessel J (used to draw off water, &c.) and that employed with Bunte's burette. There are certainly three stoppers or corks in the bottle, where one would have sufficed; and the arrangement in the water-trough will be more difficult than the Hempel burette with levelling tube.

Are the connections]made of indiarubber, or of glass-tubing with ground joints. If of the latter material, the whole would be so rigid as to be in constant danger of fracture, and practically unworkable; while if of the former, the objections are stronger still, as reagents like fuming nitric acid and alkaline pyro have to be forced through. The nitric acid would attack and destroy the connections; and the pyro would render a sound joint between india-rubber and glass-tubing almost impossible.

If water must be used as the confining liquid, would it not have been better to have employed water saturated with a portion of the gas to be tested?

The reagents employed are introduced from an open burette, in spite of the fact that pyrogallic acid and cuprous chloride solutions are entirely spoiled by continued contact with air; and that some of the remaining reagents are by no means benefited by such exposure. No mention is made of any aspirator for withdrawing the injurious absorbents, by means of the suction-bottle; although suction from the mouth can hardly be advisable.

Can hydrogen and marsh gas be estimated by this process; and, if so, by what means?

The similarity between Mr. Hicks's method and Professor Wanklyn's reappears in the absorbents, &c., employed for sulphuretted hydrogen and carbonic acid—namely, for the former a standard solution of acetate of lead, with lead paper as the indicator; and for carbonic acid standard barium hydrate titrated with standard sulphuric acid.

With regard to the method of estimating ammonia, the gas to be tested is exposed to the absorbing influence of water, which constitutes perhaps the gravest objection to the whole apparatus. It at once raises a query as to whether the results by absorption ever could agree with those obtained by titration. Sulphuretted hydrogen (another very soluble gas) is subjected to still more severe treatment. It is shaken up with aqueous solutions; washed repeatedly; the washings are lost; sulphuretted hydrogen is then absorbed by acetate of lead; and it is then contended that the acetate solution contains the whole of the sulphuretted hydrogen. This determination of sulphuretted hydrogen completely spoils the remainder of the sample, which cannot be held to have any further recommendation.

Why does Mr. Hicks prefer naphtha to bromine or fuming sulphuric acid? I may as well here point out what appears to be a clerical error. The writer, after speaking of titration of sulphuric acid solution with potash, afterwards refers to ammonia as being used for titrating; leaving us in doubt as to which reagent is intended to be employed.

One more point occurs to me. It will be necessary to note the

absorption that takes place during the course of an analysis; and the apparatus will be found rather faulty in this respect. To get the gas-bottle perfectly vertical each time a fresh constituent is absorbed will be very difficult; for, unlike the Hempel burette, it has no accurate base to stand upon, and the slightest variation in the level would cause considerable deviation from the true reading.

As regards the corrections given for temperature and pressure, they answer well enough for results obtained by titration; but the majority of the various gases would have to be estimated by noting the absorption. The correction of the percentages thus obtained would be rather erroneous if carried out as directed in Mr. Hicks's paper. Both the bulk of the gas used and the results obtained by absorption have to be reduced to the normal state; and the percentages then calculated from the corrected results. Where the conditions of temperature and pressure are fairly constant, or where the analysis is rapidly performed, correction is hardly necessary.

Commercial Gas-Works, Stepney,
Sept. 7, 1888.

E. W. WHIELDON.

WALKER'S PATENT TAR-SPRAYER BURNER.

SIR,—In your issue of the 7th ult. a report is given of the paper read at the recent meeting of the North British Association of Gas Managers by Mr. John McCrae, of Dundee, on "Coal Tar as Fuel for Steam-Boilers." A diagram is also given of Messrs. C. and W. Walker's patent tar-sprayer burner, which is only supplied by that firm.

Now, I do not know upon what Messrs. C. and W. Walker found their claim to a patent for this tar injector or sprayer, or whatever it may be called, because for the past two-and-a-half years I have had one in use exactly like it in principle.

On Feb. 16, 1886, Mr. John Smith, of Bangor, described in the JOURNAL an injector for burning tar. I immediately made one on the same lines; and added a small needle valve (moved in and out by a screw) for regulating the flow of tar to the fire. A description of this is given in the JOURNAL dated April 13, 1886. It is a very simple arrangement (can be made by an ordinary smith for half-a-crown), and it answers the purpose admirably. Messrs. Walker's patent tar-sprayer is precisely the same idea described by Mr. Smith and myself in 1886; but made in a more elaborate form, and consequently more expensive. This is its only claim to superiority; but it does not include invention.

Gas Works, Bodmin, Sept. 8, 1888.

JAS. THOMAS.

THE SUPPLY OF OIL GAS AT COLINSBURGH.

SIR,—Referring to an article on page 427 in your issue of this week, I (in common doubtless with many of your readers whose "recollection" it is intended to refresh) feel interested in the use of mineral oil, as employed in the manufacture of illuminating gas, and especially so, when used as an enricher of poor coal gas in localities distant from rich shale, and cannel coal fields.

Naturally one might expect that the subject of oil gas production would command that breadth of view for which as a public journalist your pages are read and appreciated. You will therefore excuse the liberty I take in calling attention to the article in question, and to the somewhat prejudiced method employed in dealing with the report of Mr. Dawson, the Secretary of the Colinsburgh Gaslight Company. I do so all the more frankly because I observe that one of your contemporaries has also gone wrong, and devoted a semi-leading article of adverse criticism of the reported results, without, also (as in your JOURNAL) advancing a single argument in support of the disparaging tone adopted. On public grounds I respectfully demur to such treatment of a matter destined to perpetuate the manufacture of high illuminating power gas, by continuing a demand for it, and such as will prove a powerful factor in deservedly maintaining purity and high-power illumination, even though it should increase the price of mineral oil that at present competes so successfully with coal gas because of its low price and its convenient supply. However, as electricity was viewed in much the same way until it proved itself (as it now undoubtedly is) a formidable displacer of coal gas, it would be idle to do more than I have now ventured to do—namely, to question the propriety of disparaging that aid to the gas industry which mineral oil, whether used alone or in conjunction with gas from low quality coal, undoubtedly is.

As I happen to know that the statement given by Mr. Dawson is logically, and for all practical purposes accurate, and worthy of fair and square consideration, I would ask, in the interests of gas consumers that it be dealt with accordingly. In conclusion, I would say that 14 per cent. cannot be considered excessive "leakage," when there are over 50 gas-works in Scotland with balance-sheets recording 14 to 30 per cent. "unaccounted-for gas;" and as regards "smokiness," the correspondent "Colinsburgh," whose letter you quote from, has evidently not tried a No. 0 or a No. 1 Bray's burner with the Colinsburgh gas, as I have done, or he would have found the light about as near perfection as he is ever likely to see in this world.

Sept. 7, 1888.

"UTILITY."

[In regard to the above letter, we would point out to "Utility" and other readers specially interested in the question on which he writes, that the news "article" to which he refers was, as clearly stated last week, merely an abstract of correspondence that lately appeared in one of the Scottish newspapers. There was not the slightest attempt at commenting on the various statements made; the original words of the writers being, in the main, adopted. If "Utility" will be good enough to indicate "the somewhat prejudiced method employed in dealing with the report of Mr. Dawson," we shall at once, in fairness to that gentleman, set the matter right.—ED. J. G. L.]

"OUTSIDER'S" CRITICISM OF COLONEL MAKINS AND HIS STATEMENTS.

Alluding to the letter published in last week's JOURNAL, by a correspondent who signed himself "Outsider," the *Financial News* of Saturday writes as follows:—"When the chairman of a public company has made his annual or half-yearly speech to those whose investments he handles, he is apt to think that he need not trouble his head until the time comes round for airing his eloquence again. At these gatherings

of shareholders, weak points in the presidential address often pass unnoticed; fallacies in facts and figures escape detection; and, for the most part, practical criticism is a vanishing quantity. After the meeting is over, it may be that a few discoveries are made, and one or two proprietors regret a lost opportunity of putting the chairman through his facings. Sometimes, however, thinking that comment comes better late than not at all, the unconvinced shareholder writes to the newspapers to point out in what particulars his co-proprietors have been misinformed by the spokesman of the board. This is the course which has been taken by a shareholder, though apparently by an outsider, in regard to The Gas-light and Coke Company. This gentleman describes himself as a statistic who is in the habit of scrutinizing general statements made as to financial results. He asserts that at the recent meeting over which Colonel Makins presided, and to which we made some reference at the time, the Chairman's utterances on some points were absolutely erroneous. Colonel Makins gave, among other statistics, some figures relating to the net cost of coal during the previous half year, and described the reduction which had been effected as the largest within his recollection. But the amateur statistic is down upon him with a confuting array of figures industriously worked out. It seems that the net reduction during the half year ended June 30, as compared with the corresponding period of the previous year, has been considerably exceeded in the course of the Company's past history. Nor did this occur in any remote period of that history; for Colonel Makins's critic points out that the cost of coal was lower in the half year immediately preceding the period which the Chairman was discussing, as well as in the half year ending June 30—a period to which Colonel Makins made special reference. If the statistic is right, Colonel Makins was wrong, and wrong without any justification; for no Chairman, however multifarious his parliamentary or business engagements, can be allowed to limit his recollection to a period of half-a-dozen months. It would be interesting, therefore, to know how Colonel Makins, who must have had ample means of accurate information at hand in the Company's office, could have been induced to make so misleading an assertion on a point of vital interest to those whom he addressed. Figures are sometimes troublesome; the early anguish of simple arithmetic has left its mark on most of us. Multiplication is still vexation to many; but in riper years, when the handling of figures is not compulsory, it should be required of those who elect to expound them, to learn their lessons first. If, as the amateur statistic declares, the actual and comparative results of past expenditure for coals by The Gas-light and Coke Company can be ascertained by the four elementary rules of arithmetic, how came it to pass that the Chairman went so egregiously astray? A little sum which might be worked out by the Board scholar of the period ought to be within the competency of an experienced member of Parliament and Governor of an important public Company, which deals with millions of money. There are one or two passages in the critic's letter which indicate that he is an admirer of Mr. George Livesey, Chairman of the South Metropolitan Gas Company, whose public relations with Colonel Makins are not exactly of a cordial character. But with these matters we do not concern ourselves. We have before now criticized Mr. Livesey's action, even more plainly than that of Colonel Makins, or of any other chairman. Chairmen as a class are too prone—and it is not surprising—to make the colours rosy; but their duty is to be accurate, and it is just as well that there should be a 'chiel amang' them capable of taking notes, with the view of putting on the useful drag of criticism."

SHREWSBURY GASLIGHT COMPANY.—In their report for the year ending June 30 last, the Directors of this Company state that the available balance of profit amounts to £5546 17s. 9d., out of which they recommend that the authorized dividend be declared. There has been a small increase in the consumption of gas during the year; and there is also a slight improvement in the returns for residuals. The unaccounted-for gas has been 4.38 per cent. The reserve fund now amounts to £6876, and is fully invested in 2½ per cent. Consols. The Directors have deemed it advisable to revise the prices charged for rental of meters, and have reduced the same to about one-half the amount hitherto charged.

THE GAS SUPPLY OF HEANOR.—At the meeting of the Heanor Local Board on Tuesday last, the advisability of taking steps to purchase the plant, &c., of the Langley Mill and Heanor Gas Company, Limited, was under consideration. Mr. Bowley moved, and Mr. Watson seconded—"That this Board constitute itself into a Special Committee to consider the advisability of negotiating for the purchase of the undertaking of the Langley Mill and Heanor Gas Company, Limited, and take such preliminary steps as they may deem advisable." Mr. Bowley remarked that the town was increasing in population; and the purchase of the gas-works would be a great benefit to the parish, inasmuch as the price charged for gas would be lowered considerably to the consumers, and the rate-payers would receive double benefit. The Chairman said that some four or five years ago this question came before the Board. The Gas Company were then willing to sell for £16,000; but the sum was so high that the Committee appointed could not advise the purchase. Mr. Oldershaw said the Company would require double that sum for the property now. The Chairman thought the matter should be deferred, as probably in a short time the electric light would be within easy distance. The motion, however, was carried.

GLOUCESTER GASLIGHT COMPANY.—A very favourable report was presented by the Directors at the half-yearly meeting of this Company on the 30th ult. The affairs of the Company, they stated, continued to progress satisfactorily. There was a considerable increase in the sale of gas during the half year, as compared with the corresponding period of 1887; and the revenue from residual products showed a steady improvement. The net profit for the half year, after providing for interest on mortgages, &c., was £4238 9s., out of which the usual dividends were declared. These will require £3334 18s., leaving a balance of £903 11s. to be carried forward to the next accounts. In their previous report, the Directors expressed a hope that should the business of the Company continue to progress favourably, they would be able to make some concession in the price of gas; and they announce that the result of the past half-year's working was so satisfactory that they feel justified in making a reduction in the price of gas of 2d. per 1000 cubic feet—such reduction taking effect as from the commencement of the current half year. This, when the discount for prompt payment is taken off, reduces the price to the general consumers to 2s. 5½d. per 1000 cubic feet. The price is 2s. 7d., with a discount of 5 per cent. to all consumers for prompt payment; and 10 per cent. extra to those using 1,500,000 cubic feet per annum. The Directors trust that this low price will be an inducement to a more extended use of gas for cooking and other purposes, as well as for lighting.

Miscellaneous News.

THE GAS COAL CONTRACTS OF THE HALIFAX CORPORATION.

THE CHARGES AGAINST GAS-WORKS OFFICIALS.

The Monthly Meeting of the Halifax Town Council was held last Wednesday—the Mayor (Alderman James Booth) presiding—when it was intended, at the close of the usual business, to have a meeting of the Council in Committee to take into consideration what is known locally as “the Gas Scandal.” At the instigation of the Mayor, however, the reporters were invited to remain. There had, he said, been so many garbled statements made with regard to the question they were to consider, that it would be the best and fairest way for the public to know when a clear and distinct statement was made to the Council on the subject.

The Mayor, in opening the proceedings on behalf of the Sub-Committee who had had the matter referred to them, said that the members of the Council would remember that about two months ago certain statements appeared in the *Pall Mall Gazette*, and certain letters were received, imputing certain malpractices in Halifax, and which statements reflected upon the Gas Committee of the Corporation. A Sub-Committee was appointed; and, in the first place, a resolution was passed authorizing an indemnity to be given to a Mr. T. K. Fox, so as to enable him to make charges in accordance with the letter he had written to the Corporation. It was afterwards found that this indemnity was considered too narrow; and the Council then passed a resolution giving full power to grant, on the part of the Corporation, the indemnity required. Well, during his (the Mayor's) absence, this indemnity was drawn up; but it was afterwards found that the Council had not the power to give any such indemnity. In fact, the indemnity, if given at all, must be given by the Mayor acting for the Corporation. Now, he had no objection whatever to give this indemnity—he spoke for the Committee, and his present statement must be taken as emanating from the Committee—but it struck him that there was a far simpler way by which to attain their object. By signing the indemnity, they would be putting money into the pocket of an individual, or, in other words, furnishing him with the “ways and means” to fight them; and should the charges not be sufficiently proved, they would have had to part with a considerable amount of money. Well, seeing that Mr. Carr was so directly implicated in this charge, and also knowing that he would be capable of sustaining an action against the *Pall Mall Gazette*, and also be able to prove for substantial damages, and that if they gave the indemnity to Mr. Fox they would then simply have to call on Mr. Carr to take action, the Committee thought they would be justified in asking Mr. Carr to himself take action against the *Pall Mall Gazette*. Well, when this was named to Mr. Carr, he said: “I am not prepared to spend any money over it.” He (the Mayor) replied at once that, so far as any money question was involved, if the Council would not indemnify Mr. Carr he was prepared personally to indemnify him against any loss, provided he proved that he was innocent. He assured Mr. Carr that he should not be one farthing out of pocket—that all they wanted him to do was to take action, and prove the charges to be groundless. Well, notwithstanding these explanations, Mr. Carr did not seem willing to take action. Therefore, the only alternative for the Committee was to tell Mr. Carr that he must either take action against the *Pall Mall Gazette* or send in his resignation; and this was the conclusion the Committee had come to. They must insist upon Mr. Carr taking action (holding him free from costs if he proved his innocence), or else resign his position. He therefore proposed a resolution to the effect that Mr. W. Carr be requested to commence an action for libel against the *Pall Mall Gazette* (the Council to indemnify Mr. Carr against costs); and in case of his declining to do so, that he be asked to resign his position as Gas Manager.

Alderman DAVID SMITH seconded the resolution.

Alderman MICHAEL BOOTH, in supporting it, said that, as a member of the Council, he felt a great responsibility in the matter. The public had a great deal to say on the subject; but he had all along held to the hope and belief that Mr. Carr would be able to clear himself, and he still believed he would do so at the finish. He thought the Mayor's proposition a right one.

Mr. J. W. BROADBENT also supported the motion. At the same time he was prepared to go further than this, and say that, if Mr. Carr would not take active proceedings, the Council would themselves take proceedings. If Mr. Carr resigned, was that, he asked, to be the end of the business? They might perhaps think harshly of Mr. Carr; but if he did not take action, it might be said that he could not prove his innocence. If it was a question of money with Mr. Carr, then the Mayor could not do more than he had engaged to do. Even if the action was lost on technical grounds, Mr. Carr would not be out of pocket. It was the bounden duty of Mr. Carr to take action; and it was the bounden duty of the Council to insist on his taking action or resigning.

The Mayor pointed out that when they took Counsel's opinion, they took it on the point whether or not the Corporation could take action. As far as Mr. Carr was concerned, the amount of evidence that could be brought to bear on the question proved that the article referred to Mr. Carr.

Alderman LONGBOTTOM said he had not seen the article in the *Pall Mall Gazette*; but he understood that the Town Clerk had taken Counsel's opinion as to whether or not it was actionable.

The Town Clerk read the opinion of Counsel (Mr. T. D. Wright), which has already been published; but he pointed out that at the time this opinion was taken, Mr. Carr had not made his application for the post of Gas Manager to the Nottingham Corporation, and no one could then be said to have suffered specific damage from the article. The Town Clerk then went on to say that he did not apprehend any difficulty in agreeing to the terms of their indemnity; and as soon as it was signed, Mr. Fox stipulated to give the names and addresses of the parties against whom malpractices were alleged. When the Committee met, to consider as to the signing of the indemnity, one of their number said, “Why should not Mr. Carr commence an action against the *Pall Mall Gazette*?” He (the Town Clerk) might say that the Committee had received information to this extent—namely, that three names would be mentioned against whom malpractices were alleged; and it had also been stated, in confidence, that Mr. Carr's name would be one of the three. Therefore, in insisting upon his taking action, they were not asking him to put on a cap and make it fit the statements of the *Pall Mall Gazette*. He would also point out that the reference to Mr. Carr had been morally sanctioned by the public and by newspaper comments on the subject; and he read extracts from an article in the *Journal*, in which the allegations were, he said, taken to reflect directly upon Mr. Carr. What, therefore, would be thought of Mr. Carr if he hesitated to take proceedings after the indemnity which had been offered him? He had no hesitation in saying that if Counsel's opinion had to be sought at the present stage, it would certainly be that Mr. Carr ought to take action against the *Pall Mall Gazette*.

Mr. Jessor pressed for an answer to Mr. Broadbent's question as to what steps the Council would take if Mr. Carr resigned.

The Mayor replied that the question was one which it would not be prudent to answer at the present stage; but he would assure the Council confidently that they would get to the bottom of the affair. In reply to further questions, he said that they would get the three names, whether Mr. Carr took action or not, if the resolution now before the Council were passed.

Alderman POLLARD pointed out that, even if Mr. Carr resigned, they could still give the indemnity to Mr. Fox.

Alderman MINGLEY thought it was rather hard upon Mr. Carr, seeing that there were allegations against three names, that he should be singled out and asked to take action. He was in a bad state of health; and the excitement of an action would tell adversely upon him. He had long known Mr. Carr, and had always regarded him as a very useful public servant. At the same time, the statement of the Mayor was a very fair one indeed.

The Mayor pointed out that they only had power over those who were their servants; but Mr. Carr did not urge ill-health as a reason for not taking action. He (the Mayor) announced that if the Council did not pass the resolution, he would sign the indemnity. Therefore it would make no difference in that respect to Mr. Carr.

Mr. OSBORN observed that it was stated outside that they wanted to make Mr. Carr the scapegoat.

The Mayor repudiated any such intention, and intimated that they would certainly be put in possession of the three names alluded to. He also observed that if half as much had been said about himself as had been said about some persons, he should have taken action long since.

Mr. G. CLEGG supported the motion, as in his opinion the course taken by the Committee was clearly the right one. Mr. Carr had not one iota to fear; and as to the effect upon his health, to his mind the having to bear the reflections that were cast upon him was far worse than embracing the opportunity of clearing himself before the public.

After some few further remarks by other members of the Council, the motion proposed by the Mayor was put and carried unanimously.

The Halifax Correspondent of the *Bradford Observer* (from which the report given above was prepared), writing on Thursday last, says: “The statements made at the meeting of the Halifax Town Council on Wednesday evening have produced a deep and satisfactory impression among the ratepayers. The feeling universal throughout the district is that the matter must, at any cost, be sifted to the very bottom. Acting on behalf of Mr. William Carr, Gas Manager to the Corporation, Mr. Walter Storey, solicitor, has written to the Mayor stating that Mr. Carr has decided to resign rather than fight an action which must prove abortive.” The *Halifax Courier*, of Saturday's date, however, says: “It is not true, as has been publicly stated, that the Manager of the Halifax Gas-Works has sent in his resignation.”

THE WOLVERHAMPTON CORPORATION AND THE GAS COMPANY.

At Yesterday's Meeting of the Wolverhampton Town Council, the Special Gas Committee presented the following report:—

At a special meeting of the Council, held in December last, your Committee were re-appointed to consider the question of the supply of artificial light for the use of the inhabitants of this borough, and to obtain such professional advice with reference thereto as they might think fit, and to report thereon to the Council. Your Committee deemed it desirable to submit a series of questions to various corporations and gas companies in the country, with regard to their respective gas undertakings; and a large number of replies have been received. It was also considered necessary to ascertain, as far as possible, to what extent electric light and oil were being used in those places for lighting the public streets. Your Committee have to report upon the various points as follows:—

OIL-LAMPS.

With regard to oil-lamps, your Committee find that they are used to a very limited extent only for street lighting; and they, therefore, do not propose to report to the Council the details of the information which they have obtained relative thereto. Your Committee have, however, every reason to believe that, owing to the cheapness of oil, and the greatly improved character of the lamps now in use, oil is being used for household purposes to a larger extent than formerly, and is becoming in this respect a formidable rival to gas.

ELECTRIC LIGHT.

At Eastbourne, Hastings, and Blackpool electric light is used for lighting some of the principal places, streets, and thoroughfares; but your Committee have not sufficient information from those boroughs to enable them to judge as to the relative cost of gas and electric light for the areas supplied. The Corporations of Bristol, Carlisle, and Huddersfield have obtained Provisional Orders for the supply of electric light, but they have not been acted upon; whilst at Norwich and Middlesbrough electric light has been tried and its use abandoned. The Town Council of Bath have recently decided to light about fifty streets with electric light.

Your Committee have consulted Messrs. Elwell-Parker, Limited, of Wolverhampton, with regard to the cost of lighting the streets of the borough with electricity, who cannot at present recommend the Corporation to undertake the lighting of the streets alone, owing to the length of leads necessary to be used for the purpose, and the amount of labour of laying down mains necessary for this comparatively limited amount of lighting. Messrs. Elwell-Parker are of opinion that “if Wolverhampton is lighted by electricity, it must be arranged to be done upon the same plan as gas—that is to say, by taking off the mains to light dwellings or shops, or wherever the current could be sold, so as to utilize the cables to the greatest extent.” In case of carrying out such a plan of lighting, they have no hesitation “in recommending the Corporation to use electricity, as electrical engineering is sufficiently advanced to make the thing a thorough success, and to give a good return for capital invested at reasonable rates charged. Even in small installations, where not more than 4000 lights are used, it will compare favourably with gas at 3s. 6d. per 1000 feet. If a 40,000 lamp installation were entered into, the present price of gas in Wolverhampton could be successfully competed with by electricity.”

Your Committee find, on comparing the estimate of cost of plant, &c., which they have received from Messrs. Elwell-Parker, Limited, for lighting 60 miles of streets in the borough, and for providing for the probable requirements of the inhabitants, with that of Mr. J. N. Shoolbred, which was submitted to the Council in November, 1882, and which provided for the lighting of a small area in the centre of the town only, that an enormous reduction has been made in the cost of such plant, and there is no doubt that on the further development of electric light, still greater reductions will be made.

Your Committee may also here call attention to the Electric Lighting Act, 1888 (51 and 52 Vict., c. 12), amending the Electric Lighting Act, 1882. Under this Act a Provisional Order for the supply of electric

light in the district of any local authority is not to be granted, except with the consent of the local authority, unless where such consent is refused the Board of Trade are of opinion that such consent ought to be dispensed with, when they are to make a special report, stating the grounds upon which they have dispensed with such consent. The grant of authority to any undertakers to supply electricity within an area is not to restrict or hinder the granting of a License or Provisional Order to the local authority, or to any other company or person within the same area. The Act also gives local authorities power to purchase the undertakings for the supply of electric light from the undertakers within six months after the expiration of a period of 42 years from the date of the Act confirming the Provisional Order, or the passing of the Special Act, or within six months after the expiration of every subsequent period of 10 years, or such shorter respective periods as may be specified in the Provisional Order or Special Act. These periods in the former Act were 21 and 7 years respectively. The sale is to be made without any additional price in respect of compulsory purchase or goodwill, or of any profits which may, or might have been, or be made from the undertaking, or of any similar considerations; but subject to any variation of the terms which may be made by the Board of Trade. It is generally thought that these modifications of the principal Act will have the effect of stimulating and extending the use of the electric light.

GAS.

Your Committee have obtained valuable information from 87 towns on this subject; but in attempting to make a general comparison between the price of the gas supplied in these towns and that supplied in Wolverhampton, they have met with considerable difficulty, inasmuch as not only does the price of gas vary considerably, but also the illuminating power thereof. Moreover, in some towns gas consumers get advantages from the allowance of discount for cash payments; in some a reduction is made to large consumers; whilst in others no charge is made for the hire of meters. Your Committee, however, find that in many boroughs, apparently not more favourably situated than Wolverhampton, the gas consumers are on the whole supplied to better advantage than in this borough.

Your Committee have thought fit to lay the gas accounts which have been filed with the Clerk of the Peace of this Borough, the report of Mr. Edward Carter to the County Quarter Sessions on the state and condition of the concerns of the Wolverhampton Gas Company, dated 1868, together with other necessary documents, before Messrs. Howard Smith, Slocombe, and Co., of Birmingham, who are thoroughly versed in the examination of gas accounts, for their report thereon. Their report has been submitted to the Gas Company, who have, through their Solicitors, Messrs. Manby and Son, and Messrs. Neve and Cresswell, replied to it; and such reply has been sent to Messrs. Howard Smith, Slocombe, and Co., for their remarks thereon. A copy of this latter document has also been sent to the Gas Company, from whom no further reply has been received. The chief points raised by Messrs. Howard Smith, Slocombe, and Co., are seven in number, and your Committee propose to take them seriatim.

1.—Share Capital.

Messrs. Howard Smith, Slocombe, and Co. call attention to the conversion by the Gas Company of the loan capital of £10,000 into capital bearing 10 per cent. dividend, and raise the question as to the legality of the conversion, and its effect upon the finances of the Company.

The Solicitors to the Gas Company reply that the legality of the conversion was not raised in Mr. Carter's report of 1868, nor before the Court of Quarter Sessions; that the conversion took place in 1861, under the powers of the Companies' Clauses Act, 1845, and was recognized by the Order of the Board of Trade in 1875. Under these circumstances, and owing to the lapse of time which has taken place, your Committee do not propose, unless otherwise instructed by the Council, to pursue this point further.

2.—As to the Payment by the Gas Company of the Dividends on the 10 per cent. Capital, free of Income-tax.

Messrs. Howard Smith, Slocombe, and Co. say "that, in case the practice of paying the 10 per cent. dividend free of income-tax, is illegal, there is a sum (at the present rate of the tax) of nearly £250 per annum paid to the shareholders annually, which ought to remain in the funds of the Company. If the tax had been deducted, as it should have been, during only say the last 12 years, there would have been no necessity to reduce the reserve-fund by about one-half, for the purpose of assisting the profit and loss account, as was done on the 31st of December, 1887."

The Solicitors to the Gas Company reply "that the Directors are prepared to stand on the legality of the course they have adopted in paying dividends free of income-tax; that the question was dealt with in Mr. Carter's report, and was brought before the Court of Quarter Sessions, but no opinion was then expressed by the Court which would justify the unhesitating opinion of Messrs. Howard Smith, Slocombe, and Co. in the present report."

The Town Clerk is of opinion, having regard to the decision in a case (which was not brought to the notice of the Court of Quarter Sessions at Stafford) that the practice is illegal.

3.—Capital Outlay.

Messrs. Howard Smith, Slocombe, and Co., in their report fully criticize the capital outlay made by the Gas Company, and state "that the filed accounts certainly demonstrate considerable variation in the rate of progress of the capital expenditure during the last 20½ years. They suggest 'that it may be that there has been during the first half of the period a lack of accurate discrimination between capital and revenue; but an independent answer to that question could only be obtained at the cost of an exhaustive inquiry into details.'"

In reply to this, the Solicitors to the Gas Company say "that the variation in the rate of progress of the capital expenditure during the 20 years covered by the report, must be a matter for which the Accountants must have been prepared from their examination of the accounts of other gas companies, and it is not one to cause surprise or remark. The capital outlay on works for the manufacture and supply of gas is, both as a matter of necessity and economy, unequal. Since the report of Mr. Carter, in 1868, the Board have been careful accurately to discriminate between capital and revenue."

Your Committee do not propose to enter more fully into the matter in this report, although they consider it one which should in the future receive the careful attention of the Corporation.

4.—Cost of Coal.

Messrs. Howard Smith, Slocombe, and Co. state that "they have made some calculations with a view of comparing the cost of coal at Wolverhampton with that at other places during the year 1885—that year being the last in respect of which they had before them the 'Analysis of Metropolitan, Suburban, and Provincial Gas Accounts,' prepared annually by Mr. Field; and they find that, whereas the cost of coal per 1000 cubic feet of gas sold during the year 1885 was at Wolverhampton 18-52d., the cost at Birmingham was only 11-89d.—the average cost of the nine provincial corporations analyzed by Field, was 1s. 1-70d., and the average

of the ten provincial companies analyzed was 1s. 3-14d. This apparent excess in the cost of coal at Wolverhampton is, however, doubtless due to some extent to the fact (evident upon the accounts) that coal is used there for fuel instead of coke. But, allowing for that fact, there is a balance of excessive cost apparent, which is largely counterbalanced by the better revenue from coke; this being at Wolverhampton exceptionally good. The revenue from coke per 1000 cubic feet of gas sold, at the places quoted above, is as under:—

Wolverhampton	7-00d.
Birmingham	3-02
Nine Provincial Corporations quoted by Field	2-43
Ten Provincial Companies quoted by Field	3-29

But the whole of this seeming advantage cannot be charged against Wolverhampton as compared with the other places, because assuming (as stated above) that at Wolverhampton coal is used for fuel instead of coke, all the coke made necessarily remains in hand for sale, thereby increasing the comparative revenue. Giving, however, full credit for this circumstance, it is probable that Wolverhampton gains something between 2d. and 3d. per 1000 cubic feet from the superior price obtained there for coke. This favourable realization from coke aids, of course, in neutralizing the apparently excessive cost of coal; and the following table shows what the net cost of coal amounts to, after deducting coke and all other residuals:—

Wolverhampton	7-45 d.	Per 1000 cubic feet of gas sold.
Birmingham	4-96	
Average of nine Provincial Corporations	6-26	
Average of ten Provincial Companies	7-86	

In reply, the Solicitors of the Gas Company state "that the Company have, during the period covered by the report, used coal for fuel instead of coke; and have therefore had a larger quantity of coke for sale, and the coke made has been of a superior quality. Wolverhampton seems to compare unfavourably with most of the corporations and companies named in the report, owing to a large extent of its mains and service pipes being laid in ground affected by mining operations—involving an exceptional loss by leakage; and owing to many of the districts supplied with gas being thinly populated. Birmingham and other large towns have a larger day consumption of gas, which much reduces the percentage of gas unaccounted for. The comparison instituted is based not on the gas made, but on the gas sold. The table given above, showing the net cost of coal, cannot be considered unsatisfactory; as, although the estimate is based on gas sold, it shows that the cost to Wolverhampton is 0-1d. less than the average of ten provincial companies."

In reply to the above observations, Messrs. Howard Smith, Slocombe, and Co. state "that they have no opportunity of ascertaining the quantity of gas made—the published accounts and statistics do not give the information; but if they had those figures before them, they would still have considered the gas sold, according to the plan of Field's tables, the best test of results. It is true that the net cost of coal, after deducting residuals, is at Wolverhampton less by 0-1d. per 1000 feet than the average of ten provincial companies quoted; but that, with a great deal more, is evidently due to the advantage Wolverhampton gains upon coke. Notwithstanding that advantage, however, the net cost per 1000 feet at Wolverhampton is 2-49d. per 1000 feet (equal to 50 per cent.) more than at Birmingham (7-45d. against 6-96d.), and 1-19d. per 1000 feet more than the average of the nine provincial corporations quoted (7-45d. against 6-26d.)." With regard to the suggestions made by the Solicitors to the Company, as to the leakage by mining operations, Messrs. Howard Smith, Slocombe, and Co. compare Tipton and Dudley with Wolverhampton, and point out "that the gas sold at Tipton during the year ended March 25, 1887, was equal to 9213 cubic feet per ton of coal carbonized, and the return for Dudley, year 1886, gives in the same way 8904 cubic feet per ton, against 8281 cubic feet for Wolverhampton in the year 1886." As to the sparseness of population, the Accountants point out "that it must be very considerable indeed to appreciably affect a comparison with the towns referred to in the report; and the value of the Company's suggestion on this point could only be efficiently tested in figures by a comparison of the capability for supply per head of population of the Wolverhampton mains with that of the other places named." With regard to day consumption, the Accountants say "that this cannot be tested without recourse to information which is not published, and which might be difficult to obtain. If they could ascertain the quantity passing through the station-meters at Wolverhampton and some other large companies during the hours of daylight and darkness, they would be able to ascertain how far this statement is well founded." Speaking generally, they would have thought "that an important manufacturing town like Wolverhampton would not, in this respect, compare unfavourably with other large towns; and they ask if the comparison were to the disadvantage of Wolverhampton, would it really be a matter of any great moment if the mains and service pipes were in good condition and the pressure properly regulated to the requirements?"

5.—Yield of Gas Sold Per Ton of Coal.

Messrs. Howard Smith, Slocombe, and Co. state that they find the yield of gas per ton of coal in Wolverhampton is poor, compared with that at other places. For the purposes of calculating the yield per ton (on the basis of the gas sold) they have taken the year 1886, making their comparison upon the figures given in the Board of Trade returns. The yield at Wolverhampton was only 8281 cubic feet per ton of coal carbonized, whereas the yield at Birmingham was 9305 cubic feet per ton. The average yield of all the Staffordshire companies, other than Wolverhampton (most of them small concerns), was 8297 cubic feet per ton; and the average of all the Staffordshire corporations (other than Walsall) was 9096 cubic feet per ton. They state that "they excluded Walsall from the calculation because the apparent yield there is so small that it is fair to presume some mistake has been made; possibly the fuel coal has been included as well as that carbonized." Messrs. Howard Smith, Slocombe, and Co., in concluding this important division of their report, state that "they think they have now shown that there is evidence upon the accounts tending to suggest a want of economy, or manufacturing skill, or both, in the principal item of expenditure, coal, sufficient at least to call for inquiry."

In reply, the Solicitors state "that the reason which the report gives for the exclusion of Walsall from the calculations applies in fact to Wolverhampton; fuel coal having been included, as well as that carbonized, in the quantity stated in the filed accounts for 1886. The Board repudiate the suggestion that the accounts furnish evidence of a want of economy or manufacturing skill."

Messrs. Howard Smith, Slocombe, and Co. say, with regard to this, "that the reply of the Company under this head is based upon a misconception of their report. That their calculation of the yield of gas per ton of coal carbonized was not made upon the figures of the filed accounts, which do not distinguish between coal carbonized and fuel coal; but (for Wolverhampton as well as all the other districts referred to) upon the quantities stated in the Board of Trade returns to have been carbonized—

merely altering the total of gas sold at Wolverhampton to agree with the quantity shown in the filed accounts, assuming (as now appears to have been the fact) that the filed accounts give the true total. They excluded Walsall from the Board of Trade returns, suspecting that the return in that case had inadvertently combined coal carbonized and fuel coal in one total; and having no means of resolving the doubt, their only safe way was to leave Walsall out of account altogether."

N.B.—Inquiry has been made as to the Walsall return. It is found that a mistake has been made in it, as the number of cubic feet of gas sold per ton of coal carbonized was 9023; thus adding confirmation to the before-noted calculation.

6.—Fittings.

Messrs. Howard Smith, Slocombe, and Co. state "that if the items of expenditure and income in the filed accounts described as 'fittings' relate, as they presume they do, only to the fittings' work done for and charged to consumers, that branch of the Company's business would appear to have been singularly unprofitable. There has been an apparent loss in every one of the ten years for which they have copies of the filed accounts, heaviest in the last two—the loss in 1886 and 1887 having been at the rate of more than £500 per annum. If rent, interest on capital, and proportion of management charges were added to the expenditure, the loss would be much more serious than it is. On income from fittings of only £2044 18s. 9d. in 1887, it is hardly conceivable that such a loss can have been really sustained; and it would be well to inquire whether the expenditure does not cover payments which should properly be included under some other head."

The Solicitors reply that the Company's meters are not included in this item, "as they are not treated as capital, but as part of the Company's stock. If the income and expenditure in respect of meters are added to those in respect of fittings, the result will show an annual profit of about £500, instead of a loss to that amount."

With regard to this, Messrs. Howard Smith, Slocombe, and Co. say, "they do not quite understand the reply under this head; but if the paragraph means that some portion of the expenditure in relation to meters is included under the head of fittings, it is obvious that the accounts are inaccurately stated, because in the filed accounts of each year there is a sum charged (quite apart from fittings) described as 'repairing, renewing, and refixing meters.' These charges appeared to them to be about what might be anticipated under that branch of the expenditure, and no one would expect to find a second and a heavy charge in respect of meters concealed under the head of 'fittings.'"

7.—Bad Debts.

Messrs. Howard Smith, Slocombe, and Co. report "that the charges for bad debts are heavy; about double the average cost per 1000 feet of the Metropolitan and Suburban Companies quoted in Field's book for 1885, and about four times the average of the Provincial Corporations and Companies referred to by him. The average allowances at Wolverhampton, during the ten years from 1878 to 1887, gives about £630 per annum, on a total income from all sources of less than £57,000 per annum—equal to about 1½ per cent. There does not appear to be any deposit system in operation in Wolverhampton; but, even without that, for a monopoly having power to cut off in any case of arrear, the percentage seems high."

The Solicitors to the Gas Company reply "that the charges for bad debts were a few years ago exceptionally heavy. In recent years the charges under this head have considerably diminished; and the average now shows a much less percentage than that stated in the report. The Directors are responsible to their shareholders for the financial policy of the Company; and they are satisfied that their policy with respect to bad debts and other similar questions has been dictated by prudence."

In answer to this Messrs. Howard Smith, Slocombe, and Co. say "that the reply admits that the charges under this head were some time ago exceptionally heavy, though considerably diminished in recent years." As to this qualification, they remark that "the loss by bad debts is still, so far as the filed accounts go, in excess of the general average, and considerably more than the average shown by the provincial corporations and companies quoted by Field."

General Conclusions.

Your Committee, in concluding their inquiry, desire to disclaim any suggestion of antagonism to the Gas Company in respect of the steps which they have taken. They have examined in an impartial manner the evidence brought before them; and in view of the facts of the case, they are bound to remark that the position occupied by the Gas Company, by virtue of their legal monopoly, as regards the gas consumers, cannot be accepted as satisfactory to the public.

Your Committee consider that this assertion is supported by the evidence adduced before them, which the Council will note is entirely of an official character, being based upon either the Board of Trade returns, the filed accounts of the Wolverhampton Gas Company, or direct communications from corporations or private gas undertakings. It is, of course, difficult, if not impossible, for your Committee to investigate the details of gas manufacture. They can, therefore, only concern themselves with a comparison of results; and hereby the conviction is forced upon them that the public of Wolverhampton are not so well served by the local Gas Company as the inhabitants of many other boroughs. While not prepared to express a decided opinion upon the observation that "there is evidence upon the accounts tending to suggest a want of economy or manufacturing skill, or both, in the principal item of expenditure, coal," your Committee are bound to emphasize the fact that in Wolverhampton the cost of coal (both in the gross and less residuals) per 1000 feet of gas sold is considerably in excess of Birmingham and the other provincial corporations referred to; while on the other hand, the explanation of this discrepancy offered by the Gas Company entirely fails. Again, in the examination of another very practical point—viz., the yield of gas sold per ton of coal carbonized—the Wolverhampton Gas Company appears to great disadvantage as compared with the working both of distant and local undertakings. This point is further clearly proved by the comparison of Wolverhampton with a group including Birmingham and eight Staffordshire gas undertakings, by which your Committee find that in Wolverhampton 780 cubic feet (equal to 9·42 per cent.) are sold per ton of coal carbonized less than the average sales of the group of towns examined. It is not less clearly demonstrated that the public of Wolverhampton do not enjoy the same illumination as the inhabitants of many other boroughs. Birmingham, for instance, provides 17·5 average candles tested at various parts of the borough, with gas at a price rather lower than that of Wolverhampton; whereas our local Company only provides 15 candles guaranteed, or 16·25 candles as ascertained by test. It has appeared to your Committee that it would be fair to make comparison of the number of candles of illumination provided for the price charged in other boroughs with the same calculation in Wolverhampton; and they have therefore taken twenty representative cases, in which by dividing the price per 1000 feet by the candles of illumination, they have obtained a figure representing the value per candle. This figure ranges from 1·1d.

to 1·7d.—the average of the twenty is 1·5d.; whereas the same figure in Wolverhampton stands at 1·8d., or about 20 per cent. in excess. Your Committee also find (as previously referred to) that in some other boroughs gas consumers are charged at rates variable according to the amount of gas consumed, with advantage to large consumers; that discounts for cash payments are allowed; and that meter hire is not charged. Considering that the gas consumers of Wolverhampton have a right to expect from the Gas Company at least an equal quality of gas at as low a price as that supplied in other towns, and with equal concurrent advantages, they regret to observe from the records of the Town Council that hitherto the Gas Company have not met the reasonable requests of the public represented by the Corporation as your Committee think they should have done.

But your Committee feel strongly that the period has now arrived when, in common with all other commercial undertakings, the Gas Company should recognize the necessities of the times, and so far reorganize, if needful, the details of their business, as to give the public such concessions as are possible without invading the profits upon their capital which the proprietors naturally expect. Your Committee are strongly convinced that both these ends can be attained; for they have entirely failed to discover that there is, either in the situation or the circumstances of the Wolverhampton Gas Company, anything to place the Company in a more disadvantageous position than any of their neighbours.

Your Committee also think it desirable to direct the special attention of the Council to the opinion of the Town Clerk as to the illegality of the payment by the Gas Company of the 10 per cent. dividend *plus* income-tax, and also to the remarks made by the Accountants under the head of "fittings." They consider, as to the latter point, that the explanation of the Gas Company is very unsatisfactory. Referring to the filed accounts of the Gas Company for the year ended Dec. 31, 1887, your Committee find that the expenditure under the head of "fittings," amounts to £2567 9s. 1d., while the income from the same department is only shown to be £2044 18s. 9d.—leaving a deficiency of £522 10s. 4d.; and your Committee fail to see that the reference by the Gas Company to the profit made in their meter account is in any respect a sufficient explanation of this loss.

Your Committee therefore recommend to the Council that a deputation should meet the Directors of the Gas Company, and endeavour to obtain concessions upon the following points:—

1. Reduction in the price of gas, with rates adapted to the quantity consumed.
2. The allowance of discount for all monthly cash payments.
3. The abolition of charges for hire of meters.
4. Cessation of payment of dividends to shareholders on the 10 per cent. capital *plus* income-tax.

Your Committee also recommend that the Corporation should carefully examine each year the gas accounts filed with the Clerk of the Peace, in order to ascertain whether there are any special features in it to which the attention of the Council should be called; and should also make arrangements for periodically testing the gas, both as to illuminating power and purity, in various parts of the borough.

SUNDERLAND GAS COMPANY.

The Annual Meeting of this Company was held last Wednesday—Mr. E. C. ROBSON in the chair.

The CHAIRMAN, in proposing the adoption of the report and accounts (a notice of which appeared in the JOURNAL last week, p. 431), said that the central fact in the report was that they were still paying a 10 per cent. dividend. They not only did that, but they had added something to the reserve fund, which they would see, was a very respectable one. They had a balance left of £10,000, which was exceedingly satisfactory, and the result of many years' savings. They would probably infringe upon that this year, by making a considerable addition to their works in the purifying department. They purposed spending about £4000 in the erection of four new purifiers. When this was done, they would defy comparison with any gas plant in the kingdom. Their capital remained the same; but he would like to draw attention to the difference between this year and ten years ago, in order that they might see at a glance the progress of the Company. In 1878, their revenue from gas was £43,065; whilst in the year just expired the amount was £44,920. In the past year, however, they had made half as much more gas than they did ten years ago. The difference had not gone into the pockets of the shareholders, but into the public purse; and if the quantity of gas made this year had been sold at the price which prevailed in 1878, their revenue would have come to £25,000 more. With regard to reductions, they had several times—be thought three times—reduced the price of gas to the general consumer without being asked. The Directors had gone very carefully into the state of the accounts and their revenue; and they were going to lay before the shareholders a table of reductions in the price, to come into operation on Oct. 1 next. At present they invoiced the gas at 2s. 6d., and gave a discount; and they now proposed to invoice it at 2s., and give a smaller discount than before. This would reduce the price to the small consumers from 2s. to 1s. 11d. Above 50,000 cubic feet, the price would be 1s. 10d., subject to 1d. discount, or 1s. 9d. net. Above 200,000 and under 500,000 feet, the price would be 1s. 8d., subject to 1d. discount. The price to very large consumers—those of over 800,000 feet—would be 1s. 6d. net only. He believed with these prices they would defy comparison with any gas concern in the country. They had carefully gone into the matter, and saw that they were no less likely to maintain their income. The public, who would save £2200, would appreciate the reduction; and he was not without hope that they would be more than recouped by the increase in the use of gas.

Mr. STOKOE seconded the motion.

Mr. RICHARDSON, referring to the electric light, remarked that since the light had been introduced into Barnet, the shares of the local Gas Company had gone up 45.

The motion was carried.

The usual complimentary votes having been passed, the proceedings terminated.

THE GAS SUPPLY OF BLACKPOOL.—Consequent on the popularity of Blackpool as a seaside resort for residents in the Manchester and Liverpool districts, the usual order of things in regard to gas supply is largely reversed here; and an abnormal consumption of gas takes place during the month of August. Mr. John Chew, the Engineer and Manager of the gas-works, reported at last Tuesday's meeting of the Town Council that, on Bank Holiday (Aug. 6), the town was in danger of being in total darkness on account of the large consumption of gas. On Bank Holiday, 1887, night and day there was consumed 499,000 cubic feet, as against 557,000 cubic feet this year. On Aug. 20, 1887, 540,000 feet were consumed, against 580,000 feet in 1888. For the four days Aug. 20 to 23, 1887, the consumption amounted to 2,196,000 feet; and for the same period in 1888, the demand had jumped up to 2,272,000 feet—showing an increase of nearly 100,000 cubic feet in the four days. It was probable that in a very short time they would have to enlarge their works.

THE SALFORD CORPORATION AND THE COST OF THE HUNTER TRIAL.

At last Wednesday's Meeting of the Salford Town Council, a report was submitted by the Consulting Committee, who had had the matter in hand with respect to the legal charges incurred in connection with the prosecution of Samuel Hunter, the late Gas Engineer, and the civil proceedings arising therefrom. It showed that the total expense incurred amounted to £2083 12s. 6d., made up as follows:—"Criminal proceedings against Samuel Hunter: Counsel's fees, £920 8s. 6d.; travelling expenses and personal allowances of members of the Committee and officials, £266 0s. 6d.; witnesses and other expenses in obtaining evidence, £220; agency costs (on account), £200; law stationery and extra clerks' assistance, £115 15s. 6d.; Solicitor's charges, £46 3s. 8d.; shorthand notes, £47 8s. 4d.; petty cash disbursements, £58 17s. 11d.—total, £1875 7s. 2d. Civil proceedings in the case of the Corporation of Salford v. Hunter and Hawkins: Counsels' fees, shorthand notes, travelling expenses, and petty cash disbursements, £208 5s. 4d. Grand total, £2083 12s. 6d." The Committee further stated that the accounts in Regina v. Hunter are now in the hands of the agents for the prosecution, with a view to taxation as early as practicable. After this has been done, the certified costs of the prosecution will be repaid by the county; and the additional costs incurred by reason of the trial taking place at the Central Criminal Court instead of at Lancaster will be borne by Samuel Hunter. The Committee asked for the authority of the Council to direct the General Finance Committee to pay the accounts in the first instance, as well as the sum of £43 14s. 7d., the cost of defending an action brought against the Corporation by Samuel Hayward and dismissed, and which action arose out of the proceedings of the Gas-Works Investigation Committee.

The Mayor said the Consulting Committee had now ended their labours; but they were not in a position to sign any order for the payment of money. They expected to recover £400 or £500 from the county. He moved that the accounts be transmitted to the General Finance Committee for examination and payment.

Alderman WALMSLEY seconded the motion.

Alderman HUSBAND suggested that these were charges which ought to be cast upon the Gas Committee. It would be a misfortune if they were made a direct charge upon the rates.

The Mayor said, in the case of the Investigation Committee, the Finance Committee paid all the charges out of their funds; but if it were now decided that these legal expenses were chargeable to the Gas Committee, he presumed that whatever sum was recovered from Hunter would be handed over to that Committee.

Mr. JENKINSON asked whether it was true that Hunter's Solicitors had offered £20,000 to the Corporation, and that the offer was refused. It was, he said, so reported outside.

The Mayor said that while the civil proceedings against Hunter were pending, they could not discuss what offer was made, or whether one was made at all.

Alderman HUSBAND said the Consulting Committee were bound over to secrecy, and could not divulge anything that took place.

Mr. JENKINSON (to the Mayor): Do you rule that an answer, yea, or nay, cannot be given to the question whether £20,000 was offered and refused?

Mr. MANDLEY thought that before the Council were asked to vote for the resolution, they ought to have heard something about the nature of the expenses incurred, and something with respect to the progress that had been made with the civil action. It was rather too bad that those who were deeply interested in the matter should be kept so completely in the dark. He moved as an amendment—"That before sanctioning the payment of the accounts incurred in the civil and criminal proceedings against Samuel Hunter, the Council are of opinion that they should be furnished with a statement showing in detail the whole of the charges, expenses, and gifts relating, directly or indirectly, to the said proceedings; and also of those connected with the criminal proceedings against Mr. Ellis Lever; and they hereby order the Borough Treasurer to prepare such statement forthwith." He said that, although he was elected to the Consulting Committee, for some occult reason he and Mr. Rycroft were removed from it by the direct action of one member of the Committee. He was elected to the Council for the sole purpose of bringing to light the frauds going on in the gas-works; and he was determined to leave the Council the moment his work was finished. Although he had studied the question thoroughly, he was put off the Committee; and those who had systematically and with the greatest obstinacy and persistence white-washed everything that was done by the late Gas Committee and by Mr. Hunter were left on. He wanted to know what was the state of the proceedings against the men who had systematically tampered with the officials.

The Mayor: That is not the question before us. I must ask you to confine yourself to the resolution or to your amendment.

Mr. MANDLEY: Are we to pay all these expenses and not know what they are for?

The Mayor said the criminal action against Hunter was now over. In connection with it certain expenditure had been incurred; and the items were open to the inspection of members of the Council. The Council were asked to allow the Finance Committee to peruse the accounts; and if they found them correct, to pay them. That was the whole matter before the Council; and he could not allow them to go discursively into matters relating to things that occurred years ago, and that were not pertinent to the present issue.

Mr. MANDLEY: Do any of these expenses relate to any of the proceedings against contractors that are going on in the High Court of Justice?

The Mayor: We have no proceedings against contractors at present.

Mr. MANDLEY: What becomes of our statement of claim against the people who have systematically bribed our servants?

The Mayor: That is in connection with the civil action which is now proceeding. During the long vacation nothing can be done.

Mr. MANDLEY: Does this account cover any of the expenses incurred in the High Court of Justice in our proceedings against these other people.

The Mayor: About £200, I fancy.

Alderman ROBINSON said that none of the contractors had as yet been proceeded against in a civil court.

The amendment was not seconded.

Alderman WALMSLEY said that he did not remember accounts being presented to the Council under similar circumstances on any previous occasion. There was a supposed Committee before whom the accounts were presented; but they did not feel in a position to take upon themselves the responsibility of signing any document involving the payment of money. The accounts were then presented to the General Finance Committee, who returned them to the Consulting Committee. That Committee were still unmindful to undertake the responsibility of passing accounts, as to which there was some doubt; and that they felt the only thing to be done was to refer it to the Council. Mr. MANDLEY was quite mistaken in saying that any steps were taken in order to prevent himself and Mr. Rycroft having any part in the proceedings of the Consulting Committee. The Investigation Committee concluded their business, and

made their report. At a subsequent meeting of the Council, it was proposed that four gentlemen should be appointed with whom the Town Clerk might consult with regard to the proceedings then being taken against the Gas Engineer. It was agreed by the Council at the time that these gentlemen should not be called a "Committee," because Committees were bound to report to the Council and to answer questions put at the Council meetings; and it was felt that it was not desirable that statements should be made at Council meetings with respect to a criminal case that was pending. The accounts that had been presented spoke for themselves; and the Consulting Committee were satisfied that the amount would have to be paid, and ought to be paid. With regard to the proceedings against certain contractors, it would be most inexpedient at this stage to lay completely before the public what was going on.

Alderman McKERROW said it was a gross perversion of the truth to represent the matter as Mr. MANDLEY had done. Mr. Hunter would not have been apprehended and convicted had the original Investigation Committee continued to exist. It was necessary that some of the members should be removed from it.

Mr. MANDLEY (excitedly): I challenge that statement; I would have had him arrested myself.

Alderman BOWES moved, as an amendment, that the accounts be referred to the Gas Committee.

Mr. HUSBAND seconded the amendment.

Mr. RYCROFT said these expenses had been incurred, not by the Committee, but by the late Town Clerk. It was a perfect scandal that in a prosecution in which there was no legal difficulty, such a monstrous sum as £920 should be paid in fees to Counsel. As to the civil proceedings, he had learned that a writ and statement of claim had already been issued.

The Mayor: I object to these remarks; and I shall rule out of order anything you say about the civil proceedings against Hunter.

Mr. RYCROFT: It is proposed to relegate these accounts to the Finance Committee to pass them. What materials will that Committee have on which to judge as to the correctness of the charges. On April 12, 1888, £20,000 was offered—

The Mayor: This is very improper. I must call the attention of the Council to it; and they must support me in my position as Mayor, or I shall put in force rule 14.

Mr. RYCROFT: It is a most extraordinary thing that we, as members of the Council, discussing our affairs, cannot give information. We have had some extraordinary rulings in this Council Chamber; and it is a matter of surprise to me that members should sit down and be told, when they are asking questions about their own affairs, they are out of order. The members of the Council are entitled to know about their own affairs.

Mr. MANDLEY: Not in Salford.

Mr. RYCROFT: If such an offer had been made to the Consulting Committee, I should have thought it was the duty of the Committee to have called a meeting of the General Purposes Committee to consider the matter.

The Mayor: That is not the question before the Council; and as the affair is now *sub judice*, you must know you ought not to speak about it.

The amendment was then put to the meeting and rejected, and the original resolution was carried.

PROPOSED EXTENSION OF THE BURNLEY GAS-WORKS.

At the Monthly Meeting of the Burnley Town Council last Wednesday, Alderman Greenwood, in moving the adoption of the minutes of the Gas Committee, drew attention to the resolution asking for additional powers to borrow £30,000 for the extension of the gas-works. He stated that in May, 1884, Mr. S. P. Leather, the Gas Engineer, reported strongly on the importance of taking in hand the question of extending the works; and again in 1887 he spoke of the necessity of such a step being taken. The result was that Mr. Woodall was called in to report upon the whole matter. Mr. Woodall's report stated that the demand for gas in the last ten years had doubled; while the population of the town had doubled every twenty years since the commencement of the present century. The consumption of gas had thus increased at exactly double the ratio of the increase of the population; and he recommended extensions to the gas-works which would involve an expenditure of £30,000. The Committee recommended the pulling down of old buildings near the present works for the proposed extension, and had secured 7909 yards of land, or thereabouts, at 7s. 6d. per yard, for the purpose. The Committee had found, however, that they could not erect works there without—in compliance with a Standing Order of the House of Commons—giving notice to the owners of property within 300 yards of the proposed new works, and he (Alderman Greenwood) believed securing their consent. Consequently, they could not proceed with the extension until they obtained the requisite sanction from Parliament. In concluding, he submitted the following tabulated statement as to the development of the gas-works:—

	1885.	1888.	Increase.	Increase Per Cent.
Gasholder space	310,000	2,292,000	1,982,000	640
Consumption per year . .	35,540,000	296,096,000	260,556,000	733
Largest daily consumption .	2,77,000	2,009,000	1,742,000	652
Smallest " " " " " "	25,000	231,000	206,000	824
Gas meters	1,608	11,351	9,743	606
Cost of works	£31,299	£171,637	£140,338	£448
Debt on works	£31,299	£104,566	£73,257	£234
Do. per 1000 c. ft. consumed	17s. 7d.	10s. 7d.*	—	—
Population	24,000	80,000	56,000	233
Rateable value	£41,681	£244,000	£179,319	£400
Cost of works per £10,000 rateable value	£7,005	£4,750	£2,255*	£32
Cost of proposed extensions	—	£30,000	—	—
Annual charge 3½ per cent.	—	£1,631	—	—

* Decrease. Land purchased from Canal Company (7909 yards at 7s. 9d.), £3067. The minutes of the Committee were confirmed after a brief discussion.

THREATENED STRIKE OF GAS STOKERS.—A strike of the whole of the gas stokers in the employ of the Bolton Corporation (about 140 in number) has just been averted. Some time ago, Mr. Smith, the Manager, suggested to the Gas Committee of the Town Council certain alterations in the working of the carbonizing departments at their respective works, which were accepted, but with considerable modifications, however. By the new arrangement the stokers were to work twelve-hour shifts, instead of eight, as previously; and carbonize 4 tons 4 cwt. of coal, instead of 2 tons 2 cwt. The rate of wages was to be as before, 5s. for the shift. As compensation for the extra four hours' labour, and the double quantity of coal to be lifted, it was proposed to relieve the stokers from carrying the coal from the yard into the retort-houses and also wheeling out the coke. The men refused to accept the new conditions, and gave notice last week to cease work in seven days. The Gas Committee held a special meeting last Tuesday, and practically gave way to the men's demands, and subsequently the men withdrew their notices. The men, therefore, continue to work virtually as before.

NOTTINGHAM CORPORATION GAS SUPPLY.

THE STATISTICS OF THE GAS UNDERTAKING FOR THE PAST YEAR.

At the Meeting of the Nottingham Town Council on Monday last week—the MAYOR (Alderman Turney) presiding—the accounts of the gas undertaking for the year ending March 25 last, with the report of the Gas Committee, were presented.

The Gas Committee, in the course of their report, stated that the increase of gas consumption during the past year was the smallest of which they had record; being only 1·03 per cent. This, they say, mainly arises from the number of empty houses; due, no doubt, to the present condition of trade. It was, however, very satisfactory to have to report that the profit on the year exceeded by £7509 that of the previous year. The quantity of gas made was 1,405,149,000 cubic feet, against 1,383,267,000 cubic feet last year; being an increase of 21,882,000 cubic feet. This was accomplished by the consumption of 3517 tons of coal less than last year; resulting in a great saving of labour and wear though of course there was a less production of coke and residuals. The market for coke and other residuals, the Committee asserts, is somewhat looking up; so that better prices may be hoped for in the future. The profit on the chemical works for the year, after charging thereto the residuals at the current market price, and £1000 per annum rent, was £7467. Some outlay is at present going on at these works for facilitating operations there. The Committee report that they have not paid over to the credit of the general district rate any moneys in accordance with the resolution of the Town Council passed at a meeting held on June 13, 1887.* They anticipated that they would be enabled this year to hand over to the Council a much larger sum from the profits of the gas undertaking than last year; and the result being so, they have arranged with the Finance Committee that they should receive out of profits the sum of £16,000 (the same amount as last year) towards the current rate, and should receive the further sum of £7500 out of profits on account of moneys payable under the above resolution—the balance (£2500), if necessary, to be paid by the Gas Committee during the current year out of the reserve fund interest. The Committee also allude to the appointment of Mr. W. R. Chester, of Manchester, in succession to Mr. Lewis T. Wright, as the Engineer and Manager of the undertaking. Mr. Chester, they remark, is 34 years of age, and has followed the profession of gas engineering for the last 18 years. He received his early training at the Vauxhall works of the Phoenix Gas Company. He has been eight years under the Gas Committee of the Manchester Corporation; and during the last three years, has had charge of their extensive new works at the Bradford Road Station. At the close of their report was the following comparative statement of the gas and meter rental for the past two years:—

Year ending	Due	Due	Due	Due	Total
March 25.	June 25.	Sept. 25.	Dec. 25.	March 25.	
1887.	£25,949	£22,637	£52,012	£53,571	£154,171
1888.	26,550	23,070	52,644	53,572	155,837

Accompanying the report of the Committee was one presented to them by their late General Manager (Mr. Lewis T. Wright, F.C.S.), on the works and manufacturing operations during the year. It was as follows:—

Gentlemen,—The increase in the gas consumption during the year ending March 25, 1888, has been very slight indeed, yet the improved gas manufacturing arrangements which have been introduced within the last five years have borne full fruit this year; so much so that the increased consumption—viz., 1·03 per cent.—of gas has been effected with a reduction of expenditure of £1031. The following table will show the relation between the total expenditure on revenue account and gas sold during the last few years:—

Year.	£	Gas sold.
1882	121,325	1,040,665,300
1883	9 months' report only	
1884	127,831	1,163,225,500
1885	130,614	1,213,259,700
1886	124,258	1,258,405,500
1887	123,832	1,299,750,700
1888	122,801	1,313,165,800

It will be seen, whilst the gas undertaking has been growing year by year, that since 1885 each year's expenditure on revenue account has been less than that of the preceding year, and that now in 1888 the total expenditure is very little more than it was in 1882, though the gas sold has increased since then by over 26 per cent. The progressive efficiency of your works during this period has only been obtained by vigorous efforts on the part of all members of your staff; and I hope you will be able to find a way of recognizing these services.

I am glad to be able to report that the carbonizing plant is in an efficient state. During the year ending March 25, 1888, the production of gas per ton has been 10,528 cubic feet, against 10,097 cubic feet in the previous year. It is by means of this increased utilization of the gas-making constituents of the coal that the increased consumption of gas, of 13,406,100 cubic feet, has been met with the decreased consumption of 3517 tons of coal. The illuminating power has been well maintained, and averaged 18·77 candles in George Street, against 18·43 candles in the previous year. The gas unaccounted for still remains at a figure—viz., 6·55 per cent. of the gas made—which is very favourable for a gas district of such area and character as yours.

During the year there was an improvement in the market prices of some of the tar products, which have yielded £4932 more than the year ending March 25, 1887. Sulphate of ammonia being slightly better, accounts for an increased revenue of £718. Coke, which was certainly a drug a year ago, is now scarce, and better prices are being obtained.

The number of retorts at the three gas-works are: Easteroft, 424; Radford, 378; and Basford, 896; total, 1698—equal to a production of over 9½ millions per diem. This large producing power of the works is due to the increased efficiency of the carbonizing plant; a production of 5500 cubic feet per diem per retort being now easily obtained from retorts of the same dimensions that a few years ago produced but 4600 cubic feet.

The total mileage of mains of all sizes is now 259·28; there having been 2·99 miles added to the canalization during the year. The number of meters fixed on March 25, 1888 (including 251 lamp meters), was 39,597; being a decrease on the previous year of 385 meters. Of these 37,562 belong to the Gas Department, and 1735 to the consumers. The orders and calls for attention of various kinds from consumers was 41,317, against 41,104 in the previous year. There were 1546 new gas-services laid, against 1805 in the previous year.

In February last it was estimated that there were in use in the gas district the following gas-stoves:—Gas-ovens, 1071; gas-fires, 1739; small boiling-stoves, 6562—total, 9372. Of the 1071 gas-ovens, 700 were rented from the Corporation. These gas appliances form an important element in the use of gas.

In regard to the Giltbrook Chemical Works, with plant of such a nature as is used in these works, and submitted during the autumn, winter, and spring to a heavy strain, working continuously night and day, the wear and tear is very appreciable. The steam-boilers this summer are being re-fueled; and all the plant is being overhauled and repaired for the next

season. The improvements ordered by the Committee in connection with the traffic approaches to the works will no doubt prove of much service.

The following analyses accompany Mr. Wright's report:—

Analyses of Accounts for the Years ending March 25, 1887 and 1888.

	1888.			1887.		
	Amount	Per Ton of Coals	Per 1000 c.ft. Sold.	Amount	Per Ton of Coals	Per 1000 c.ft. Sold.
Expenditure.						
Manufacture—						
Coals carbonized, tons	183,474	183,474	183,474	183,474	183,474	183,474
Gas made, cubic feet	1,405,149,000	1,405,149,000	1,405,149,000	1,383,267,000	1,383,267,000	1,383,267,000
" sold, do.	1,313,165,800	1,313,165,800	1,313,165,800	1,299,750,700	1,299,750,700	1,299,750,700
" unaccounted for, do.	91,983,200	91,983,200	91,983,200	83,507,300	83,507,300	83,507,300
" " per cent.	6·55	6·55	6·55	6·04	6·04	6·04
Distribution—						
Salaries and wages	5,006	0 9·00	0 9·91	4,576	0 8·55	0 9·90
Repairs, &c., mains and services	4,828	0 8·68	0 8·88	5,874	0 10·29	0 10·09
Repairs, &c., stoves	754	0 1·36	0 1·14	3,221	0 5·64	0 5·59
Repairs, &c., meters	4,413	0 7·93	0 8·81	68	0 12	0 10
Lamp fittings	44	0 0·08	0 0·01			
Rents, rates, and taxes—						
Rents and acknowledgments	531	0 0·95	0 1·10	201	0 0·35	0 0·04
Rates and taxes	5,740	0 9·84	0 10·00	5,610	0 9·83	0 10·04
Management—						
Salaries	2,661	0 4·78	0 4·49	2,684	0 4·70	0 5·50
Collectors	1,607	0 2·89	0 2·29	1,584	0 2·78	0 2·29
Stationery, printing, &c.	616	0 1·11	0 1·11	810	0 1·42	0 1·15
General estab. charges	442	0 0·80	0 0·08	498	0 0·87	0 0·09
Auditors	164	0 0·30	0 0·03	158	0 0·28	0 0·03
Law charges	72	0 0·13	0 0·01	65	0 0·11	0 0·01
Bad debts	1,075	0 1·93	0 2·20	860	0 1·51	0 1·16
Total expenditure	122,801	18 4·81	1 10·44	123,832	18 0·95	1 10·87
Receipts.						
Sale of gas—						
Private consumption	141,346	21 2·16	2 1·83	139,835	20 4·11	2 1·73
Public lights	8,360	1 3·08	0 1·53	8,693	1 3·27	0 1·61
Rental of meters	6,131	0 11·02	0 1·12	6,144	0 10·76	0 1·14
" stoves	312	0 0·55	0 0·06	121	0 0·21	0 0·02
Residual products—						
Coke and breeze	10,813	1 7·44	0 1·98	11,926	1 8·89	0 2·20
Tar and its products	8,525	1 3·83	0 1·56	3,593	0 6·30	0 0·66
Sulphate of ammonia	11,121	1 8·00	0 2·03	10,403	1 6·23	0 1·92
Refuse lime, &c.	911	0 1·64	0 17	442	0 0·77	0 0·08
Distribution materials	1,776	0 3·19	0 32	2,875	0 5·04	0 5·53
Stoves, gas-fires, &c.	666	1 1·20	0 12			
Rents	475	0 0·85	0 0·09	497	0 0·87	0 0·09
Sundries	137	0 0·25	0 0·02	67	0 0·12	0 0·01
Annuities	32	0 0·06	0 0·01	31	0 0·05	0 0·01
Total receipts	190,605	28 6·73	2 10·84	184,127	26 10·58	2 10·00

Alderman BARBER, in moving the adoption of the Gas Committee's report, said he thought the report must commend itself to the Council as being highly satisfactory. The Committee had very much to regret the small increased consumption of gas during the year; the increase amounting only to 1 per cent.—the smallest which had ever had to be recorded. This, however, was no fault of the Gas Department. They regretted to say that it arose from the bad state of trade in the town. He thought that the figures contained in the report were sufficiently clear as to render it unnecessary for him to occupy the time of the Council at any length in going into details. He had, however, prepared a short summary of the results of the working of the gas undertaking, which he would read. In the year ending March 25 last, they paid £2799 less for coal, £311 less for purifying, £738 less for salaries, and £482 less for wages. There was an increase on repairs to the works of £2125. This left a lessened expenditure on the department of £2205. In the distribution department they had paid £129 more for salaries, £1045 less for repairs, and £1946 more for meters and stoves. During the previous year, however, the contract for meters was very low; and the increased expenditure in this department was £1035. They had paid £190 more for rates, and £243 less for general management. On the expenditure side of the account, they had therefore a total of £1440 more on the one hand, and £2471 less on the other; leaving a reduced expenditure altogether of £1031. On the other side, they had received £2011 more for gas, and £334 less for public lighting. They had obtained £12 less for meter-rents, and £191 more for the rent of stoves; thus making the increased receipts £1856. During the year they had received £1112 less for coke; and there was a very remarkable thing about this to which he wished to draw their attention. During the period mentioned the gas companies in England were "rucked" up with coke. They lowered the price of their coke very much; and their stock was large. Since March 25 the Committee had been enabled to get from 1s. to 1s. 3d. more for coke. They had not a ton of coke unsold; and throughout England whole mountains of coke had disappeared. Although this might not show an improved state of trade in Nottingham, he could not but think that the great consumption of coke that had suddenly arisen must indicate a better state of trade throughout the country. During the year the Committee had received £4932 more for tar, £717 more for liquor, and £469 more for oxide and lime; making the increased receipts under this head £5006. They had received £432 less for meters and materials for distribution; and £22 less for rents. The total, therefore, of increased receipts was £6478; and added to this, they had a diminished expenditure of £1031—leaving an increased profit of £7509. There were 400 less meters fixed than in the previous year. They might be interested to know that the capital of the Gas Committee now stood at £28 per million feet of gas made less than it did at the time the concern was taken over from the Company, notwithstanding the expenditure of between £100,000 and £200,000 some years ago on the new retort-house and gasholders at Basford and the enlargement of the Radford works.

Mr. FITZGIBB seconded the motion.

Alderman GILPIN observed that the report was very satisfactory to the Council; and the Committee might be congratulated on the result of their working during the past year. He would like to ask if the use of cooking-stoves had been in accordance with the expectations the Committee previously entertained.

Alderman BARBER replied in the affirmative. They had endeavoured to

* See JOURNAL, Vol. XLIX., p. 1133.

avoid putting themselves in competition with the ironmongers of the town. The steps they had adopted had drawn public attention to the use of cooking by gas; and he was informed that ironmongers in the town had had a very large increased sale of gas-stoves in consequence of the movement. They themselves, too, had a very good trade in stoves.

Mr. FROGGATT inquired if any reduction was made for depreciation. He did not see any depreciation charge in the report, which, however, mentioned that the depreciation for repairs was £1704.

Alderman BARBER said the Committee had no fund to provide for depreciation, except at Giltbrook. The reason they had that fund was because a certain class of work was done there which they could not have repaired. To show that there was no need for a depreciation fund, they never spent less than £20,000 a year in keeping up the works to their standard point. This year they had expended altogether £26,000. They did not need a depreciation fund, therefore; because their works were better at the end of the year than at the beginning.

The report was adopted.

SALFORD CORPORATION GAS SUPPLY. THE PAST YEAR'S WORKING.

In last Tuesday's JOURNAL (p. 428), we gave a few extracts from the report of the Salford Corporation Gas Committee for the year ending March 25; and to-day we give some further particulars gathered from the report, as well as the appendix to it—prepared by the Engineer and Manager, Mr. S. Y. Shoubridge.

The make of gas increased during the last financial year by 6,532,000 cubic feet over the corresponding previous twelve months; the figures being 842,777,000 and 836,245,000 feet respectively. The leakage was, however, during the same time reduced from 50,080,800 to 46,566,600 feet, or a decrease of 7.01 per cent. The average illuminating power of the gas at all the stations (as tested by Mr. Francis Jones, F.R.S.E.) was equal to 19.76 standard sperm candles; being fractionally higher (about one-third of a candle) than was returned for the previous year. The total gas and meter rental was £127,703—composed of private consumers, £113,476; public lamps, £11,000; meter-rents, £3227. The total for the preceding year being £125,838, an increase is shown of £1865. There were 28,437 consumers supplied with gas by the Corporation, and 6828 public lamps. During the year 2052 yards of new mains were laid, and 1225 yards of new mains to replace others of less dimensions. The length of street mains in use in the borough and out-districts on March 25 last was, therefore, 376,164 yards, or nearly 213½ miles. The amount of coal and cannel carbonized during the year was: Coal, 49,601 tons; cannel, 34,264 tons—showing a proportion of 59.15 and 40.85 per cent. The average yield of gas per ton of the mixture was 10,049 cubic feet. The gas used on the works and in the offices was 11,549,000 cubic feet (1.37 per cent. of the gas made), as against 14,523,000 cubic feet (1.74 per cent.) for the previous year. The loss by leakage decreased from 5.99 per cent. in 1886-7, to 5.53 per cent. in 1887-8.

The abstract of accounts accompanying the Committee's report shows that the total capital expenditure to March 25 last was reckoned as £548,881, divided into—land acquired, £23,945; buildings and manufacturing and storage plant, £319,620; main and service pipes and works connected with same £166,855; meters, £38,461. As stated above, the gas and meter rental realized £127,703; and the revenue account shows that residuals and a small amount (£190) from rents raised the total income to £145,809. Coke brought in a net amount—allowing £511 for yard labour—of £7537; tar, £4070; and ammoniacal liquor, £6273. A sum of £61,525 was carried to the credit of the profit and loss account; the expenditure on revenue account being £84,284, made up as follows:—

Manufacture of gas—			
Coals, including labour, carriage, and all expenses of depositing on works . . .	£46,610	2	7
Carbonization—wages of stokers and foremen . . .	11,050	11	3
Purification—wages and materials . . .	1,471	4	5
Salaries of Superintendents and Analysts . . .	666	18	0
Repairs of works and plant . . .	9,060	15	8
	£68,859	6	11
Distribution of gas—			
Salaries of superintendents, inspectors, and clerks in rental-office . . .	£2,314	0	5
Repairs of main and service pipes . . .	973	16	3
Fixing and repairing meters . . .	946	2	4
	4,233	19	0
Repairing public lamps . . .	65	19	5
Rents, rates, and taxes . . .	6,938	17	4
Management—			
Salaries . . .	£1,206	2	8
Collectors . . .	1,800	0	6
Stationery and stamps . . .	424	9	0
Incidentals . . .	589	6	10
	4,019	19	0
Bad debts—			
Amount written off . . .	£1,148	17	5
Less balance of bad debt fund . . .	982	9	2
	166	8	3
	£84,284	9	11

The report and accounts above referred to were presented to the ordinary monthly meeting of the Salford Town Council last Wednesday, when, in moving their adoption, Mr. H. Lord, the Chairman of the Gas Committee, said he hoped the members of the Council would carefully look through the report, in order to see the progress that had been made. He pointed out that a very important saving had been effected in the consumption of gas on the works. No less than £450 had been saved last year as compared with the previous year. The motion was seconded by Mr. F. S. Phillips, and adopted.

MARYBOROUGH (QUEENSLAND) GAS COMPANY.—The Directors of this Company, in their report for the half year ending June 30 last, state that the operations of the Company continue satisfactory. The amount at the credit of profit and loss account is £1682 12s. 2d., which the Directors recommend should be apportioned as follows:—Dividend for the half year at the rate of 10 per cent. per annum, £1251 7s. 6d.; for reserve fund, £100; and towards replacement of retort-benches, £200—leaving a balance to carry forward of £131 4s. 8d. Since the last half-yearly meeting, a new exhauster with engine and other appliances have been received, and are in course of erection. The construction of the new retort-benches (which has been carried out under the supervision of the Engineer, Mr. J. Henderson, C.E.) is also nearly completed. It is anticipated that when this new plant is brought into use, great advantages will result to the Company. The number of consumers is gradually increasing; and considerable additions continue to be made to the mains and services.

THE EDINBURGH AND LEITH GAS UNDERTAKING. MESSRS. LIVESSEY AND LASS'S REPORTS ON THE WORKS AND BOOKS OF THE COMPANY.

As intimated by our Edinburgh Correspondent in his "Notes" last week, the Gas Commissioners of Edinburgh and Leith have just issued, as a Corporation document, the joint and independent reports prepared for them by Mr. George Livessey, C.E., and Mr. Alfred Lass, F.C.A., and on the receipt of which by the Special Gas Committee of the Corporations, it was agreed to confirm the provisional agreement for the purchase of the undertaking by the towns.

The joint report (dated June 28) merely states that having considered the matter, and examined the Company's works and books, it was Messrs. Livessey and Lass's opinion that the terms of purchase set forth in the provisional agreement were "fair and reasonable in the interests of both the contracting parties."

MR. LIVESSEY'S REPORT.

This document (dated July 16) states that a visit of inspection was paid to the works by Mr. Livessey on June 28, when he found the general arrangement and condition of the works to be very good, and the surplus power in almost all particulars considerable. The report then continues: As in the case of the Edinburgh Gas Company, the manufacture is on land quite separate and distinct from that on which the gasholders are placed. The area occupied by the works is somewhat greater in proportion to the gas made than at Edinburgh; being rather over 2½ acres in extent. The maximum day's make last winter at the Baltic Street works was 1,986,000 cubic feet; while the maximum sent out in one day was 2,075,000 feet. The gasholder storage is 2,256,000 feet, which is considerably in excess of what is necessary. Where the gas is used mainly in shops and private houses, with no great preponderance of mills or manufactories (as in Edinburgh and Leith), it is not necessary to provide storage capacity in excess of the maximum consumption in 24 hours, or (say) equal to 100 per cent.; and when by the increase of consumption this is year by year reduced, it is found that the proportion may come down to 70 per cent. without undue inconvenience. But when this point has been reached, an additional gasholder should be erected, or existing gasholders telescoped, to bring up the storage to at least 100 per cent. of the maximum consumption. According to this rule, the Leith Company's storage of 2,256,000 feet is equal to 70 per cent. of a maximum consumption of 3,223,000 feet; and, therefore, it will not be absolutely necessary to increase the storage until the maximum consumption of last winter (2,075,000 feet) is increased by upwards of 50 per cent. I do not advise cutting it so fine, as in case of possible, but not probable, accident to one of the gasholders, with only 70 per cent. of storage, there would result a certain amount of loss and great inconvenience. I should, therefore, in good time telescope the two single-lift gasholders at Canonmills, which would add about 400,000 feet to the storage, and the cost should not exceed £4000. When further extensions become necessary, another gasholder of similar diameter, and 50 per cent. greater capacity (if made of three lifts, which is now common, instead of two lifts) can be erected on vacant land at Blandfield. The contents of the existing gasholder on that site are 1,125,000 feet. It is quite new, having been built in 1885. The largest gasholder at Canonmills is also comparatively new, dating from 1872—contents 750,000 feet—while the two others, of about 200,000 feet each, single lifts, are older but also in good condition.

The gas sold by the Leith Company has increased from 241,017,000 feet in 1878-9 to 358,627,000 feet in 1887-8—or, as nearly as possible, 50 per cent. in the nine years; while in the same time the unaccounted-for gas has come down from 13.87 per cent. to 7.63 per cent., which is strong evidence of good management, and that the distribution of gas has been well attended to.

It was, of course, impossible to inspect the mains supplying the various districts with gas. But the small amount of unaccounted-for gas, considering the very large mileage of mains in proportion to the gas sold, shows conclusively that they are in good order; and the low maximum pressures worked during the heaviest consumption of a winter's day, proves that the mains are of more than sufficient capacity for the efficient supply of gas to the consumers. The pressures above referred to are, I am informed, as follows:—Edinburgh district, 18-10ths; Leith district, 18-10ths; Stockbridge district, 19-10ths; and Granton low-level district, 26-10ths. With these facts before me, and having no reason to doubt that the Edinburgh Company's mains are also in a thoroughly good condition, I have no doubt, that by the amalgamation of the two undertakings, and the consequent re-arrangement of the districts supplied from the respective works, the distribution of the gas will be rendered even more efficient than heretofore. Duplicate mains will be removed; the aggregate mileage reduced; leakage still further diminished; and the supply of gas improved, to the advantage of the respective Corporations and the consumers.

Turning now to the manufacturing works, they are in appearance quite as crowded as those of the Edinburgh Company, as there is but little space uncovered with buildings. To some extent this is deceptive, as the area is practically considerably increased by the use made of the large and substantial stone buildings that formerly enclosed the now abolished gasholders. The whole of the purifiers are placed on an upper floor in part of these buildings; thus rendering the ground floor available for other useful purposes, and so in effect raising the total area available for the manufacturing station to about 3 acres. The site is eminently suitable for a gas-works; and as very little room is necessary for the storage of coke—the make of that article being regulated to the demand by increasing or diminishing the use of shale that yields but little coke—the whole available space should be used for the manufacture and purification of gas, which may be very largely increased on the land belonging to the Company. Mr. Linton has a plan for greatly facilitating the railway arrangements by abolishing the turntables, and bringing the railway into the works by a curve, which can be done by removing a station meter, which appears to me to be in the wrong place, to a more suitable position, where both meters can be placed side by side. There are four retort-houses, fitted with 256 retorts, heated on the Siemens principle, and 124 on the old system in No. 2 house, in which the retorts are circular, 14 inches diameter. In the other houses—No. 1, with 128, No. 3, with 56, and No. 4, with 72 large Q-shaped retorts, each 21 inches wide by 15 inches high and 8ft. 6in. long—the manufacture of gas can be conducted on the Siemens principle with much less fuel of a poorer kind; and higher and more regular heats can be maintained than under the old system. Thus, by means of the larger retorts carbonizing more cannel or coal, and producing more gas with charges of shorter duration, these advantages have proved so great that No. 2 house, with the old settings, has been thrown entirely out of use; and I believe it was the intention of the Company not to use it again until fitted up on the Siemens system. Last winter the greatest number of retorts in use was 192; thus leaving in reserve 64 of the Siemens, and the entire house of 124 set on the old plan—or, shortly, 192 retorts in use and 188 in reserve, in the depth of winter. There are coal-stores for 4000 tons, which, considering the railway facilities and the nearness of the collieries, is ample for a much larger make of gas than at present.

Passing over the condensers, engines and boilers, and exhausters with

the remark that they are of the best for their respective purposes, in good order, and like the retorts, equal to the production of over 50 per cent., more gas, I come to the purifying plant, which, I think, is capable of improvement. Mr. Linton is evidently of the same mind, as he has begun the remodelling of the purifiers. As to the scrubber-washers, I raise no objection, though it is doubtful whether they are better than the old-fashioned scrubber. Still they are efficient instruments, and of abundant power for the work to be done now and for some time to come. But I do not like the five sets of purifiers; necessitating the dividing of the gas into separate streams, and thus increasing the difficulty of controlling the process of purification. For a make of two, three, four, or even five million feet a day, I prefer, when practicable, passing the gas through only one set of purifiers. But in old works this is generally not practicable. As the make increases, additional sets of purifiers become necessary, as the old ones often cannot be enlarged. But the time comes at last when a clearance will be found to be advantageous; and this, I think, is the case at present at Leith, where the four smaller sets should be either abolished or converted into one set of large area—say four boxes, each 30 feet by 25 feet, or an area of 700 or 800 feet for each box, disposed or proportioned as may best suit the existing building. This would give a total area about the same as at present, and would be sufficient for many years to come.

I found the works well up to the mark in all the details so necessary for good results, and cannot conclude this report without saying that the whole arrangement and management does great credit to the Engineer.

MR. LASS'S REPORT.

In his report (dated July 6), Mr. Lass states that he has inspected the books of the Company over a period of ten years ending the 16th of May, 1888. He examined the accounts as made out on the Company's own system—remodelled in conformity with the Gas-Works Clauses Act, 1871, which latter was the form in which the accounts were put in evidence in support of the Bill promoted by the Company last year in Parliament. As his investigation proceeded, Mr. Lass found that the Company had from time to time during the ten years reduced the profits by charging to revenue account certain sums which should have been charged to "fixed plant" account. The profits were also further reduced by charging various other sums for depreciation, wear and tear, &c., which in the remodelled accounts had been written back; thus restoring the profits which had been originally taken. The following table shows the profits of the Company at the 15th of May in each of the specified years, on the two systems of account keeping:—

	Profits on Trading, as per Company's Books.	Profits on Trading, as per Remodelled Accounts.
1878	£12,461	£14,926
1879	12,489	14,570
1880	12,972	19,084
1881	10,903	14,630
1882	12,834	16,181
1883	13,850	18,713
1884	13,001	19,602
1885	12,922	21,627
1886	13,371	19,376
1887	19,475	22,250
1888	26,331	—

In two supplementary tabular statements, Mr. Lass gives the details of the revenue accounts, and shows the differences between the profits on trading under the two systems of account keeping. He then proceeds to answer the two questions:—"How is it that the profits in 1887 were £22,250, and in 1888, £26,331?" and "Have the profits for 1888, amounting to £26,331, been unduly inflated?" In reply to these questions, he first points out that in 1887 there was charged for abnormal parliamentary expenses £1901, and in 1881, £1121, but for which the profits on trading in these years would have been £24,151 and £27,452 respectively. To this he adds a table showing increases in receipts (under the ordinary heads) of £1838, £1425 of which was increased gas-rental, and £396 increased receipts for tar, coke, and waste lime; also another showing a total decrease in ordinary expenses, amounting (after subtracting various increases in expenditure) to £1413, the chief item in which is a saving of £1984 in the cost of coals. The total is thus brought out—

Total increase in receipts	£1888
Total decrease in expenses	1413
Total increase in profits	£3301

The next table shows the gradual increase in the sale of gas for the eleven years from 1878 to 1888; that of the former year being 232,218,000 cubic feet, and that of the latter year, 358,627,000 cubic feet.

Another table shows that, while in 1878 the quantity of coal carbonized was 27,594 tons, the quantity so treated in 1888 was 39,744 tons; the figures for the intervening years showing an almost uniform increase. On this point Mr. Lass remarks: "On reference to the foregoing, it will be seen that notwithstanding an increase in the quantity of gas sold from 349,767,000 cubic feet in 1887 to 358,627,000 cubic feet in 1888, and an increase in the number of tons of coal carbonized from 39,203 to 39,744, yet there has been a decrease in the expenses of 1888 compared with 1887 of £1984 in the cost of coal, and a further decrease of £380 in wages. These decreased expenses are the direct result of an expenditure on capital account in converting the ordinary furnaces into regenerative furnaces, which enables a cheaper class of coal to be carbonized with more beneficial results."

The following calculations show the working of the undertaking for the year ended May 15, 1888:—

Gas made	389,000,000 cubic feet.
Gas sold	355,865,000
Gas used on works	2,762,000
	358,627,000
Gas unaccounted for	30,373,000
	389,000,000 cubic feet.
Gas made per ton of coal carbonized	9787 cubic feet.
Gas sold per ton of coal carbonized	8954 "
Gas sold, per cent. on make	91.48
Gas used on works, per cent. on make	0.71
Gas unaccounted for, per cent. on make	7.81
	100.00
Cost of coal	14.83 pence per 1000 cubic feet sold.
Less—realized on sale of residuals	4.33 do.
Cost of coal, less residuals	10.50 do.
Working expenses	15.49 do.
Coal and working expenses, less residuals	25.99 do.
Gas-rental and meter-rents, realized	43.75 do.
Profit	17.76 do.

The working expenses of the Leith Company, therefore, amount (says Mr. Lass) to 15.49d. per 1000 cubic feet of gas sold; while those of the London and other Companies amount to the following:—

Average London Companies	12.89 pence per 1000 cub. ft. sold.
Do. London Suburban Companies	15.27 do.
Do. Gas undertakings (8) in hands of Local Authorities	11.61 do.
Do. Undertakings (10) in hands of Provincial Gas Companies	12.20 do.

It may, therefore, be taken that the answer to the second question is that "the working expenses charged against the revenue of the Leith Company for the year 1888, have not been unduly decreased for the purpose of inflating the profits."

With reference to the capital employed by the Leith Gas Company, the following calculations have been made:—

	Total.	Per Ton of Coal Carbonized.	Per Million of Gas Sold.
Capital employed as per Company's Accounts	£204,905 or £5 8 1	or £575	
Do. do. as per Remodelled Accounts	£265,329	6 13 6	715

The capital employed by the above-mentioned London and other Companies is as follows:—

London Companies	£5 11 3	£594
London Suburban Companies	6 7 10	663
Gas undertakings in hands of Local Authorities	6 3 2	666
Undertakings in hands of Provincial Gas Companies	5 9 8	564

Mr. Lass remarks that, on this showing, "it may be considered that such expenditure or capital employed, compares favourably with the expenditure or capital employed by other undertakings, especially looking at the following evidence given by the Company's Engineer (Mr. Linton), viz.:—that 'the works are competent for a manufacture of an amount of gas much beyond the present output.'"

The average profits for the two past years being £25,801, Mr. Lass thinks the maintainable profits of the undertaking may fairly be taken at £25,000 per annum, in which case the position of the Corporations will be as follows:—

Annuities at 9½ per cent. on £150,000	£14,000
Interest on debentures, 4 per cent. on £20,000	800
Interest on bank loan, 4 per cent. on £11,700	468
Interest on grassum, 4 per cent. on £11,000	440
Interest on working capital, 4 per cent. on (say) £20,000	800
Pensions (assuming that the whole will be paid)	1,050
Sinking fund ½ per cent. on £399,000 (capitalized value of annuities at 2½ years' purchase, which, at 9½ per cent., will provide £399,000 in 60 years)	1,995
Sinking fund, 1 per cent. on £62,700 (which, at 3½ per cent., will provide £62,700 in 44 years)	627
	£20,180

Leaving a surplus of £4820 per annum.

The interest on debentures, bank loan, grassum, and working capital (calculated at 4 per cent.), may, however, Mr. Lass considers, probably be reduced to 3½ per cent.

After showing that, by the agreement, the Company acquired a sum of £439,225, equal to about 31½ years' purchase of a dividend at 9½ per cent. on £150,000, or a perpetuity at 3½ per cent., Mr. Lass says: "Looking at the whole of the foregoing, I am of opinion that the terms contained in the provisional agreement for the purchase by the Corporations of the Leith gas undertaking are fair and reasonable to both contracting parties, and that the agreement should be confirmed."

THE GAS SUPPLY OF MIDDLESBROUGH.

Some interesting figures have recently been published dealing with the supply of gas by the Corporation of Middlesbrough, comparing the cost of the production of gas in winter and summer respectively—the difference in the demand being particularly marked in this northern town. Last January the make of gas reached to a little more than 33 million cubic feet; while in June the quantity was slightly over 12½ millions. The total manufacturing charges amounted in January to 1s. 7.34d. per 1000 cubic feet; and in June to 1s. 10.56d. The increase is found in most of the separate items—wages paid, for instance, having risen from 3.37d. to 3.85d. per 1000 cubic feet. On the other hand, residuals yielded a little more, to the extent of 8.87d., as against 7.31d. per 1000 cubic feet. The net price of the gas made was, therefore, 1s. 0.03d. in January, and 1s. 1.69d., in June. It is remarked that "the difference does not seem very large; but had the receipts for residuals been on an equality, it would have been larger, and even as it is, when spread over 20 or 30 million cubic feet, is important." In January, at the price at which gas was sold, there was a balance of more than 1s. per 1000 feet left to pay interest, redemption, and profit; while at June there was rather more than 10d. only to be so applied. In regard to these figures, our contemporary the *Engineer* says: "It is obvious that it is impracticable to obtain as large a consumption of gas in the summer as in the winter; but it is also evident that what is needed by the authorities in connection with gas-works is to aim to raise the consumption in the summer months by the fostering of the sale for purposes of heat, light, and power. The winter demand rises yearly; and as it does, it enforces a larger and larger provision for manufacture, storage, and distribution, and these facilities are necessarily idle in large degree in the summer. To utilize these facilities, especially for purposes of heat and power, means a double gain—it means a consumption in the summer, and it also means a day consumption at a time when the facilities would be otherwise unused. The utilization of the large resources of the companies and corporations producing gas would be a great boon to the commercial world; and it is to be aimed at in the way the official figures we have above summarized point out."

BELFAST CORPORATION GAS SUPPLY.—The monthly meeting of the Belfast Town Council was held on the 1st inst., when the Gas Committee presented a statement of their accounts for the year ended June 30 last. They showed a net profit of £12,535 3s. 1d., after providing a sinking fund of £7609 10s. 7d., and for depreciation on the gas stoves, meters, and lamps. This result the Committee consider very satisfactory, having regard to the fact that the price of gas was reduced by 3d. per 1000 cubic feet from the beginning of the financial year—the reduction representing a difference of nearly £10,000 on the year's profit. A balance of £5135 13s. 11d. was brought forward from the previous year to the credit of profit and loss account, out of which £3500 was contributed towards the cost of the erection of the temporary Albert Bridge, leaving a balance of £1635 13s. 11d., which, added to the net profit on last year's working, brings up the amount to £14,170 17s. The Committee recommended that £10,000 of this sum should be transferred to the reduction of capital account; and that the balance be carried forward to next year. Alderman Sir John Preston moved the adoption of the report and accounts; and this was agreed to without discussion.

THE GAS SUPPLY OF DUBLIN.

In the course of the proceedings at the Monthly Meeting of the Dublin City Council yesterday week, Mr. Dennehy called attention to the fact that there was no authority in the statute laws or bye-laws of the Corporation that would warrant or empower the Paving and Lighting Committee to engage any person at the rate of two guineas a day without having been previously authorized by the Council to do so; and he moved that the Paving and Lighting Committee report to the Council what are the facts and circumstances of such employment or engagement. Alderman Meagher stated that there was some friction between the Gas Company and the Inspector of Public Lighting. The latter made certain reports which were controverted by the Gas Company; and as the Committee looked forward to the matter being tested by a legal issue, it was decided, on the advice of the Inspector, that his opinion should be fortified by an expert, independent of the Gas Company or the Corporation, and accordingly a gentleman was so employed. The Lord Mayor said the standing order referred to salaries of persons who were permanently employed, and was not intended to refer to employment of a casual or temporary character in an emergency, as in the case before them. If the motion were carried, it might have the effect of seriously harassing or hampering the Corporation if the Gas Company had a battalion of evidence, whilst they (the Corporation) had only a solitary official. Mr. Dennehy agreed to withdraw his motion. Alderman Mulligan subsequently moved—"That the Paving and Lighting Committee be employed to name a Sub-Committee to take all necessary steps with reference to the supply of gas, and that the first standing order, being a resolution of the Council of 1851, be to this extent modified or rescinded." The Committee, he said, deemed it expedient to appoint a Sub-Committee to look after the gas supply, and to report from time to time with regard to the steps they took. Mr. Mayne remarked that, as there was some friction—as Alderman Meagher mentioned—between the Gas Company and some of the officers of the Corporation, he thought the Committee were perfectly justified in bringing forward this motion, which would provide for any contingency that was likely to arise. The motion was adopted.

TYNEMOUTH TOWN COUNCIL AND ELECTRIC LIGHTING.

At the Quarterly Meeting of the Tynemouth Town Council on Friday, the 31st ult., a discussion took place on a recommendation of the Trade and Commerce Committee that application be made by the Council for a Provisional Order for lighting the public buildings and streets with electric light. In January last, it should be stated, a new market was opened by the Corporation; and this is illuminated with the electric light, for which the ratepayers have had to pay dearly.

Alderman GREEN, in introducing the subject, proposed that the terms of the Committee's recommendation should be altered as follows:—"That a special meeting of the Council be convened for the purpose of considering the advisability of applying for an Order to light the principal streets and public buildings with electric light." He said that he wished to dissipate the notion that it was intended to enter upon any larger scheme of electric lighting than their present installation. Their object was simply to utilize the power they already possessed, and to make it a less losing concern than it was at present. He deprecated the idea that such a proposal would give rise to alarm in the borough on the ground of cost.

Mr. TATE seconded the motion.

Mr. DODDS observed that from the first he had regarded the introduction of the electric light into the market as ridiculous nonsense. He was still of that opinion. He urged upon the Council to let their first loss be the greatest, and not launch upon another scheme, the cost of which they could not foresee. He moved, as an amendment, that the whole matter be referred back to the Committee for further consideration.

Mr. ESKDALE, in seconding the amendment, said he was convinced that to rush headlong into expenditure over further electric lighting, would meet with the unanimous condemnation of the ratepayers. He held that Alderman Green's scheme meant additional apparatus, and not merely the utilization of the surplus electric energy and driving power which they already possessed; and he was persuaded, judging from past experience, that the promoters would not hesitate to carry any new power they might acquire to costly extremes.

After some further discussion,

Alderman GREEN, said the powers that the Corporation already possessed did not enable them to cross a street for the purpose of extending the electric light; and he insisted that his intention was to limit the application of the new illuminant to the corporate buildings, to portions of one or two of the principal streets, and to the new post-office, which was to be erected in the vicinity of the market.

The motion was ultimately adopted by ten votes to five.

THE CHELTENHAM TOWN COUNCIL AND ELECTRIC LIGHTING.

At the Meeting of the Cheltenham Town Council on Monday last week, a report was presented by the Committee appointed to consider the best mode of lighting a portion of the town by electricity. The position of the question may be thus briefly stated: About eight months ago, a Committee was appointed to report upon the advisability or otherwise of introducing the electric light into the town. The Committee led the Council to commit itself to the expediency of putting down an experimental installation over a restricted area, subject to its being carried out at a cost not disproportionate to the superiority of the light over that of gas. At Monday's meeting, Mr. Darby strongly opposed a minute of the Committee, which was to the effect that the electric lighting being adopted, and other things being equal, it was desirable that the supply of the light should be in the hands of the town rather than of a private company; and for the purpose of ascertaining the relative advantages and cost, it was desirable to employ an expert. He said that he declined to vote, with the information before the Council, in favour of the Corporation making themselves a trading body. In Birmingham, he said, a Provisional Order was sought for at a cost of £16,000, and then dropped, on account of the limit of time put down by the Electric Lighting Act of 1882. He concluded by moving an amendment to the Committee's report. At this stage of the proceedings, a letter was read from the Town Clerk to the Gas Company stating that, should the Corporation determine to submit the electric lighting to tender, it would be a satisfaction to them to be in a position to accept a tender from the Company, if they should be able and willing to tender. A long discussion followed; and eventually it was agreed that the Committee should, before any further step was taken, bring up an approximate estimate of the cost of lighting the experimental area.

The tender of Messrs. C. and W. Walker, of Donnington and London, has been accepted for the new gasholder to be erected in connection with the extension of the Perth Gas-Works. The cost of the holder will be about £9000; and it will probably not be completed till the autumn of next year.

THE THIRLMERE WATER-WORKS OF THE MANCHESTER CORPORATION.

At the Monthly Meeting of the Manchester City Council last Wednesday, the Mayor (Sir John Harwood), in answer to a question addressed to him, made a statement as to the present position of the Thirlmere water scheme. He said that the whole of the Thirlmere accounts would have to be recast, and placed on a uniform basis with regard to the repayment of the loans. Meanwhile, he might say that the Water-Works Committee hoped that they would be able to economize so that the whole of the interest on the money that had been expended would be provided without imposing any undue burden on anyone. The Committee would, as far as they could, distribute the entire cost on everybody who took the water, and not put the whole burden on the ratepayers. Alderman Lamb said he had often contended that the water-works never cost the ratepayers a single penny; and if the Thirlmere works had had a moiety of the gas profits, he did not think the ratepayers would have had to pay a penny now. The Mayor (resuming) explained that the Corporation were about to seek the sanction of Parliament for a proposal to raise the embankment at Thirlmere to the height of 20 feet only for the present, instead of the 50 feet their Act empowered the Committee to do. The Committee were of opinion that this change in the elevation would meet all requirements for the next ten, twenty, or possibly thirty years. It was besides in harmony with the wishes of all persons who took an interest in the Lake District of England; and would be conducive to the best interests of the Corporation.

NOTTINGHAM CORPORATION WATER SUPPLY.

ANNUAL REPORT OF THE COMMITTEE.

At the Meeting of the Nottingham Town Council yesterday week—the Mayor (Alderman Turney) presiding—the report and statement of accounts of the water undertaking for the year ending March 25 last were presented. They showed that there had been an increase in the revenue of £1127, and a decrease in the expenses of £561, as compared with the previous year. After paying the annuities and interest on loans and consolidated stock and the contribution to the several sinking funds, and putting aside £1000 for depreciation, the net profit available for disposal as the Council might see fit amounted to the sum of £749. The average profit made by the Corporation since the transfer in 1880 has been £3180 per annum, after payment of annuities and interest.

Alderman GRIPPER moved the adoption of the Committee's report and accounts. He said that it was satisfactory to note that they were this year able to report that, while the income had increased, the expenses had decreased. The report specified the net results; and therefore he was not going into detail to point out the whole of the items. The number of empties had increased by £284 over the previous year; but the not-collectable had decreased by £126. The collectable arrears had been £129; so that, putting the collectable and not-collectable together, they stood at a similar amount as in the previous year. After having paid the interest on the annuities and borrowed money, the Committee had actually saved, including interest accruing, during the eight years they had had the concern, £25,500 in round figures, or an average of £3180 per annum upon the undertaking. The amount in different years had naturally varied. In 1886, at the commencement of the enlargement of the works at Papplewick, they had a considerable reduction in the profits, inasmuch as they then began to pay the interest on the fresh outlay, from which they had not then received any benefit. They were now receiving a yearly increase from that outlay; and he did not think they could at present anticipate a reduction of profits to so low a point as in 1886. Everything was now going on satisfactorily; and he hoped would continue to do so. In conclusion, he said he thought there was an omission in the resolution he had to move. There ought to be added: "And that the sum of £700 be paid to the Finance Committee in aid of the district rate, and a small balance paid to the depreciation and renewal fund."

Mr. McCraith seconded the motion, which was adopted unanimously.

THE LIVERPOOL CORPORATION AND MR. HAWKSLEY.

At the Monthly Meeting of the Liverpool Corporation last Wednesday—the Mayor (Mr. T. W. Oakshott) presiding—a long discussion ensued on the presentation of the Water Committee's minutes, with regard to the award in the recent arbitration with Mr. Thomas Hawksley, C.E. The terms of the award of the Arbitrator (Mr. Bosanquet, Q.C.) were given in the JOURNAL last week, p. 429.

Alderman BOWER, in moving the confirmation of the Committee's proceedings, referred at length to the circumstances which necessitated the arbitration with Mr. Hawksley. With these our readers are already fully acquainted. He then went on to say he was very sorry to inform the Council that, contrary to the anticipation of their Counsel and of everybody who was interested in the arbitration on behalf of the Corporation, there had been a larger amount awarded against the town than they expected. He was not going to say anything against the award; at the same time, when first he heard of it, he was under a strong impression that the Arbitrator had forgotten the last sum of £11,000 paid to Mr. Hawksley. However, that was not so; and, the award having now been made, he felt that the right thing was to accept the position. It had been stated that the award, or the cause of the arbitration, led to a loss to the city of something like £40,000. He would remind the Council that in January, 1885, Mr. Hawksley made a return stating that the probable total expenditure upon the works would be £2,163,750. That was supposing the works had been carried out under that gentleman's directions. Taking from this sum £277,750, the cost of land, &c., in respect of which no commission was to be paid, there remained £1,886,000, on which, according to Mr. Hawksley's return, they would have had to pay him commission. Therefore Mr. Hawksley, if he had continued at the work and spent that amount, would, at 2½ per cent. commission, have been entitled to £47,160. The actual state of the case was that the amount paid to Mr. Hawksley was £20,617; and they had already paid to him the amount of the award—£14,123. If he admitted the costs of the arbitration at the large sum of £4000 (which he had reason to believe would be considerably above the amount), it would show that they would have spent now £38,740. In other words, by Mr. Hawksley breaking off his work in the way he had done, the Council, having all his plans and everything with which to finish the work, and the work being now nearly completed, the town, instead of losing £40,000 by these proceedings, would benefit to the extent of £3420. In the arrangement first entered into with Mr. Hawksley, it was suggested by him that Mr. Deacon should receive 2 per cent. and Mr. Hawksley himself 3 per cent. commission. If this had been carried out, the commission of both Engineers would have reached the sum of £94,235; Mr. Hawksley's 3 per cent. commission amounting to £56,595, and Mr. Deacon's share, to £37,780. Whereas now the Corporation would only have to pay under the agreement and the award, £38,740. To this sum there must be added £12,500 paid to Mr. Deacon in salary and expenses; making the total £51,345. Therefore, in comparison with what Mr. Hawksley originally asked the two Engineers justly should take, and

even taking the award against them, there was a saving to the Corporation of £42,985. Much as he regretted that the incompatibility between the two Engineers should have been increased by discussions in the Council, and much as he regretted that circumstances should have led to the separation from the work of Mr. Hawksley, the fact was, taking the most unfavourable view towards the Liverpool Corporation, that a saving had been effected by Mr. Hawksley's leaving, of at least £8000.

Mr. O'HARE complained of the way in which this matter had been brought before the Council. He thought some means should have been taken by the Water Committee to avert a litigation which had ended so disastrously to them, and involving between £30,000 and £40,000. If it was within the range of possibility that Mr. Hawksley would succeed in his claim, then it was their duty as public servants to try and compromise the claim, and meet it half way, rather than have to pay from £30,000 to £40,000.

Alderman BOWER explained that not only was Connell's opinion taken, but the Water Committee empowered him to try to compromise the matter with Mr. Hawksley. He made three journeys to London to attempt to arrange the matter with Mr. Hawksley; but they could not arrive at any compromise at all.

Mr. O'HARE considered in a case of this kind that it would be more satisfactory if they received the fullest documentary information that the Water Committee could afford them; and he proposed that the submission and award be printed, and that a copy be sent to each member of the Council.

Sir JAMES PICTON seconded Mr. O'Hare's motion.

A long discussion followed, in the course of which some members expressed the opinion that a mistake had been made at the outset in appointing two Engineers in connection with the Vyrnwy works; while others protested against the Water Committee being blamed for what had taken place.

The TOWN CLERK afterwards pointed out that Mr. O'Hare's motion would not obtain for him the information he desired.

Mr. O'HARE thereupon said that, after the long discussion they had had, he would withdraw his motion.

The proceedings of the Committee were then confirmed.

THE WATER SUPPLY OF BELFAST.—The connection between Stoneyford and the Lagmore reservoir of the Belfast Water Commissioners has now been completed. The culvert is 7 miles in length; and the Contractors (Messrs. Fitzpatrick Bros.) have earned the bonus of £1500 offered for its completion within a specified time. The Commissioners are now considering a scheme for the filtration of the entire water supply at a cost of about £60,000.

LEWES GAS COMPANY.—The report submitted at the half-yearly meeting of this Company last Wednesday stated that the revenue account showed a profit for the half year of £1353 19s. After providing for interest on mortgage bonds, the balance of net revenue, as shown in the profit and loss account, was £1652 6s. The Directors recommended that a dividend of $\frac{1}{2}$ per cent. be declared, amounting to £1209 12s., and leaving a balance of £442 14s. to be carried forward. The report was adopted.

BATH GASLIGHT COMPANY.—A very satisfactory increase in gas-rental, compared with the corresponding half of last year, was experienced by this Company during the six months ending June 30. The amount received for gas from private consumers and public lamps was £24,736 19s. Residuals realized £3969 16s.; and this also compared favourably with the June half of 1887. The total revenue in the six months was £29,342; and the expenditure, £20,324. The balance of net profit to be carried forward, subject to the half-year's dividends to June 30, is £8711. The Directors reported that an additional lift is being added to one of the holders. At the meeting of the shareholders on the 31st ult., the Directors' report was adopted, and maximum dividends declared.

HARROW DISTRICT GAS COMPANY.—Reporting upon the operations of this Company during the half year ending June 30 last, the Directors state that the reduction in the price of gas at Lady-day of 3d. per 1000 cubic feet has affected the rental to the extent of about £30. They trust, however, that the increased consumption, in consequence of the reduction, will soon re-establish the usual rental. The balance on profit and loss account is £1673 14s., out of which the Directors recommend the declaration of a dividend at the rate of $\frac{7}{8}$ per cent. per annum on the original "A" capital, of 7 per cent. on the first additional "B" capital, and of $\frac{5}{8}$ per cent. on the second additional "C" capital, all less income-tax. The revenue account shows that the receipts in the half year amounted to £3965, and the expenditure to £2415.

THE PROPOSED NEW WATER-WORKS FOR PADHAM AND HAPTON.—Last Tuesday a special meeting of the Padham and Hapton Local Board was held to adopt an amended estimate of the cost of completing the new water-works at Churn Clough; and to authorize an application to the Local Government Board for permission to borrow a further amount of £26,100, and to withdraw the application for £32,000 agreed to last December. The Clerk gave a brief review of the history of the water-works scheme since the holding of the Local Government Board inquiry in May, and the interviews which the Engineers and deputation from the Board had had with the Inspectors of the Local Government Board. He also pointed out the suggestions which had been made by the Inspectors; and the consequent change in the estimate arising from a deviation from the original scheme. He added that the deputations were of opinion that the matter could not be arranged by correspondence. The resolution proposed to be adopted was to withdraw the application for sanction to borrow £32,000, and ask for £26,100 for the completion of the construction of the works; and this was agreed to by the Board with only one dissentient.

THE PUBLIC LIGHTING OF CHILVERS COTON (NEAR NUNEATON).—At a recent meeting of the Chilvers Coton Local Board, a discussion took place in reference to the way in which the gas-rate should in future be levied; it being felt by those who have been accustomed to pay it, that the farmers in the outlying portions of the parish (where there are no public lamps) ought to contribute something towards the cost of the lighting, inasmuch as they derive benefit from it when passing through the lighted area in the evening. On the other hand, many of the outsiders object to contributing towards the cost of the public lighting; contending that they get no benefit therefrom. The Clerk of the Board was accordingly instructed to communicate with the Local Government Board, asking if a 6d. gas-rate might be levied over the present lighting area, and the balance taken from the general district rate; it being stated that this would probably be satisfactory to the outlying ratepayers. A reply has just been received from the Local Government Board, in which it is pointed out that, under section 211 of the Public Health Act, 1875, the proposal of the Local Board cannot legally be carried into effect. The Board will therefore continue the lighting, for the ensuing season, as heretofore; the cost of it falling upon those residing within the area in which the public lamps have been erected.

NOTES FROM SCOTLAND. (FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.
In the course of the four months ending with August, the amount of gas-rental collected in Dundee was £9532, which is £246 more than the sum collected at the same date last year. At a meeting of the Gas Commissioners on Wednesday, the Finance Committee recommended that Mr. A. I. Strachan, who has long been Chief Clerk in the office, should be appointed Treasurer, in room of the late Mr. Matthew, at a salary of not less than £300; and they asked the Board to remit to them to report on the Treasurer's duties, and as to the changes which should be made in the office staff consequent on Mr. Strachan's promotion. The recommendations were unanimously agreed to; and Mr. Strachan's security was fixed at £1000.

It is announced that an oil-gas works is being erected at Cowdenbeath, a mining centre in Fifeshire. About 25 years ago, there were only one or two houses by the roadside, where now there is a town of 5000 inhabitants. The scheme is being promoted by a Mr. Alexander. This gentleman recently opened a shop at Cowdenbeath; and, being convinced of the advantages of oil-gas over the ordinary paraffin-lamp, he at once brought the matter before a number of business men in the rising village. Assured of support, Mr. Alexander put himself into communication with the Patent Paraffin Gas Lighting Company, Limited, of Glasgow; and the erection of the works was shortly afterwards commenced. The gasholder, it is stated, will be about 1200 cubic feet capacity, which may appear small; but it is pointed out that the gas is about 60-candle power, and therefore the 1200 is equal to $2\frac{1}{2}$ times that amount, or say 3000 cubic feet of the ordinary coal gas supplied in Scotland. Already about 200 yards of 4-inch pipes have been laid; and service-pipes therefrom to several persons who have contracted for a supply of the gas, and arrangements have been made for laying a 3-inch main in the footpaths on both sides of the street.

The estimate for the lighting of the City of Edinburgh for the current year has been made by a Town Council Committee; and it amounts to £14,445, or £230 more than last year.

The statement of accounts to be presented to the shareholders of the St. Andrews Gas Company at their meeting next Wednesday shows that the income during the year ending the 31st ult. was £3971 8s.; and the expenditure £2908 9s.—leaving a balance of £1062 19s.

Last year the Police Commissioners of Dalkeith had before them a proposal to acquire the gas-works, and rejected it as being too risky, in view of the advance of electric lighting. They have now appointed a Committee to consider the question of introducing electric lighting into the borough. The gentleman who introduced the subject urged its advisability on the ground that, with a large gas-engine, which is used in pumping water, not fully employed, there was a surplus of power which might be utilized in driving dynamos. The query which naturally arises in one's mind is whether if, in a place of the size of Dalkeith, the Commissioners cut off their consumption, it will be possible for the Gas Company to go on; and in this event, whether it might not have been more sensible rather to acquire the gas-works in the first instance, and then have considered the feasibility of introducing electric lighting.

The Water Committee of the Aberdeen Town Council, at their meeting on Tuesday, had under consideration the estimate of the income and expenditure for the year 1888-89. Last year the revenue was £15,710; and the expenditure £15,805, leaving an adverse balance of £95. From the previous year, however, a surplus amounting to £945 was carried forward, so that the year ended with a balance to the good. For the coming year the estimate shows a slight increase on wages; and there will be an increase also on the amount paid as interest. The sinking fund will also show a rise; and it is calculated that at the present rate, which the Committee agreed to continue, all the existing surplus will be required, and that next year will close with an adverse balance of £55.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.
After passing over August as a holiday month, the Glasgow Corporation Gas Commissioners had an "innings" at the Town Council meeting on Thursday. The annual report of the Gas Committee, a full summary of which has already been given in the JOURNAL (*ante*, p. 301), was submitted by Baillie McLaren, Convener of the Sub-Committee on Finance, who moved its adoption. In the course of his remarks, he pointed out that the proposed reduction in the price of the gas from 2s. 10d. to 2s. 8d. per 1000 cubic feet would give a benefit of £18,000 to the community of Glasgow and the suburbs. He also stated that, during the past five years, the Gas Trust had reduced the price of gas to such an extent that the consumers had benefited by upwards of £110,000. Baillie Macfarlane, in seconding the motion, remarked that the average illuminating power of the gas during the year 1887-8 had been 23.1 candles. It was not intended to make any change in that respect. He stated that while the works generally were in a very fair condition, the Committee intended to remodel the Tradeston or South-Side works; the expense involved in the alterations and extensions to be spread over a period of two or three years; and for this purpose the sum of £12,000 had been written off the value of the Tradeston works. The report was adopted; and the Committee's minutes were approved of.

Baillie Shearer was present at Thursday's meeting of the Glasgow Gas Trust; but he did not submit the motion of which he gave notice several months ago, to the effect that he would ask a vote of £5000 from the gas surplus profits for the benefit of the "Common Good;" indeed, he seems to have quietly acknowledged that the Gas Committee had taken the "wind out of his sails," as they had so dealt with the year's profits of the gas undertaking as to leave only a net surplus of £5201 2s. 2d. to carry forward to next year's account.

The resolution to reduce the price of Glasgow gas to 2s. 8d. per 1000 cubic feet will at once take effect; and in accordance with the practice of past years, the Directors of the Partick, Hillhead, and Maryhill Gas Company will at once "follow suit," and also supply their consumers with gas at the price just mentioned.

Business has been done during the week in the ordinary shares of the Partick, Hillhead, and Maryhill Gas Company at 89s. per £5 share.

The Falkirk and Larbert District Water Trust have now set to work in right earnest to carry out the terms of the Water Act that was passed in the last session of Parliament. Mr. W. R. Copland, C.E., of Glasgow, who prepared the scheme for the consideration of Parliament, has been appointed by the Trustees to carry out the works which are contemplated in the Act; and he is now engaged in preparing the plans and specifications, which are expected to be ready in November, so that there is a reasonable prospect that the contractors who may be entrusted with the execution of the necessary works will be ready to begin operations early in the ensuing year. Mr. Copland is sanguine enough to believe that within two years from the time of commencing the works a supply of water will be available for the entire district, while a portion of the district nearest the source of supply may be having the water at an earlier period. Mr. Wilson, Town Clerk, of Falkirk, has been appointed *ad interim* Clerk to the Water Trust.

The completion of the Camphill scheme for extending the water supply of Paisley may now be regarded as an event of the early future. The scheme was inaugurated several years ago; and from the fact that the Contractor, Mr. R. B. Stewart, has somewhere about 200 men employed on the works, it may naturally be concluded that the extension works in hand is a very important undertaking. When it was decided by the Paisley Water Commissioners to construct the Camphill reservoir, which is expected to bring their storage capacity up to 1519 million gallons, they had in view the fact that they would be able to make such provision for the manufacturers of the town, and the community generally, that they would be beyond the chance of want for many years to come. The reservoir is formed in the glen through which the Rye Water flows. The embankment thrown across the glen was 55 feet high when the reservoir was opened two years ago; and it is contemplated to raise it another 25 feet. The collecting ground extends to an area of about 6800 acres.

Messrs. Osborne and Stevenson, of Pollokshields, Glasgow, have been successful in gaining the contract for the construction of the water-works extensions for the town of Gourrock; their tender amounting to £1650. The works are to be commenced at once.

The Glasgow pig-iron warrant market has been more active within the past few days than in any week of the past half year. There is a large amount of legitimate trade passing, and several special brands have been in requisition, with the result that in nearly all cases prices have been advanced. America has been buying more freely than for some time past. The stocks of pig-iron in the public warrant stores have only increased to the extent of 124 tons during the week; the ordinary make being practically all absorbed. On Monday the price of Scotch warrants opened at 41s. 4d. per ton cash; and up to 42s. 3d. per ton was subsequently reached. "Bears" bought largely on Wednesday to cover oversold accounts; more than 50,000 tons changed hands, and 42s. 3d. per ton was again touched—the highest rate since the spring. There were realizations for profits on Thursday; and there were evidences of considerable strength in the market. Yesterday the tone was decidedly weaker, down to 41s. 7½d. per ton cash buyers being quoted at the close. Hematite and Cleveland have been very strong all the week.

The improving tone in the coal trade still continues, especially in the export department, and a brisk business is now doing at the Clyde and Ayrshire ports. For main coal the quotation has reached 6s. per ton f.o.b. at Glasgow coaling cranes. The demand for furnace qualities is on the increase; and prices are responding to the better feeling in this branch of the trade. For house coal there is a good steady demand; but the prices have not made any upward move in consequence.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Sept. 8.
Sulphate of Ammonia.—There has been a fair "spot" demand, but hardly sufficient to raise values; and to-day the feeling is very quiet again. There is, therefore, practically no change in the quotations; the position is in no way altered. The inquiries for future delivery, principally from the end of the year to March next, have been on a larger scale; but the limits are too low to tempt makers, and so the orders have been taken by speculators. The anxiety to secure forward contracts, at moderate rates, seems to be generated by the higher quotation of nitrate for Sept.-Oct. shipment; and freights are still rising. As regards the actual position of this commodity, the visible supply (including stocks and cargoes afloat) is about 50,000 tons in excess of that at the same time last year. The total shipments the first eight months of this year were 370,000 tons, against 310,000 tons for same period of 1887; while the consumption does not seem to have materially increased.

LONDON, Sept. 8.
Tar Products.—There has been no important change in the position of this market during the week. The demand is fairly good, considering the time of year. Prices may be taken as follows:—Tar, according to position, 17s. 6d. to 22s. 6d. per ton. Benzol, 90 per cent., 3s. 1½d. per gallon; 50 per cent., 2s. 4½d. Toluol, 1s. 9d. per gallon. Solvent naphtha, 1s. 2d. per gallon. Creosote, 2d. per gallon. Pitch, 12s. to 13s. 6d. per ton. Carbolic acid (crude), 3s. 4d. per gallon. Cresylic acid, 9d. per gallon. Tar salts, 15s. per ton. Anthracene, 30 per cent., "A" quality, 1s. 6d. per unit; "B" quality, 1s. 3d.

Ammonia Products.—There is a slightly better feeling in the sulphate market; but this article still "hangs fire." It has changed hands during the week at an advance of several shillings on the previous week's sales. Prices: Sulphate of ammonia, £11 5s. to £11 7s. 6d., less discount. Gas liquor (5° Twaddell), 7s. 6d. per gallon, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 1½d. per lb. Carbonate of ammonia, 3½d. per lb. Muriate of ammonia, brown, £18 per ton; white, £27. Sal-ammoniac, £30 per ton.

[From the *Chemical Trade Journal*, Sept. 8.]

Sulphate of Ammonia.—The market is still in a very abnormal state; and the shyness of Continental buyers is by many attributed to the action of Beckton in lowering their prices. Liverpool values are still above those obtainable at Hull; and there is still but little offering for prompt delivery. Leith is well supplied with orders; and makers are eagerly following the course of the market, with the intention of making their September-December sales. Beckton prices stand at £11 5s.; London outside makes, £11 8s. 9d.; Liverpool, £11 10s.; Hull, £11 7s. 6d.; Leith, £11 5s.

Tar Products.—The benzol market remains much in the same inactive state as has characterized it for some months past. The fact that 90's benzol has not risen or fallen lately is due to there being not a tithe of the quantity made by carbonizing which was projected at this time last year; and yet, with this wonderfully diminished production, it has scarcely been able to hold its own. We have no hesitation in saying that should ever the quantity be required, four times the quantity of benzol could be produced that has been made during the past six months. The price of 90's is variously quoted from 2s. 10d. to 3s., and 50/90's at 2s. 4d. Pitch remains without change in value; but it has been in fair demand lately at old rates.

LIGHTING OF THE TEES WITH GAS.—At the meeting of the Tees Conservancy Board yesterday week, the scheme for lighting the river with compressed gas, which has received the approval of the Commission and of the Trinity House Brethren, was, on the recommendation of the Works Committee, ordered to be proceeded with in accordance with the Engineer's report, at a cost not exceeding £1800.

SOUTH STOCKTON GAS SUPPLY.—Some time ago the South Stockton Local Board applied to the Stockton Corporation to have the price of gas in South Stockton reduced to the same price as in the municipal borough—namely, from 2s. 8d. to 2s. 6d. per 1000 cubic feet. The Gas Committee, at the meeting of the Town Council last Tuesday, reported that they could not see their way to make the suggested reduction.

SALE OF SHARES.—A number of "A" and "B" shares in the *Cleveland Gas Company* were recently disposed of by auction at average prices of £16 7s. 6d. and £14 10s. 6d. respectively.

METROPOLITAN GAS COMPANY OF MELBOURNE.—At the half-yearly meeting of this Company held on July 27, a dividend at the rate of 17 per cent. per annum was declared; £20,000 was added to the reserve fund (raising it to £133,750); and £33,433 was carried forward.

REDUCTIONS IN PRICE.—The *Oswaldtwistle Local Board* decided, at their meeting yesterday week, that the price of gas to consumers of 400,000 feet and upwards in six months should be reduced to 2s. 10d. per 1000 cubic feet, and to consumers of less than that quantity, 2s. 11d. per 1000 cubic feet, with 5 per cent. discount if paid for on or before the last day of the month following the end of the quarter.—The proprietors of the *Bungay Gas-Works* have notified to their customers that, in order to encourage the further consumption of gas, the price will be reduced from 5s. to 4s. 6d. per 1000 cubic feet, on and after the 1st prox.—The *Workington Local Board*, at their last meeting, resolved to reduce the price of gas, on the 1st prox., from 2s. 11d. to 2s. 8½d. per 1000 cubic feet.

THE INTRODUCTION OF GAS IN GLASGOW.—Our Glasgow Correspondent, writing on the 1st inst., says: "Just 70 years ago to-day (in 1818), gas was introduced into the street lamps of Glasgow for the first time. A notice of the event appeared in the *Glasgow Herald* (then a small four-page sheet, published bi-weekly, at 7d.) of the following Friday. The notice ran as follows:—'For the last three evenings a part of Trongate, and a number of shops in the town were lighted with gas. The appearance was highly beautiful, particularly last night; and when the Company are enabled to carry fully into execution their whole plan, we anticipate, from the broadness of our streets, it will have a grand effect. Some malicious persons having removed one of the burners on Wednesday evening, a reward of ten guineas is offered for such information as may lead to their conviction.'"

NORTHERN COAL TRADE.—The improvement in the northern coal trade continues; and there have been contracts decided at advanced prices during the past few days. Steam coals have been steady, at prices which vary from 7s. 6d. to 7s. 9d. f.o.b. in the Tyne for best qualities; second qualities being lower. For gas coals, the demand is large and growing. Some interest has been felt in the decision as to the contracts of the Newcastle Gas Company. Most of the coal was offered at prices varying from 6s. to 6s. 6d. The Directors of the Company made a counter-offer at a price which is 3d. per ton above that of the past year, or about 6s. 1½d.; but this offer has not as yet been accepted. It is quite probable, however, that this will be about the price on the average; and coal delivered at this rate must be held as cheap. Other contracts show a slight advance; so that it must now be concluded that an advance in gas coal, both sales and contracted, may be regarded as established. Manufacturing coal is dearer; but household coal is dull.

DOVER GAS COMPANY.—At the half-yearly meeting of this Company on Monday last week, the statement of accounts presented showed that the receipts for the six months ending June 30 amounted to £13,448, and the expenditure to £10,821; leaving a balance of £2627. The Chairman, in moving the adoption of the Directors' report, alluded to the fact that notwithstanding the 3d. reduction made in the price of gas in January, the profit for the half year was sufficient to pay the full parliamentary dividend. They had also announced a further reduction of 2d. per 1000 cubic feet as from July 1 last. With reference to the accounts, the reduction in price made at the commencement of the year took from the gas-rental the sum of £900; but with the increased consumption of gas, which was 3·37 per cent., the revenue from the sale of gas was only less by £547 15s., as compared with the corresponding period of last year. Then the residuals had increased £223 17s.; coke and tar had realized £100 more; sulphate of ammonia, £123 extra; stove-rentals, £12 9s.; and the interest on the reserve fund investment was more by £41 1s. 2d. The total revenue had increased by £270 17s., compared with the corresponding half of last year. The total expenditure, notwithstanding the increased quantity of gas sold, was less by £168. The manufacture of gas and residuals under the management of Mr. R. Herring had, he said, been most satisfactory. The report was adopted; and a dividend declared at the rate of 7½ per cent. per annum, less income-tax.

RESUMPTION OF THE CONSTANT SUPPLY OF WATER AT LIVERPOOL.—Yesterday week, the usual meeting of the Water Committee of the Liverpool City Council was held, when the proceedings of the Executive Committee included the following report, which was presented by Mr. Parry, the Engineer of the Rivington works:—"The volume of water now in store at Rivington is 1547 million gallons, which is equal to about three months' supply at the present rate of consumption. Though this is an increase upon the volume in store at the corresponding date last year, it is still very considerably less than the usual contents of the reservoirs in the month of September. Since the restoration of constant service in the year 1875, the average quantity of water in stock at the beginning of September has been 2679 million gallons. The present stock of water is therefore 1132 million gallons below the average of the last twelve years; and if the exceptional experience of last year were repeated, the reservoirs would fall to an undesirably low level in the coming winter. The resources of the Committee at Rivington are thus still deficient; but having regard to the supplemental supplies which have been provided, and especially considering the importance to the community of restoring a constant supply at the earliest possible date, I think that the Committee may safely resume the constant service as soon as due notice of the change can be given." It was resolved that the constant supply should be resumed on the following Thursday, and this was accordingly done.

MORECAMBE GASLIGHT COMPANY.—At the annual meeting of this Company on the 31st ult., the Directors reported, with sincere regret, the death of their Chairman (Mr. Alderman Roper), in whose place they had appointed Mr. R. Briggs. They also stated that the capital account had been overdrawn to the amount of £639 17s.; and in order to meet this, they proposed making a call of £1 per share on the 800 old shares of the Company. The revenue received during the past year was £3292 17s.; and the expenditure was £2213. After payment of mortgage interest, the profit amounted to £875 15s., which, with the balance from last year (£825 4s.), made a total of £1700 19s. An interim dividend of 3½ per cent. was paid on March 1 last; and a similar dividend was declared at the meeting—making 7 per cent. for the year, free of income-tax. In moving the adoption of the report, the Chairman stated that the new retort-house and six purifiers which they had been erecting were now completed. The amount expended upon them was £4438 16s. 9d., less £400, which has been debited to revenue account in consideration of the old purifiers and old bench of retorts which would have had to be renewed out of the revenue; so that the cost of the extensions stood in the Company's books at £4038 16s. 9d. These extensions, he said, were giving every satisfaction, and would enable the Company to send out double the quantity of gas. Votes of thanks were passed to the Chairman and Directors, and to the Manager (Mr. W. Duff).

A "SUBSTITUTE FOR GAS" TO BE FOUND AT CASTLEFORD.—At the last ordinary meeting of the Castleford Local Board, in consequence of the Gas Company having positively declined to make any reduction in the price of gas supplied to the Board, it was resolved, on the recommendation of the Finance Committee—"That the Clerk make inquiries as to the feasibility and cost of providing a substitute for gas."

CHICHESTER WATER-WORKS COMPANY.—A very favourable report was presented by the Directors at the recent half-yearly meeting of this Company. It stated that the receipts from water-rents during the last three half years have been as follows:—For the half year ending June, 1887, £1143; December, 1887, £1187; June, 1888, £1184. The profits for the past half year amounted to £753 11s., which, together with the balance of profits brought forward from the previous half year, made a sum of £1701. Out of this a dividend of 7s. 6d. per share on the fully paid-up shares, and of 6s. per share on the partly paid-up shares (£8 paid), free of income-tax, was declared on Feb. 23 last, amounting to £710. After carrying £200 to the reserve fund, there remained a balance of £880, from which the Directors now recommended an interim dividend of 8s. 9d. per share on the fully paid-up shares, and of 7s. per share on the partly paid-up shares; being at the rate of 8½ per cent. per annum, free of income-tax. The report was adopted.

THE GAS QUESTION AT FLEETWOOD.—The Committee recently appointed at a meeting of Fleetwood ratepayers, to inquire into the methods and cost of lighting in other towns, have had several meetings to consider proposals from electric lighting and other companies; and when the sanction of the Board of Commissioners has been obtained (and it will probably be granted to-morrow, Wednesday) the Committee will proceed to towns to which they have been invited, to examine modern systems of lighting. The inducements to adopt the electric light are said to be locally very strong; and it is probable that for street illumination the Committee may recommend the formation of a Company to undertake the lighting of the town by electricity. Failing the electric light, the system patented by the Automatic Gas-Oil Company will have a favourable report from the Committee, as the proprietors of this process have offered to enter into a contract to light the town as effectively as at present, for 25 per cent. less than is being paid to the Gas Company.

REFUSING TO SUPPLY WATER.—At the Thames Police Court on Tuesday last, the Secretary of the East London Water-Works Company (Mr. I. A. Crookenden) was summoned at the instance of Mr. J. H. Johnson, of St. Ann's Wharf, Limehouse, for refusing to supply water to two houses belonging to him. The complainant said that the reason the Company gave for refusing a supply when requested to do so was that he declined to put in storage cisterns. Mr. George Keble, on behalf of the Company, maintained that they were only within their rights in not giving complainant a supply, as he had not conformed to the several sections of the Acts of Parliament bearing on the matter. Before a supply was given, the Act provided for the putting in of a cistern to store the water; and if it was not done, they had power to discontinue the supply. Mr. Lushington considered that the complainant was entitled to a supply, but consented to have the case adjourned for a fortnight to have the fittings examined; the Company in the meantime undertaking to lay on a supply without prejudice.

NEW WATER-WORKS FOR LIMERICK.—Last Wednesday the ceremony of turning the first sod of the new water-works which the Corporation of Limerick are about to construct at Clareville was performed by the Mayor, by the aid of a silver spade which was presented to him by the Engineers and Contractors. The new works, it is stated, will cost £35,000, and are based on a turbine scheme devised by Messrs. Cruise, Browne, and Fogarty, Engineers, of Limerick. Mr. Dixon, of Dublin, has been appointed Contractor for the works of construction to the extent of £16,000. It is estimated that the works will take from eighteen months to two years to complete; and the cost of working, after completion, is put down at £500 annually. The scheme is in the first instance propulsion and elevation by a system of turbines on the Shannon, near the Falls of Doonass. The water thus raised will be stored at Newcastle Hill, in a reservoir having a capacity of 70 million gallons. The reservoir will be at such an elevation as will secure a constant supply to the city of 1½ million gallons daily; and the pressure will be sufficient to force the water over the top of the highest house in Limerick. After the ceremony, the Engineers entertained the representatives of the Corporation and other guests at luncheon.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 456.)

Issue.	Share	When ex-Dividend.	Dividend of Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.					£ s. d.
GAS COMPANIES.								
530,000	10	12 Apr.	10½	Alliance & Duhlin 10 p. c.	10	18½-19½	+½	5 7 6
100,000	10	"	7½	Do. 7 p. c.	10	13-14	..	5 7 1
800,000	100	2 July	5	Australian (Sydney) 5% Deb.	100	110-112	..	4 9 3
100,000	20	30 May	10	Bahia, Limited	20	23-25	..	8 0 0
200,000	5	11 May	7½	Bombay, Limited	5	7-7½	..	5 0 0
40,000	5	"	7½	Do. New	4	5-5½	..	5 9 1
380,000	Stock.	29 Aug.	11½	Brentford Consolidated . . .	100	220-225*	..	5 4 5
110,000	"	"	8½	Do. New	100	161-166*	..	5 5 5
220,000	20	14 Mar.	10½	Brighton & Hove, Original .	20	44-46	..	4 11 8
320,000	20	12 Apr.	11½	British	20	46-48	+1	4 13 9
50,000	10	14 Mar.	11	Bromley, Ordinary 10 p. c.	10	20-22	..	5 0 0
39,000	10	"	8	Do.	10	13½-14½	..	5 10 4
328,750	10	30 May	8	Buenos Ayres (New) Limited	10	14½-15½	+1	5 3 2
200,000	100	2 July	6	Do. 6 p. c. Deb.	100	108-110	..	5 9 1
150,000	20	10 Aug.	7	Cagliari, Limited	20	25-27	..	5 8 8
550,000	Stock.	12 Apr.	13½	Commercial, Old Stock . . .	100	274-279	+6	4 18 6
130,000	"	"	10½	Do. New do.	100	214-219	+3	4 18 2
121,234	"	28 June	4½	Do. 4½ p. c. Deb. do.	100	123-128	..	3 10 3
557,320	20	14 June	12	Continental Union, Limited	20	45½-46½	..	5 1 0
242,680	20	"	12	Do. New '69 & '72	14	29½-30½	..	5 10 0
200,000	20	"	9	Do. 7 p. c. Pref..	20	35-37	..	4 17 3
75,000	Stock.	28 Mar.	10	Crystal Palace District . . .	100	205-215	..	4 13 0
234,060	10	27 July	13	European, Limited	10	25½-26½	..	4 18 1
120,000	10	"	13	Do. New.	7½	18½-19½	..	5 0 0
354,060	10	"	13	Do. do.	5	124-134	..	4 16 3
5,468,350	Stock.	29 Aug.	13	Gaslight & Coke, A, Ordinary	100	252-256*	-1	5 1 6
100,000	"	"	10	Do. B, 4 p. c. max.	100	98-103*	..	3 17 8
665,000	"	"	4	Do. C, D, & E, 10 p. c. Pf.	100	260-265*	+2	3 15 6
30,000	"	"	5	Do. F, 5 p. c. Prf.	100	125-130*	..	3 16 11
60,000	"	"	7½	Do. G, 7½ p. c. do.	100	152-157*	..	4 0 2
1,300,000	"	"	7	Do. H, 7 p. c. max.	100	167-172*	..	4 1 4
463,000	"	"	10	Do. J, 10 p. c. Prf.	100	258-263*	+2	3 16 1
1,061,150	"	14 June	4	Do. 4 p. c. Deb. Stk.	100	120-123	..	3 5 0
294,850	"	"	4½	Do. 4½ p. c. do.	100	125-130	..	3 9 3
650,000	"	"	6	Do. 6 p. c. do.	100	175-178	..	3 7 5
3,600,000	Stock.	11 May.	10	Imperial Continental . . .	100	207-210	+1	4 15 3
75,000	5	14 June	6	Malta & Mediterranean, Ltd	5	5-5½	..	5 9 1
560,000	100	3 Apr.	5	Met. of Melbourne, 5 p. c. Deb.	100	114-116	..	4 6 2
541,920	20	14 June	10	Monte Video, Limited . . .	20	20-21	..	5 14 8
150,000	5	30 May	10	Oriental, Limited	5	9½-9¾	..	5 2 7
60,000	5	28 Mar.	7	Ottoman, Limited	5	6-7	..	5 0 0
People's Gas of Chicago—								
420,000	100	2 May	6	1st Mtg. Bds.	100	107-110	..	5 9 1
500,000	100	1 June	6	2nd Do.	100	95-100	..	6 0 0
100,000	10	26 Apr.	10	San Paulo, Limited	10	16-17	..	5 17 8
500,000	Stock.	29 Aug.	15½	South Metropolitan, A Stock	100	308-318*	..	4 19 0
1,350,000	"	"	12	Do. B do.	100	243-247	+½	4 17 2
141,500	"	"	13	Do. C do.	100	245-255*	..	5 1 11
550,000	"	28 June	5	Do. 5 p. c. Deb. Stk.	100	135-140	..	3 11 5
60,000	5	29 Aug.	11	Tottenham & Edm'ton, Orig.	5	11-18*	..	4 4 0
* Ex div								
WATER COMPANIES.								
717,467	Stock.	28 June	9	Chelsea, Ordinary	100	256-261	..	3 9 0
1,720,560	Stock.	12 Apr.	7	East London, Ordinary . . .	100	197-202	..	3 9 4
700,000	50	14 June	9	Grand Junction.	50	124-128	..	3 10 4
708,000	Stock.	10 Aug.	10½	Kent	100	260-274	..	3 16 7
1,043,800	100	28 June	9	Lambeth, 10 p. c. max.	100	258-263	..	3 8 5
406,200	100	"	7½	Do. 7½ p. c. max.	100	204-209	..	3 11 9
200,000	Stock.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	118-122	..	3 5 7
500,000	100	27 July	12½	New River, New Shares . . .	100	347-352	..	3 8 10
1,000,000	Stock.	"	4	Do. 4 p. c. Deb. Stk.	100	123-127	..	3 3 0
902,300	Stock.	14 June	6	S'hwk & V'xball, 10 p. c. max.	100	162-167	..	3 11 10
126,500	100	"	6	Do. 7½ p. c. do.	100	157-162	..	3 14 1
1,155,066	Stock.	14 June	10	West Middlesex	100	264-269	..	3 14 4

† Next dividend will be at this rate.

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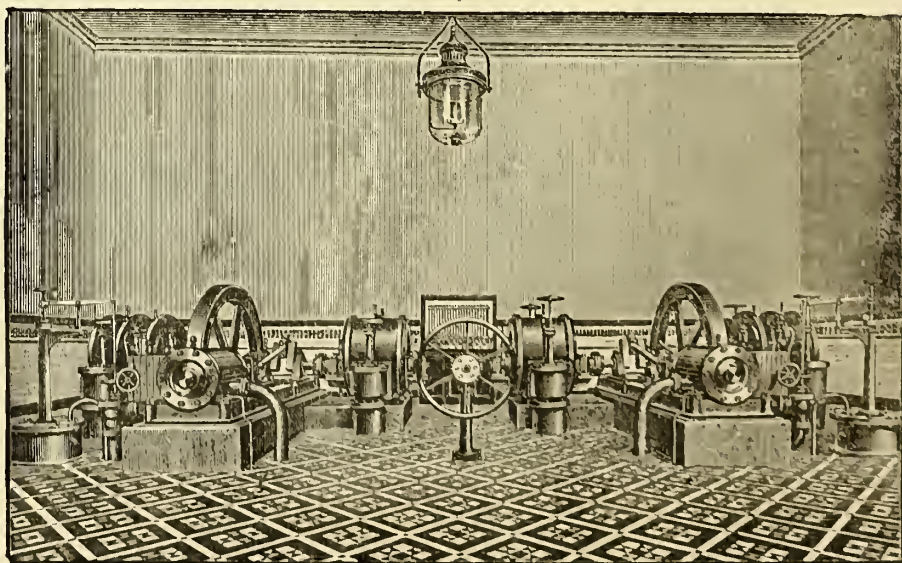
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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, SEPTEMBER 18, 1888.

THE BRITISH ASSOCIATION REPORT UPON STANDARDS OF LIGHT.

It would be pardonable if photometrists had forgotten the existence of the British Association Committee on Standards of Light, seeing that this Committee was nominated several years ago, and has never done anything very definite towards settling the questions which its members have taken into consideration. The Committee presented their final report at the recent Bath meeting, however, and have thus terminated their labours, which demand some notice at our hands. Their conclusions are not of a startling character, since they merely confirm those stated by Mr. Dibdin in his report to the Metropolitan Board of Works. This is gratifying, as it is rare for photometrical research committees to corroborate each other. Mr. Dibdin's report is, therefore, endorsed by independent authority as being the exposition of the truth as regards photometrical standards; and perhaps when the

London County Council settles into work, it will be acted upon, to the final extinction of the discredited standard candle. The ground covered by the British Association Committee is the same as that on which many other photometrists have laboured before them. They took samples of standard candles of different makers, including one special kind submitted for examination, and they compared them with pentane and the amyl-acetate lamp. With regard to candles, they arrived at the conclusion that they are not worthy of being called a standard, for the same reasons that have often been advanced to their discredit. Briefly, it is found that there is no connection whatever between the parliamentary definition of a standard candle and its illuminating power. Spermaceti does not mean any definite chemical composition—and, besides, candles are never made of spermaceti alone. There is no definition for the constitution or material of the wick; so that so-called standard candles, conforming to the terms of the law, can be made which nevertheless vary largely in illuminating power. It is stated in the report that, in the preparation of spermaceti for candle making, considerable improvements have been made of late years, which introduce a source of possibly grave error in photometry by the standard candle. The manufacturer's object is to separate his spermaceti, in as dry a condition as possible, from the liquid which accompanies it while in the crude state, and which is sperm oil. Modern processes which have been adopted with this view have resulted in the separation of a drier solid, with a higher melting point, than was obtainable even ten years ago. The increased difficulty of burning this dry spermaceti has necessitated the use of larger wicks in the candles, which consequently give less light than the old candles consuming the same weight of material with small wicks. It may be remarked here that this conclusion differs from that arrived at by some photometrists, which is that standard candles give more light now than formerly. The Committee emphasize the observations that the illuminating power of candles is materially affected by the conditions as to ventilation under which they are burnt.

The Committee naturally have something to say about the Violle standard of light, which was so enthusiastically adopted by the International Congress of Electricians that met in Paris some years ago, and has never been used by anybody but its author. The way in which this recommendation of the Congress has been ignored is a striking commentary upon the futility of such formal certificates, although issued by the highest authority, when unsupported by substantial advantages. Nobody has ever been able to make use of the Violle standard, except M. Violle himself; and when Mr. Dibdin wished to try it in the course of his own exhaustive inquiry, he could not even obtain the apparatus. The Violle standard, however, has been a veritable *ignis fatuus* for photometrists. They have been haunted by the fancy that there must be something in it to have attracted the patronage of the Congress of Electricians; and the original apparatus being unavailable, they have tried a variety of devices for throwing the light of molten or solidifying platinum upon an ordinary photometrical screen. The results have not been satisfactory, however, except as illustrations of the practical impossibility of employing light radiations from the surface of molten metal. Very much to his own satisfaction, M. Violle has demonstrated that all lights of combustion must of necessity be fluctuating and unreliable. It has been shown, however, by abundant testimony, that this objection applies even more strongly to lights of radiation from molten metallic surfaces; and so the platinum unit must be regarded as proved by the majority of witnesses to be unworthy of further consideration.

The Committee had the advantage of the use of Mr. Dibdin's testing-room and his four-way photometer at Spring Gardens—the most perfect appliance for the purpose ever used. Here they tried against each other standard candles, the pentane standard, the new pentane lamp, and the amyl-acetate lamp. They could not try any other, for the simple reason that there are no more to try. It was at one time hoped that a standard light could be obtained from an incandescent electric lamp; but this hope has faded with extended experience. Consequently, if we exclude all standards of the Methven type, produced by selecting, by means of a screen, the steadiest portion of a gas or oil-lamp flame, there are no others now available besides candles, pentane, and amyl-acetate. Between these, selection becomes comparatively easy. The candles are rejected on account of the range of their variation from the average. The amyl-acetate lamp was much more constant than the candles, but the red colour of its light, and probably also its feebleness, are against it. It will in all probability

continue to be used for some photometrical purposes, however, because of its extreme handiness and simplicity, in which it resembles a common spirit-lamp. Pentane triumphed on the score of steadiness; and is accordingly strongly recommended by the Committee, who "urge most earnestly the importance of undertaking such action as is possible to ensure the immediate rejection by the Board of Trade of the parliamentary candle as a standard of light, and the adoption of the pentane standard in all future work." They do not suggest any change in the legal name of the standard of light for the United Kingdom. It would still be the "standard candle," and the intelligible and convenient term "candle power" would be used; but the unit would not be indicated for photometrical purposes by an actual candle, for which the pentane flame would be substituted.

For gas testing, as we have repeatedly remarked, whether pentane or candles occupy the pride of place as the legal standard, the convenient, always-ready Methven unit will remain the general favourite. The British Association Committee's report does not make any mention of the Methven device; but, for all that, in their actual work with Mr. Dibdin's photometer the central light by which all the others were compared was a gas-flame with the top portion screened off. The report was not discussed at the meeting when it was presented, which is rather to be regretted, as discussion might have elicited additional information from the author, who was present, and received the customary vote of thanks. The presentation of the report closes the chapter of contemporary investigations respecting standards of light up to and including the pentane era. Henceforward pentane rules supreme as the best authorized means of representing the light of a legal candle for photometrical purposes. Something better may be suggested at a future time; but we suppose we must declare now that there is nothing so good at present known to science, and that the matter must be allowed to rest where it is until a well-accredited rival appears. There can at least be no justification for further investigations of the kind now concluded, until something new comes forward to disturb these conclusions. There can be no possible rivalry between the pentane and the Methven standards, now that their relative offices have been settled by experience, and recognized by Mr. Dibdin's report. The pentane, as used in the form of a lamp, is a portable standard, available for photometrical work where gas is not obtainable. In the photometer-room of a gas-works, or a town gas-testing station, the Methven screen, standardized by reference to the pentane flame, is convenience itself. This is the practical conclusion of the whole matter; and it is to be hoped that next time the subject of photometrical standards engages public attention, it will be with reference to some progressive action, and not to investigations and reports, of which there are now enough.

MR. CARR RESIGNS.

THE Halifax "gas scandal" has entered upon a new phase by the resignation of Mr. W. Carr, Manager of the Corporation Gas-Works, in consequence of the action of the Town Council commented upon in these columns last week. The Town Council unanimously resolved that Mr. Carr must institute proceedings against the *Pall Mall Gazette* or resign. Two months ago the Council were advised that no sufficient cause of action existed for anybody against the newspaper in question; but, notwithstanding this opinion, pronounced by their own Counsel, they sought to force Mr. Carr to commence proceedings, upon peril of losing his appointment. Mr. Carr's position in regard to the matter is very clearly set forth in the communication from his Solicitors (notifying the course taken by him under advice) to the Town Clerk, and which will be found elsewhere. It is herein stated that "notwithstanding all that was advanced in alleged justification of the course the Council were taking, our client is still advised that no action can possibly lie against the proprietors, printers, or editor of the *Pall Mall Gazette*; and therefore to commence the proceedings required by the Council is out of the question." Consequently, Mr. Carr accepts the only possible alternative, short of defying the Corporation as contemplated in our last week's notice of the affair. A sentence in his Solicitors' letter, however, reserves the right of enforcing against the Corporation "such claims as the action of the Council may enable him to make." And now, what will the Corporation do? They cannot let the matter rest where it is. They thought it would be a simple and easy way out of their troubles to make their Gas Manager a scapegoat; but now that he has preferred to sacrifice his appointment rather than undertake a task pronounced hopeless by his

and their advisers, what course remains for the Council? It seems to us they will have to go on just as though they had never thrown Mr. Carr overboard; but with the additional load of a manifest act of injustice. Once more it has been demonstrated that the simplest course out of a difficulty—by shifting it on to somebody else's shoulders—is not always the best. The more the course taken by the Town Council is looked at, the uglier it appears. According to the local newspapers of the day or two after the Council meeting at which the *ultimatum* to Mr. Carr was agreed upon, this action met with the general approval of the townspeople; and it was even reported that there was experienced in the town a feeling of relief at the imaginary prospect of something at last being done to clear off the cloud of suspicion that has rested over the Municipality ever since the publication of the *Pall Mall Gazette* innuendo. This feeling was natural under the circumstances; for most people like to know that "something is being done" in an emergency, and are not particularly curious at first as to whether the "something" is the right thing or not. In this case, however, the action of the Council has "missed fire" so completely, and Mr. Carr is so clearly in the right in the position which he has taken up, that we are inclined to imagine that by this time not a few of the doubtless well-meaning Town Councillors who agreed to the minatory resolution, regret their hasty vote. It is reported now that public opinion in the town has veered round, and is setting as strongly in Mr. Carr's favour as it did against him for the day or two after it was shown that he was deserted by the whole body of the Town Council. The fickle wind of popular applause is not to be counted, however, among the elements out of which a man's reputation is to be maintained; and we may be sure that Mr. Carr and his advisers are not under any illusion in this respect. Whatever may be hoped or feared in the town, outsiders will not refuse to listen to Messrs. Storey and Co.'s plea for suspension of judgment in the matter. Something definite is certain to come out of the maze before long. We notice in a local newspaper that Mr. Ellis Lever has deemed the business ripe for exhibiting his personality again, in his favourite character of the Patron of Purity; having come forward with another of those glittering offers of money premiums of which he is so fond—to be bestowed in this case upon the Halifax Infirmary, in the event of the vaguely-accused persons being able to clear themselves. We do not at all like giving Mr. Lever this additional "advertisement;" but the aroma of the seething Halifax "stew" would not be perfect without the Lever flavouring. Meanwhile we cannot withhold an expression of congratulation to Mr. Carr's advisers for the admirable position they have taken up in the interest of their client. His acceptance of the alternative to the impossible legal proceedings dictated by the Town Council, preserves him from antagonism to that body, and is, indeed, an expression of respect for them. At the same time it leaves them precisely where they were before, and under the same responsibility for dealing at first-hand with Mr. Fox's allegations. The Mayor has a difficult part to play. He is naturally enough reluctant to arm Mr. Fox with an indemnity; and yet he is told that nothing can be done without it. There will be plenty of interest in the development of this affair.

THE LIGHTING OF WOLVERHAMPTON.

In our last week's issue appeared a long and important report of the Special Gas Committee of the Wolverhampton Town Council relative to the lighting of the borough, which will be found worthy of attentive study by those who desire general information respecting modern systems of artificial lighting, as well as by the ratepayers of the town. The Committee took into consideration the use of oil-lamps and electricity as possible for the lighting of the borough; but the former are dismissed with very little notice and no favour. Upon the possibilities of electric lighting the report is decidedly ambiguous. It says a good deal in support of the idea that the town might be lit by electricity in competition with gas, but does not come to the point of recommending the Council to undertake such a venture on their own account; nor does it contemplate with favour the alternative of sanctioning the establishment of a local electric lighting company. This timidity on the part of the Committee is very significant. They obtained estimates from Messrs. Elwell-Parker, Limited, well-known electricians carrying on business in the town; and this firm actually went so far as to recommend the Corporation to speculate in electric lighting for the whole district, laying down for this purpose plant

for supplying 40,000 lamps, in which case they asserted that "the present price of gas in Wolverhampton could be "successfully competed with by electricity." That the Committee who obtained this information should have been content to place it upon record, without a word of recommendation, is a most significant commentary upon its practical value. It may be gathered from the report as a whole, however, that the Committee considered their principal duty to consist in investigating the affairs of the Gas Company, with a view to discovering some way of putting pressure upon the Directors to obtain concessions in the matter of price and in other respects. To this end they placed the filed accounts of the Company in the hands of Messrs. Howard Smith, Slocombe, and Co., for analysis and comparison with data furnished by other gas undertakings. Before submitting their Accountants' report to the Council, however, they showed it to the Solicitors of the Company, and obtained their explanations, which were again remitted to the Accountants for criticism. The report consequently contains, in the first place, the Accountants' statements, followed by the commentaries of the Company; and these again are capped by the Accountants. It must be admitted that the investigation did not result in the discovery of anything very damaging to the Company. Their worst offence seems to have been the payment of dividends free of income-tax; and when confronted with this impeachment, the Directors simply deny that they have been in the wrong, and declare, almost in as many words, that they mean to go on doing as they have hitherto done. As to this, it is necessary to tell them that such a position will be found untenable. Although there is nothing else of a definite character alleged against the Company, they are accused in very serious terms of grave mismanagement of their manufacturing and commercial concerns. The Committee of the Town Council believe and have persuaded the Council that the Company require to be awakened to a sense of their duty to the community whom they serve. They "feel strongly" that the period has now arrived when, in common with all "other commercial undertakings, the Gas Company should recognize the necessities of the times, and so far re-organize, if needful, the details of their business as to give the public such concessions as are possible without invading the profits upon their capital which the proprietors naturally expect." This is as much as to say that fresh blood is wanted in the administration of the affairs of the Company. In other respects the recommendations of the report are very mild.

A QUESTION OF METHOD.

So much has been published in these columns at different times on the economy of generator and regenerator furnaces, that we are very loth to begin to discuss the subject again. The point which we desire to make at present, however, is not a controversial one, but is merely a statement of an obvious truth. It is that nobody has ever yet been able to give the results of working with these furnaces in comparison with others of the same or of the older direct-acting class, in a way that satisfies everybody. If the weight of fuel required for the work of carbonization is carefully calculated out as a percentage of the weight of coal put into the retorts, somebody is certain to object that this must have been gathered from working under "test conditions," and that these cannot be expected in the ordinary way of retort-house management, year in year out. It will also be remarked that nothing is more difficult than obtaining absolutely fair returns when stokers and firemen know that their superior's desire is fixed upon securing a good showing for any experiment upon which he has set his mind. If, on the other hand, a Gas Manager eschews all test weighings, and simply declares that, whereas he once sold so much coke out of the yard before adopting a certain system of retort-setting or heating, he has since sold so much more, the statement is found fault with as unscientific and misleading. Differences in the yield of coke from various kinds of coal are "thrown at his head;" and in the end he must be a patient man if he does not sometimes repent having had the temerity to say anything about his working. This comment is not a novel one; but it bears repetition. For all that may be remarked to the contrary, we hold to the opinion that the practical "sales" test is a good one, more especially in the case of very small works. When a Manager of such an establishment is able to say, for example, that without desiring to compare his own particular fancy in retort-settings with others, to their detriment, he is able to get through the summer without buying fuel, as he once did, and even to sell a

certain quantity of his make of coke at such times, one cannot help thinking that this is ample justification for his satisfaction with his working under the new conditions, and for his publication of them for the benefit of less fortunate colleagues. In saying so much, we do not mean to deny the value of more precise tests; but we do think that the practice of complaining that when a man writes a paper, or gives results of working for what they are worth, he has not done so in some different way, can be pushed to such an extreme as to deter others from contributing useful information. If errors are committed, or bad faith suspected, by all means let right be done by valid criticism. We offer these remarks not with any view to personal applications, new or old, but purely in the interests of future writers of technical papers, and of Secretaries of Associations in difficulties with respect to the elicitation of such communications from authors who may have a plain story to tell, but do not like the idea of being dragged into controversies respecting their manner of telling it.

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(FOR STOCK AND SHARE LIST, see p. 521.)

BUSINESS on the Stock Exchange was again very active all last week; and the settlement was a heavy one. The tendency of almost all descriptions has been upward, with the exception of American Rails; the failure of one of the chief granger lines to earn even its preference dividend for the last bad half year being a serious blow. The Bank of England rate was raised on Thursday from 3 per cent. (at which it had stood for five weeks) to 4 per cent. It was only last week that we wrote anticipating that the rate would remain unvaried; but we have nothing to retract, for the change was a general surprise. Business in the Gas department has been on the whole only moderate, although a few issues have been more than usually active. The changes in the quotations are somewhat irregular and capricious. South Metropolitan "A" and Commercial old have been lowered; the former 2, and the latter 1. But at the same time, not a single transaction has been marked in either of them. South Metropolitan "A" now figures to return $\frac{1}{2}$ per cent. more for money than the "B;" but we do not know why. Gaslight "A" has been extremely steady all the week, at about 255; all transactions marked ranging no more than a fraction higher or lower. The demand for debenture and secured issues has been much quieter. Imperial Continental has risen 1; having changed hands repeatedly at 210 $\frac{1}{2}$. In Continental Unions, the fully-paid shares are put down $\frac{1}{2}$, and the partly paid put up $\frac{1}{2}$, which brings them more nearly together in point of value. The only other change is a rise of 1 in Buenos Ayres debentures. Water was quiet and very firm during the earlier portion of the week; and several issues made considerable further advances. But towards the close there was some disposition to realize. For the last two or three months, the stocks have been steadily rising; and a good profit can be made out of them at present figures.

The daily operations were: On Monday, the business in Gas was very restricted, and offered no feature of note. South Metropolitan "A" receded 2; but Imperial Continental advanced 1. Nothing at all was done in Water. Tuesday's Gas business was mainly in foreign undertakings; the home companies being scarcely dealt in at all. Buenos Ayres debentures rose 1; and Continental Union, partly paid, $\frac{1}{2}$. But Commercial old fell 1. In Water, Chelsea advanced 2; and Lambeth and Southwark ordinary, 1 each. There was no increase in activity in the Gas department on Wednesday; and all prices remained unchanged. Water was a shade busier; and Chelsea rose 2 more. New River debentures also improved 1. Thursday's business in Gas was only moderate, and prices were but fair. Continental Union, fully paid, receded $\frac{1}{2}$. Water was about the same. Lambeth advanced 1 more, and was marked at top price. Southwark ordinary rose 2. On Friday, business in Gas was much the same as the previous day, and prices remained at the same level. Water was extremely active, and a good many issues changed hands; but the figures were mostly low. On Saturday there was a little done in Gas at fair prices; but Water was an absolute blank. All quotations remained without further change.

ELECTRIC LIGHTING MEMORANDA.

PROFESSOR AYRTON ON THE ELECTRICAL TRANSMISSION OF POWER—A TOTAL ECLIPSE AT BARNET—RIVALRY AT LEAMINGTON—A PANEGYRIC ON ELECTRICITY—THE LIGHTING OF THE MANCHESTER EXHIBITION LAST YEAR.

THE popular lecture which is always a feature of the British Association meetings was this year delivered by Professor Ayrton; the subject being the "Electrical Transmission of Power." The lecture (of which an abstract appears elsewhere) was very popular, for there is nothing like electricity for amusing an audience; and Professor Ayrton is a very able expositor. He knows exactly the sort of explanations and experiments that will interest a popular audience; and he gave plenty of the latter at Bath. With regard to the subject which furnished a title for his lecture, the learned Professor did not say very much that was new. He claimed for electrical distribution of power economy of fuel, more perfect control over each individual machine, ability to bring the tool to the

work instead of requiring the work to be brought to the tool, greater cleanliness, and, lastly, the advantage that the power which during the daytime is used for driving machinery can be used during the night for giving light. These claims suggest some reflection. The Professor did not explain how it is that the electrical distribution of power, which he said was so economical of coal, is so expensive in money. He did little more than hint at M. Deprez's disastrous experiments in this line, which were too much even for the Paris Rothschilds. He could not explain why the gas-engine and the hydraulic motor are so popular in London and other great centres, while electric-motors, at least as old as the latter, are so rarely heard of. And, with regard to his last claim, what does it mean, except that all work with electro-motors must cease at dusk? This may be a desirable result from the humanitarian standpoint; but it was not precisely from this point of view that Professor Ayrton was recommending electrical distribution. On the whole, the lecture may be fairly described as brilliant; but it left the subject pretty much as it was, ending, as it began, with a display of electrical fire-works. Professor Ayrton would scarcely like to be told that the Bath public enjoyed his display much as though it had been an indoor copy of Brock's or Pain's pyrotechny; but such a rendering would not be far from the truth.

Poor Barnet! Only a week ago it was proclaimed in a score of newspapers as being the most enterprising little town in the kingdom, on account of the Local Board having taken up with electric lighting for the streets; and now the inevitable extinction has come already. "Owing to an unfortunate accident," as one of the newspapers remarks, "the electric light which was installed with success at Barnet a fortnight ago suddenly collapsed on Wednesday night, and the town was left in total darkness for some hours." The old story. Of course, the system was not to blame. It was only a new and improved dynamo that struck work at an inconvenient time, on account of the overheating of a bearing. Still, notwithstanding all the pains of the electrical contractor and his newspaper apologists, the interesting fact remains that he plunged Barnet, that "go-ahead town," in total darkness for several hours. We have no desire to unduly magnify this awkward episode, which, if it had been the only one of its kind, might have escaped notice. Seeing how persistently electric lighting machinery disappoints its patrons at awkward times, however, one is bound to notice its return to its old tricks, even when tried in new places.

There is a fresh development of the electric lighting question at Leamington. A London firm have written to the Corporation offering to introduce into the town what is called the "Waterhouse" system of electric lighting, apparently in competition with the local Chamberlain and Hookham Company. We do not know what this particular system of electric lighting may be. Westinghouse we know; but who is or what is Waterhouse? However, the dazzling prospect is held out to Leamington that if the Corporation will favour this particular system, the town will "stand on a par with Berlin and other cities on the Continent." The style of the letter does not give a reader any very high opinion of the writers; but this is perhaps mere prejudice. There is a grand vagueness about the project also, for beyond remarking that "the most successful manner of lighting is to use arc lamps for street lighting, and 50 or 100 candle power incandescent lamps for shop lighting, and 16-candle power lamps for domestic purposes," the promoters say nothing to indicate what their system is. Still less do they show concerning its cost, for there is not a single reference or hint of the money side of the question, which is gracefully kept in the background. Very little notice was taken of the offer of this public-spirited London firm. It was perhaps considered that it would have looked better if they had directed their attention in the first place to other towns where there would not have been the suspicion of rivalry with other electricians struggling to make a paying business under unfavourable conditions.

Mr. John Stent has published a little book entitled "Electricity versus Gas," "as a small contribution to aid in extending the knowledge of electric lighting in this country, and to promote intelligent confidence in electricity as the certain illuminant of the future, for the whole world." If one asks who is Mr. Stent, that he should come forward at this time of day in his self-appointed character of "promoter" of electrical knowledge, the answer is not easily forthcoming. The book is a long panegyric of electricity and disparagement of gas, but with what object it has been written and published remains a mystery. It is conspicuously, even painfully vague. There is not one reference in its feeble pages to any particular system, so that it is scarcely an advertisement; while the eulogistic tone of every reference to electric machines, lamps, &c., removes it from the rank of purely scientific and technical manuals. Indeed, it is the perfection of commonplace writing; for there is little use made anywhere of figures, and there is not a statement in the whole book which conveys any fresh information, or discloses a new view of its subject to a reader of ordinary intelligence and scientific training. Why are such books written? It is a question more easily put than answered. Mr. Stent asks sixpence for his book; but we cannot truthfully say that it contains sixpennyworth of information for anybody. It is not a work that one can usefully quote from; but we cannot resist the temptation of giving one passage from the author's peroration. "In discovering and applying electricity to the service of man," he exclaims in a fine phrensy, "we have found the heir to the sun, and his regent whom his rule is suspended. In electricity we have reached an ultimate beyond which there is no successor. The work of the savants of our time is to enable the historian of

this nineteenth century to say: 'Within the last quarter of the century electricity became the common light of the United Kingdom, and of all the civilized nations of the earth.' Therefore, why should people be afraid to risk their money in electric lighting speculations?"

The report of the Executive Committee of the Manchester Royal Jubilee Exhibition—preliminary copies of which were issued to the press last week—contains some particulars of interest in relation to the electric lighting of the building and grounds. As the Committee remark, the installation was one of the largest yet erected in this country; and its cost was on an equally liberal scale. The cost to the Committee was no less than £10,238 12s. 4d. For this sum they had in actual use 512 arc and 3570 incandescent lamps; the former being in use for 556, and the latter for 560 hours. Roughly, therefore, the lighting by electricity cost the Committee rather less than £20 an hour. This was not, however, the sole cost; for it does not include the extra lamps which exhibitors contracted for, to light their own special exhibits and add to the attractiveness of their individual parts of the show. Nor was the electric light the sole illuminating agency employed. Throughout the machinery section and some of the other departments, gas was extensively used; while in the grounds there were no fewer than 10,000 various coloured oil-lamps. With reference to the installation, it appears that tenders were invited from all the leading firms of electrical engineers; and, after considering them, the Committee accepted that of the Anglo-American Brush Electric Light Corporation for the arc lights, and that of the Manchester Edison Swan Company for the incandescent lamps. The actual number of arc lights contracted for was 546; and these were arranged in 24 circuits. But one of the circuits was afterwards cut out, and the number of lights reduced to the 512 already mentioned. They were to be in use 600 hours; but they were actually employed for only 556. The incandescent lights were used in the art galleries and for other internal lighting; and they were in use for 560 out of the 600 hours. During the whole of the time, say the Committee, no electrical failures occurred; and the lighting was extremely satisfactory. All which goes to prove that the Manchester people were extremely fortunate; and that, where cost is not a matter for serious consideration, good results may be achieved by electrical engineers.

THE LAWRENCE GAS AND OTHER SIMILAR SCHEMES.

THE time of competitive proprietary gas schemes has come again, just as though electric lights were a dream of the night. As we glance through our piles of technical journals published at home and abroad, we here and there stumble upon announcements that recall the palmy days of Dr. Eveleigh and the New Gas Company. The "fatal facility" with which a luminous aëri-form fluid can be prepared by passing air, or a combustible but non-luminous gas, through volatile mineral oils and spirits is at the present day a source of as much delusion among men as it ever was; so that scarcely a month passes without bringing its newspaper declaration that Mr. Brown, Mr. Jones, or Mr. Robinson has succeeded in inventing a wonderful gas which is called by his name, but which the dispassionate observer finds, upon the most superficial investigation, to be nothing more than a mixture born in a carburettor of more or less fantastic design. Last February we had occasion to publish in these columns a warning upon the subject of the then newest of these proprietary gases, which was being advertised in London under the name of the Lawrence "Patent Automatic" gas. We explained how advantage was taken of the supreme ignorance of the average reporter of everything connected with gas, to foist this patent "gas" upon the public as something altogether new and deserving of attention; and in short did our best to prick the bubble that a mere handful of sharp City men were trying to blow out of the stale soapbuds provided by a probably cunning, but certainly uninstructed Yankee "inventor." We did not succeed in putting a stop to the progress of this Lawrence gas speculation; for at the present time it appears to be in full swing. Large consumers of gas in London are being canvassed by the agents of the Lawrence Gas Company for permission to establish the machines of the Company upon their premises. We have before us a printed form of agreement which consumers are asked to sign; and must admit that it does not contain anything objectionable. It is in the form of a requisition addressed to the Company for one of their machines, to be fixed, free of cost in any event, upon the consumer's premises. In consideration of this service, the subscriber agrees to pay to the Company "one-half of the amount saved to us in our gas bills, after deducting from the total amount saved the cost of the material furnished by you to the machine; said amount of saving to be determined by a comparison with bills for gas of twelve months previous to the setting of your machine, due reference also being had to the number of burners used." By way of inducement to fall in with this enticing arrangement, the prospective client of the Lawrence Gas Company is favoured with copies of reports upon the so-called gas from a Mr. Adolphe M. Levy, who signs himself "civil engineer," and from no less a personage than Dr. John Hopkinson, F.R.S., dated June 1 last.

As for Mr. Levy, he is not worth much notice; and it would be useless to sift all his elaborate calculations, whereby it is shown that, to carburet common coal gas with gasoline results in a saving of between 45 and 50 per cent. to the consumer. Dr. Hopkinson, however, is another kind of person. He has been regarded as a scientific Engineer of the highest standing; and when such a man proffers a report upon a gas-lighting device, it is but giving him his due to

take some notice of what he has to say. Dr. John Hopkinson, C.E., F.R.S., &c., &c., is doubtless a witness who should be respected. He has for several years past laid himself out for that particular class of business which consists in reporting upon patented devices, and giving expert evidence in patent-law cases. He hunts, if we may be allowed the expression, with Sir Frederick Bramwell, Mr. Imray, and their like; and he probably finds the pursuit very profitable. We are prepared to admit the necessity for such men—which is going a long way—and to honour them when they succeed in the delicate task of combining a reputation for honesty with the requisite commercial faculty of viewing a question largely according to their instructions. When, however, one of them, purely as a matter of business, reports upon such a very peculiar article as the Lawrence "gas-economizer," it is time to inquire somewhat particularly how, in such a case, the expert manages to preserve the combination already mentioned, upon which his value as a witness depends. Regarded from this standpoint, Dr. Hopkinson's report upon the Lawrence gas is painful reading, since it inspires one with the opinion that no professor of science can do himself credit by dabbling in these matters. People will very soon learn what to think of Dr. Hopkinson if he continues to father such statements as the one which we have before us, and which is nothing more than an artfully-worded warranty of a special commodity, just as valuable, or the contrary, as those analysts' certificates which are advertised in recommendation of pickles and sauces, and depending for its marketable value solely upon the writer's name and position in the world of science.

To begin with, then, Dr. Hopkinson's report professes to be upon something called the Lawrence gas-economizer—that is, upon some special kind of apparatus. It appears from the body of the report, however, that the photometrical observations upon which the chief conclusions relating to the value of the Lawrence appliances are based, were made upon gas carburetted in a mere box of trays containing shavings steeped in gasoline—that is to say, upon the effect of carburetting gas with gasoline; for nobody can pretend that there is anything special in such an apparatus as was employed in this instance. The question arises, What is this Lawrence "economizer" which Dr. Hopkinson was called in to examine and expected to recommend? In his own words, it is an apparatus "intended to enrich gas by passing the gas over wood shavings soaked in gasoline. The gas evaporates a portion of the gasoline in passing over it, and becomes enriched thereby. No external heat is applied to the chamber in which the gasoline is contained; and in this respect, *so far as I know*, the apparatus differs from previous apparatus of the same kind." When Alice was having those remarkable colloquies with the very outspoken creatures whom she met in Wonderland, she remarked to the Duchess that she did not know any cats that grinned; and the Duchess very promptly and pertinently replied, "You don't know much; that's a fact." Dare one say the same with regard to the position of such a truly authoritative personage as Dr. John Hopkinson, F.R.S., &c., with relation to gas-carbureters? Why, carburetting gas is a notion as old as gas making. Innumerable forms and varieties of carbureters have been tried at one time or another during the last half-century; and by far the great majority have not depended on external heat. If Dr. Hopkinson does not know this, he should not have said anything on the subject.

When he comes to photometrical tests, Dr. Hopkinson sinks his own individuality, and becomes merely the mouthpiece of the Lawrence gas people. Thus, he talks of a No. 0 Bray's union-jet burner as a "standard" for Lawrence gas; and, for comparison, places its duty with the common coal gas supplied to the City of London (which by the way, he prices at 3s. per 1000 cubic feet) beside that which it gives with freshly-carburetted Lawrence gas—this latter being produced by passing the former through shavings soaked in fresh petroleum spirit, of specific gravity 0.638, placed in a box on the gas-pipe a few feet from the photometer. If, according to the old truism, figures can be made to prove anything, so can photometry when suitably "worked." This photometrical exercise of Dr. Hopkinson's, conducted "by the desire of the Directors of the Lawrence Light, Heat, and Power Company, of London, Limited"—and apparently according to principles prescribed by them—is simply a parody upon the photometry of gas. Dr. Hopkinson's deliberately-expressed conclusion upon the whole matter is "that with Lawrence gas made in the small apparatus, whether jacketed or unjacketed, compared with City gas burned at equal power in good burners, the use of the Lawrence gas effects a material economy." Upon this we make bold to declare that the conclusion thus formally stated is not borne out by the data given in the report, which are wholly inadequate, and not proper for the support of any such opinion. By the way, Dr. Hopkinson has nothing to say about the asserted "automatic" character of the Lawrence apparatus. The report is as hollow and worthless as the project it is made to advertise. "There is nothing in the Lawrence so-called 'economizer' to distinguish it from thousands of other similar devices that have long since been forgotten. It is no better than a thing that any gasfitter is at liberty to make and supply to anybody. There is nothing new in the idea of enriching gas with the vapour of gasoline; and there is nothing to be gained by it, because, although the illuminating power of the gas so treated can be raised threefold, it costs thrice as much as the uncarburetted gas, to say nothing of the trouble, danger, and annoyance of the process." Such is our "report" upon this Lawrence gas—economizer and all; and we challenge any gas engineer who knows the facts to say whether this statement is not nearer the truth than that of Dr. Hopkinson.

Mr. Lawrence must look to his laurels, however, for he is not alone in the field. Lately an individual evidently hailing also from the great Republic where gas comes naturally out of the ground, came to the office of the JOURNAL with a mysterious parcel under his arm, and expressed a desire to give a display of a "new system of lighting." The parcel when unpacked proved to be a suspicious-looking copper box, to which were fixed an india-rubber tube and a brass pipe terminating in a gas-burner. With a most impressive air, the proud inventor displayed his treasure, the result, as he declared, of long years of labour and study. "Now, Sir, I will show you the result," he said—and the man, putting the end of the india-rubber pipe to his mouth, solemnly began to blow into the box while he struck a match and lit the carburetted air as it issued from the gas-burner. Then, allowing the flame to die quite out, he waited smilingly for the exclamations of astonishment and delight which he seemed to expect from his small but interested audience. There was silence for awhile; and then someone ventured to ask "Is that all you have to show us?" The poor man's self-satisfaction gave place to amazement, and this speedily passed into rage. He tried, in a slow torrent of indignant explanation, to maintain the greatness of his discovery; but ultimately retired, probably in hopes of finding a more appreciative auditory elsewhere. And in a recent issue of the *American Manufacturer* we find a very cloudy and indifferently-written account of a wonderful invention of the same kind, whereby a Mr. Johnston, "who was one of the pioneers of water gas," after 30 years' experience, has succeeded in making a "gas" containing 97 per cent. of air and 3 per cent. of petroleum vapour, which is cheaper than natural gas for every imaginable purpose. There is no difficulty in making the "gas," since the process consists in forcing air by means of a pump through a row of vertical "converters" containing petroleum; the air from the top of one vessel being taken to the bottom of the other, and so on—one of them being heated by a hot-water jacket. Crude oil is used; and, according to the published reports, "the average cost of the heating gas, where reasonable quantities are produced, will be 2 cents per 1000 cubic feet. The illuminating gas under similar conditions will cost 4 cents per 1000 cubic feet." Where is Lawrence gas now? It will be nowhere in the race when Mr. Johnston comes over from Pittsburgh to look for the necessary capitalist in Fenchurch Avenue or thereabouts.

Seriously, however, all this goes to show that there is yet an astonishing reserve of ignorance and credulity in the world with respect to gas matters, which affords a splendid opportunity for self-delusive schemers to establish their footing among a certain class of financiers. Then, when some money has been embarked upon the project, in ignorance or defiance of the experience of others who have gone before, there is no difficulty in procuring the services of experts, with any number of letters after their names, to report favourably upon just so much of this "system" as they are paid to see. This is all a part of that modern science and material progress which we have heard so much about during the last week or so in connection with the meeting of the British Association; but it is an aspect of it to which optimistic newspaper writers and readers do not usually pay sufficient attention.

AMONG the money grants submitted to the General Committee of the British Association for approval at their recent meeting, was one of £100 for investigating the subject of electrical standards.

THE death is announced of Mr. Peter Griess, whose name will be familiar to many of our readers as one of the discoverers of coal-tar colours. The deceased gentleman, who was staying at Bournemouth, passed away suddenly and unexpectedly.

IN order to test the liability of the Company for the results of the accident, one of the men injured by the explosion that occurred in May last in the gasholder house of the Montreal Gas-Works (as reported in the JOURNAL at the time), has brought an action to recover \$1200 as compensation.

THE *Japan Daily Mail* for the 25th of July last contained a short notice of the meeting of the Tokio Gas Company, Limited (of which Mr. W. Newbigging, son of Mr. T. Newbigging, C.E., of Manchester, is the Engineer and Manager), which was held on the 22nd of that month. A report on the general business and financial position of the undertaking in the first half of the present year was submitted; and a dividend for the six months, at the rate of 10 per cent. per annum, was declared.

THE appointment of Mr. Irving to the position of Resident Engineer of the Stapleton Road works of the Bristol United Gaslight Company was intimated in these columns last week; and we now learn from the Secretary of the Company (Mr. J. V. Green) that the Board have selected Mr. E. J. Lloyd for the similar position at the Avon Street works. Mr. Lloyd was formerly Manager of the Dudley Gas-Works; but is at present Gas Engineer at the York Street works of the Leeds Corporation.

THE *Engineer and Iron Trades' Advertiser* describes a method of removing rust from iron by immersing the articles in a bath consisting of a nearly saturated solution of chloride of tin. The length of time during which the objects are allowed to remain in the bath depends on the thickness of the coating of rust; but in ordinary cases twelve to twenty-four hours are sufficient. The solution ought not to contain a great excess of acid if the iron itself is not to be attacked. On taking them from the bath, the articles are rinsed in water and afterwards in ammonia. The iron, when thus treated, has the appearance of dull silver; but a simple polishing will give it its normal appearance.

Notes.

PETROLEUM AND NAPHTHA ENGINES.

Messrs. A. Shirlaw and Co., of Birmingham, the makers of the Spiel petroleum-engine, have issued a statement comparing the performance of their engine, which works with petroleum or shale spirit, with that of an engine using common petroleum. Although the engine selected for comparison is not named, it is evidently the Priestman petroleum engine, for which so much has recently been claimed. It is stated that, although the Spiel motor uses by preference naphtha or shale spirit which can be readily obtained at $7\frac{1}{2}$ d. per gallon, it will work with petroleum. The supposed danger of employing naphtha is said to be exaggerated, since the Fire Insurance Companies do not make any extra rate where the Spiel engines are employed. With regard to the comparative working of the engines, it appears that the motor using common petroleum made 160 revolutions per minute; developing 6.43-horse power on the brake, and consuming 1.71 pints of oil per brake horse power per hour. The cost per brake horse power per hour is given as 1.389d.; the figures being taken from a report by Sir William Thomson, and referring to an engine with a cylinder 10 inches diameter and 15-inch stroke. With the Spiel naphtha motor, it seems that 14 brake horse power were developed with a speed of 160 revolutions per minute, from an engine with a cylinder $9\frac{1}{2}$ inches diameter and 18-inch stroke; consuming 0.90 pint of naphtha per brake horse power per hour, and costing 0.843d. per horse power, with spirit at $7\frac{1}{2}$ d. per gallon. In reply to this comparison, the makers of the Priestman engine remark (in effect) that it is easy to get striking results from a naphtha-engine; and that they waited two years before putting their engine upon the market, in order that they could recommend it as capable of working with common petroleum oil such as can be bought anywhere by the barrel, instead of depending upon the use of volatile spirit. It is evident, however, that the supremacy of the gas-engine as a convenient source of power is being contested on all sides; and these figures are published here to show what is claimed by the makers of oil and spirit motors.

A TESTING MACHINE FOR ROAD METALLING.

The durability of road metalling and paving material is a question that cannot be settled by reference to the tensile or crushing strength of the substances used. Mr. W. F. Stock, the Public Analyst for the county of Durham and the borough of West Hartlepool, has therefore devised a method of testing stones intended for pavements; and it is described in a recent issue of the *Engineer*. The author remarks that what is wanted is a quick test, whereby the value of a quarry or consignment of stone for road making may be ascertained. Mr. Stock recommends that in such cases the stone should be analyzed, in order to determine the probability of its destruction by oxygen and carbonic acid. The specific gravity is to be determined, to give the covering capacity. The porosity of the stone largely indicates its power of resisting frost. No tests of tensile or crushing strengths are regarded by the author as of any practical value. What is wanted, he argues, is to know the capability of the material for resisting the action of light blows combined with abrasion. To effect this he has constructed a machine consisting of a cast-iron cylinder, to contain the material required to be tested, mounted by trunnions upon a frame, on which it is capable of being revolved in a longitudinal direction. The cylinder is 12 inches long, and 6 inches diameter, closed by blank flanges at each end. A stud on the axle actuates a revolution counter indicating up to 100,000. The rock to be tested is worked into inch cubes with smooth finished faces. Nine of these cubes are dried in a water-oven for two hours, and then carefully weighed and placed in the cylinder of the test machine with nine cubes of hardened steel of 0.8 inch face. A number of these steel tubes should be procured at one time, all forged and hardened to their best. Their faces must be smoothed; their angles sharp; and they should be hard enough to scratch crown glass easily. Forty ounces of distilled water are now added to the contents of the cylinder, which is then closed and revolved through 3520 turns (or two miles of travel for the cylinder), at a uniform speed of 40 revolutions per minute. At the end of the run, the stones are removed, washed in distilled water, dried again in the water-oven, and reweighed to ascertain the loss. The result shows that granites may lose from 7 to 8 per cent.; while a quartzose slate will lose 12 per cent. by weight. A standard may thus easily be set up for the stones available in any district. A machine of this kind might be found useful for other purposes besides testing road metal.

THE STRENGTH OF CEMENT.

Mr. Walter S. Church, one of the Assistant Engineers of the New Croton Aqueduct, for the supply of water to the City of New York, has published, in graphic form, the results of the official tests of all the cements used in this work up to July last. Great quantities of cement of many different brands have been employed. The records of 55 brands of Portland cements show higher breaking strains, and a more rapid increase of tensile strength up to an age of nine months, than the native American cements with which they are compared. Their average reaches 711 lbs. per square inch at nine months. A great feature of the diagrams is the effect of the admixture of sand in lowering the tensile strength. Mortars gauged as one of cement to one of sand only showed an average strength of 398 lbs. at the end of six months, as against 663 lbs. per

square inch with the neat cement. The quality of the workmanship in the New Croton Aqueduct has been tested in an unusual manner by the piercing of holes through the masonry at different points, at intervals of one and two years after its completion, in search of defects in the quality of the mortar, workmanship, &c. As a whole, the result has been found to be satisfactory. The careful tests which were insisted upon with regard to the cement frequently caused the rejection of large lots of the material, both native and foreign. The American brands, as a rule, attained a tensile strength of 123 lbs. per square inch during the first week, and gained 177 lbs. per square inch during the next two months; after which the gain of strength is much slower. At the end of eighteen months, they reach 401 lbs.; and at the close of two years, 424 lbs. per square inch. It thus appears that good native American cements, used neat, are about equal in strength to average Portland cement mortars when gauged as one of cement to one of sand.

A CHEAP NON-CONDUCTING PREPARATION FOR STEAM-PIPES.

A non-conducting coating for steam-pipes, &c., used for the past ten years with perfect satisfaction by a Boulogne engineering firm, is described in a recent issue of the *Revue Industrielle* as being conveniently applied and cheap; while it can be prepared by any steam user. It consists of a mixture of wood sawdust with common starch, used in a state of thick paste. If the surfaces to be covered are well cleaned from all trace of grease, the adherence of the paste is perfect for either cast or wrought iron; and a thickness of 25 mm. will produce the same effect as that of the most costly non-conductors. For copper pipes there should be used a priming coat or two of potter's clay, mixed thin with water and laid on with a brush. The sawdust is sifted to remove too large pieces, and mixed with very thin starch. A mixture of two-thirds of wheat starch with one-third of rye starch is the best for this purpose. It is the common practice to wind string spirally round the pipes to be treated, keeping the spirals 1 centimetre apart, to secure adhesion for the first coat, which is about 5 mm. thick. When this is set, a second and third coat are successively applied; and so on until the required thickness is attained. When it is all dry, two or three coats of coal tar, applied with a brush, protect it from the weather. It is stated that 20 frs. worth of starch will go as far in this way as 1000 frs. spent in any known commercial non-conductors of heat.

THE COMPOSITION OF CEMENT PAVEMENTS.

Although cement is frequently employed in the composition of floorings or pavements intended to resist the wear and tear produced by the friction of feet or wheeled vehicles, there is very little information available respecting the resisting qualities for this purpose of different mixtures. It appears, remarks the *Moniteur de la Céramique*, that resistance to wear upon the surface does not greatly depend upon the resistance of the cement to rupture or breaking as determined by the usual methods. In other words, it is not necessarily the most tenacious cement which is also the hardest. The nature and quality of the sand are equally influential in controlling the result; but if a series of tests is made with the same sand, upon a great number of different cements, the particular effect of the sand itself will be eliminated, and the resistance of the cement will alone remain to be considered. M. Bohme has accordingly endeavoured to ascertain, upon this principle, what is the precise proportion of cement to sand that gives the best results, regarded as a paving material. The data which he has obtained from the comparison of 23 different agglomerants go to show that this proportion varies, according to the nature of the agglomerant, from 1 to 1, to 1 to 2. In the majority of cases, the best mixture will be found to be 1 of cement to $1\frac{1}{2}$ of sand. Such is the proportion which will give certain satisfaction in the case of a cement the properties of which have not been specially studied. This resistance to friction of pure cement is in the mean the same as that of a mortar composed of 1 of cement to 3.5 of sand. The comparative equality of strength, however, is not the same for different mixtures. Indeed, it may be said to vary through a wide range. In instances cited by M. Bohme, it was as the minimum 1 to 2, and as the maximum 1 to 5.

The Committee recently appointed by the Paris Board of Health to inquire into the dietetic properties of saccharine have expressed the opinion that it should be debarred from use in articles of general consumption, as being prejudicial to public health. Its use in brewing has, it will be remembered, already been prohibited in the United Kingdom.

The people of Pittsburgh, who have of late years been congratulating themselves on having a cheap and cleanly fuel in natural gas, are now regarding it as a not unmixed blessing; for the natural gas corporations have combined and raised the price of the fuel above that of coal, and one institution (the Dixmont Hospital) has been compelled to return to the use of coal.

HERR HEMPEL states that liquids can be evaporated about six times more rapidly (with, however, the combustion of about three times the amount of gas per hour) than on a steam-bath, by employing a Siemens inverted regenerative burner placed just above the surface. The liquids do not enter into ebullition; so all spitting is avoided. Experiments show that no appreciable amount of sulphuric acid is absorbed by the liquids during evaporation; and that, whilst hot, the iron parts of the burner are not attacked by acid vapours.

Technical Record.

GADD'S SPIRAL-FRAMED GASHOLDER.

As intimated in our "Correspondence" columns to-day, Mr. W. Gadd, of Manchester, has filed the complete specification of his patent for spiral-framed gasholders; and as it has now been accepted by the Patent Office authorities, we are enabled (by the courtesy of the inventor) to publish a description of the proposed arrangements in Mr. Gadd's own words.

According to the specification, then, the improvements relate to the construction of gasholders; and have for their object the supporting of the same, in their working position, in such a manner as to enable the external or upper guide-framing hitherto employed for the purpose to be dispensed with, and yet to give the requisite stability, although such, or a modified form of framing, may be employed in connection with the improvements when desired.

To accomplish this and to effect my improvements (says the patentee), I form the interior of the tank or well in which a holder for the containing of gas is allowed to rise and fall, in a special and peculiar manner—that is to say, affixed to, or let into the face of the tank or well, or forming part thereof, or in recesses therein for the purpose; and extending from top to bottom thereof or thereabouts, are rails of metal or other suitable substance, or it may be recesses or grooves, which are formed in the shape of quick helices or spirals, or curved inclines, and (by preference) making in their total length one-quarter turn of the circle, when the holder employed is very high and telescopic. But a quicker or slower helix, or spiral, or incline may be adopted, according to the circumstances and design of the same, and which will be determined by the angle of inclination adopted; 45° and 60° from the horizontal being examples of working angles, but other angles may be employed. Arranged at intervals around the circumference of the holder, close to the bottom edge thereof, or at such distance therefrom as is desirable, and coinciding with, or fitting on to the helical or spiral rails or curved inclines attached to or forming part of the tank aforesaid, are flanged or other wheels, or anti-friction rollers, of any suitable size or form, which are made to run loosely, by preference, and may be free to slide to a certain extent laterally upon their respective axles, to allow for expansion or contraction of the holder. Or blocks or sliding-pieces or equivalent devices may be employed in lieu of wheels or rollers, or both may be combined, and the flanges may be on either or both edges. As these flanged or other wheels, rollers, or blocks, or equivalent devices, rest and move upon the helical or spiral rails or curved inclines before mentioned, by preference both over and under, or between, it will be seen that, as the holder becomes raised by being filled with gas, a screw-like motion is imparted to it—causing it to partially turn as it rises, and, in similar manner, allowing it to fall by gravity as the volume of gas is reduced.

The stability of the holder lies in the fact that it is constantly, at all working heights, supported at its base or lower edge or ring; and thus presents a position of firm resistance to wind pressure and other lateral strains, under conditions somewhat similar to that of a holder placed on the ground upon its lower edge or rim.

The flanged or other wheels, rollers, sliding-blocks, or equivalent devices may either be fixed tangentially with the side of the holder, and so run upon the top, or top and bottom surfaces of the rails; or they may be arranged radially with the holder, but at the angle of spiral. Or (and by preference) the two kinds may be combined, and the rolling surface of the rails adapted thereto, or in any other suitable manner; and the rollers, or sliding-pieces, or equivalent devices, when placed tangentially, may be employed above and beneath the rails alternately, or in couples or otherwise—the rails being constructed in double line, or double-headed or faced for the purpose.

The improvements are also applicable to telescopic gasholders, by employing similar helical or spiral rails, curved inclines, or grooves, within and attached to the lower or outer lift or lifts thereof, upon or within which the rollers or equivalent devices attached to the inner lift may work or move.

As a modification of the invention, the helical or spiral rails, grooves, or inclines may be employed upon a framing or cylinder within the lower or outer lift or holder itself; the wheels, rollers, or equivalents being affixed to the inner wall or face of the holder or lower lift. Or the holder or inner lift or lifts may all or in part be reversed in their arrangements of helical, spiral, or inclined rails or grooves, and their wheels or rollers; so that the latter are affixed to the tank and outer lift or lifts, or in connection therewith, while the rails, inclines, or grooves are fixed to, or form part of the holder or inner lift or lifts.

Fig. 1 represents an elevation, with half plan of a single-lift gasholder, raised to about its full height (and with the tank or well shown in section), of one arrangement in accordance with this invention; and figs. 2 to 8 show examples of some variations of detail in the application of the method described.

A is the holder; and B the tank or well, within which the holder rises and falls—riding on the helical, spiral, or inclined rails or surfaces E. C are the tangential, and D the angled radial rollers, which in fig. 1 are shown arranged separately from, and alternately with the tangential rollers C. By such an arrangement, they may either roll on the face of the tank or well, or upon plates or rails placed at the required angle or spiral thereon. But the two kinds of rollers may be arranged together, as shown in fig. 2, wherein the rail may be formed of channel or other iron, having a tangential roller on each side, with the angled

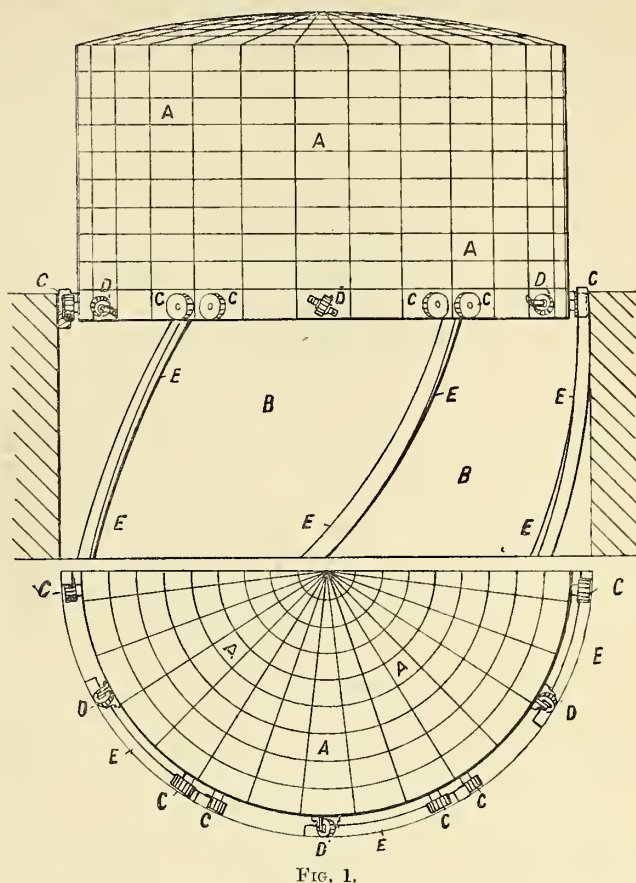


FIG. 1.

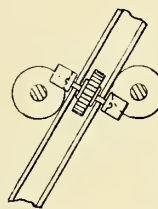


FIG. 2.



FIG. 3.

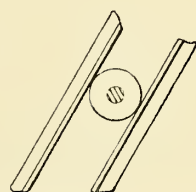


FIG. 4.

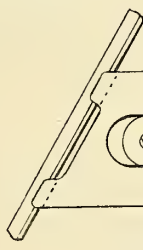


FIG. 5.

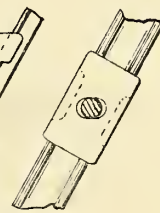


FIG. 6.



FIG. 7.

radial roller between. Or the angled radial rollers may be dispensed with by employing flanges on the tangential rollers; or other means may be employed for keeping the holder centrally, or the wheels thereof on the rails.

In the interests of safety, the patentee greatly prefers to employ either two sets of rollers—one above, and the other below the inclined or spiral rails—or double rails with one or more sets of rollers between, in order to enable the same to securely grasp, or to be grasped by the rails at various points around the edge of the holder; but nevertheless it may be possible, in some cases, to dispense with the under-set of rollers, or the over-set of rails, as the weight of the holder may be sufficient to cause the rollers to follow the inclines of the rails.

In fig. 3, the two sets of rollers are placed one below the other, instead of in line; and one of them is shown flanged. In fig. 4, two rails to each roller are shown, or it may be an inclined recess in the tank or well face, by which variation the locking action or grasp is obtained by one set of rollers. Figs. 5 and 6 show two forms of sliding blocks or pieces, which may be employed in lieu of rollers, and either in conjunction or not with the angled radial rollers. To enable allowance to be made for imperfections in the construction of the helical, spiral, or inclined rails, or for the effects of expansion or contraction therein, the studs attached to the curb or ring of the holder, carrying the tangential rollers, may be arranged to have radial play within the central boss on which the rollers turn, as shown in fig. 7, in which the tangential roller C turns on the boss C¹, having formed therein the slot C² to enable the projection or stud A¹, attached to the ring of the holder, to pass through; or other devices for radial action may be employed. A similar arrangement is shown for the sliding-pieces in figs. 5 and 6.

Fig. 8 (see next page) is a part section showing the application of the invention to a telescopic holder, wherein the outer or lower lift is provided with rails in manner similar to the tank or well, for the

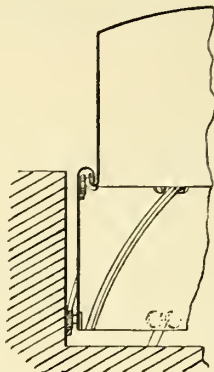


FIG. 8.

purpose of allowing the inner lift to rise and fall thereon. In like manner, a third lift may be employed, or more.

Further variations in detail may be made, and modifications of the invention may be effected, by attaching the rails to the holders, and placing the rollers around the edge of the tank or well, whereby the entire arrangement is reversed; or combinations of the two methods may be employed. Also the invention may be turned about, so to speak, by affixing the curved rails to a framing placed within the tank, but inside the holder; and then attaching the rollers to the inner surface of the holder, instead of to the outer. Also upper framing of the usual or modified form may be employed in conjunction with the mode of construction described. These and other variations—such as the number and form of the spiral guides or rails, the number and form of the rollers or sliding-blocks, and also of the radial angled rollers—may be made without departing from the peculiar character of the invention.

The claims for the invention are three in number—viz., “1. The construction of tanks or wells for gasholders, or the outer lift or lifts of such holders when telescopic, or both, with helical, spiral, or inclined rails, grooves, or recesses, built into or attached to the wall or face thereof, with the object of carrying the holder, or one or more lifts thereof as the case may be, by means of tangential rollers, sliding-pieces, or mechanical equivalents, attached to the lower ring or curb, or other convenient part of such holder, lift or lifts, for the purpose, and in manner substantially as shown and described. 2. The construction of gasholders, single or telescopic, with tangential or angled radial rollers, or both, or sliding-pieces or mechanical equivalents, attached to the bottom curb or ring of such holder or one or more lifts thereof, or both, as the case may be, with the object of causing the same to ride and rise and fall upon or within helical, spiral, or inclined rails, recesses, or grooves built into, forming part of, or attached to the wall of the tank or well or outer lift or both, for the purpose and in manner substantially as shown and described. 3. The construction and employment, for gas storing purposes, of holders and tanks or wells of the special character substantially as shown and described.”

THE USE OF SACCHARINE IN FRANCE.—A circular has been addressed by the French Director-General of Customs to the heads of all the Custom houses in the Empire requesting them to follow the movement of the importation of saccharine, either pure or in a mixed state, and to take note of the quantities which are henceforth introduced. He asks that they should inform him of these introductions, and forward as many particulars as possible as to the product, its value, &c. There was appended to the circular a copy of a letter sent last February by the Director-General of indirect taxes to the various agents, calling their attention to the subject of the introduction of saccharine into commerce, and requesting to be informed of any facts which would lead to the supposition that saccharine is used in place of ordinary sugar.

STILL ANOTHER USE FOR COKE.—There were shown in Manchester last week some interesting experiments with the portable “Sunlight” lamp, now being put on the market by the Gaseous and Liquid Fuel Supply Company, Limited, of Manchester. The apparatus (as described in *Industries*) consists of a steel boiler or retort, under which a moveable box containing the fuel is arranged. A wrought-iron chimney furnishes the necessary draught; and inside this chimney a thin tube ascends, which is fitted with a stop-valve and a small combustion chamber at the part protruding from the chimney. A pressure-gauge, a safety-valve arranged to blow off at a pressure of 40 lbs. per square inch, and an oil-inlet closed by a screw plug, are also provided. The whole of the apparatus is mounted on wheels, making it very portable. To work the lamp, the screw plug is removed and the retort filled with oil; and the plug is then screwed in tight, and the fuel under the retort ignited. The stop-valve remains closed until a pressure of about 5 lbs. per square inch is reached; then it is opened; and after allowing the air to escape, the gas is lighted, giving a brilliant flame, the intensity of which may be regulated by the stop-valve. The lamp shown gave a light of about 2500 candles while consuming 2 gallons of common blast-furnace oil per hour, and 1 to 1½ cwt. of coke in ten hours. The light was very brilliant and steady; illuminating the area of a circle of about 200 yards radius in such a manner that one could easily read at that distance. There was no smoke or smell perceptible, as the oil is converted into gas before being burnt. One man easily manipulated the lamp and wheeled it in any desired direction.

SOUTH-WEST OF ENGLAND DISTRICT ASSOCIATION OF GAS MANAGERS.

The Half-Yearly Meeting of this Association was held on Tuesday last, at Weston-super-Mare. After an inspection of the gas-works, under the guidance of the Manager (Mr. J. H. Gray), the business meeting was held at the Queen's Hotel—the President (Mr. H. Sainsbury, of Trowbridge) in the chair. Mr. Gray briefly welcomed the Association to Weston in behalf of his Directors, who, on account of the holiday season, and also some local meetings, were unavoidably absent.

The Hon. Secretary and Treasurer (Mr. Norton H. Humphrys, of Salisbury) read the notice convening the meeting; and the minutes of the last meeting were taken as read, on the motion of Mr. R. Ashton, seconded by Mr. H. G. Crowe.

The accounts for the year ending Aug. 31 last were adopted, on the motion of the President, seconded by Mr. James Lowe.

The President announced that the following list of applications for membership had been approved by the Committee; and he proposed its adoption:—Mr. S. Bark, Godalming; Mr. W. C. Bennett, Tiverton; Mr. C. V. Bennett, Wells; Mr. C. W. Folkard, Bournemouth; Mr. J. Griffin, Fareham; Mr. E. C. Riley, Great Western Railway Gas-Works, Swindon; Mr. H. F. Vincent, Frome. Mr. T. W. R. White, of Sherborne, seconded the proposition; and it was unanimously carried.

The election of officers for the ensuing year was then proceeded with. Mr. Ashton and Mr. Lowe volunteered to act as Scrutineers; and announced the result of the voting to be as follows:—

President:—Mr. J. H. Cornish, of Bridgwater.

Vice-President:—Mr. H. G. Crowe, of Wellington.

Members of Committee:—Mr. R. Beynon, of Torquay; and Mr. J. H. Lyon, of Cosham.

Auditor:—Mr. J. Nicholls, of Crewkerne.

Hon. Secretary and Treasurer:—Mr. N. H. Humphrys.

Mr. Cornish and Mr. Crowe having acknowledged the compliment offered to them in their election as President and Vice-President respectively, suggestions were invited as to the place of next meeting and Mr. Cornish proposed that it should be held at Bridgwater. Mr. White seconded the proposition; and it was unanimously carried.

The President, referring to the difficulty in obtaining papers for the meetings, said it had been proposed that the Committee should name subjects on which the members might prime themselves to speak. He invited suggestions from the members; also offers of papers for the next meeting. Mr. J. J. Jervis, of New Swindon, subsequently submitted the following subjects:—(1) To what extent are the advantages claimed for separate sections of hydraulic main realized? (2) The testimony of users of anti-dip valves. (3) Scoop-charging. (4) Scurfing retorts. He undertook to collect some information on the first question himself.

THE PRESIDENT'S ADDRESS.

The President, in the course of a few opening remarks, referred to the growth of membership in District Gas Managers' Associations generally; mentioning the newly-formed North of Ireland and the proposed Eastern Counties Associations, and wishing to all, both old and new, increased success and usefulness. He had pleasure in drawing attention to the fact that 10 new members had been elected in the South-West Association during the past year—a larger number than in any previous year—and that it now included 74 members, more than double as compared with the list produced at the first half-yearly meeting held at Sherborne ten years ago. Having alluded to the removal of Mr. W. W. Monk, who has gone to Australia, and Mr. Walter Thomas, now resident at Vancouver, British Columbia, he glanced at the recent discussions on the question of gasholder framing; resulting in Mr. Livesey's successful experiment at Rotherhithe, and the invention by Mr. Gadd, of Manchester. He concluded with a few remarks of a general nature.

MR. JERVIS'S PAPER.

Mr. J. J. Jervis, of New Swindon, offered some remarks on “Hydraulic Mains and Retort-Bench Bracing.” He said that he did not propose to direct attention to the size, shape, or material of the hydraulic main; but simply to its position. This was almost universally fixed upon as the top of the retort-bench—a good place for smoke, dirt, heat, and the general discomfort of the workmen who had to attend to anything in connection with it. The retort-bench formed a ready and inexpensive foundation for the hydraulic; but whether such was best for a reservoir that should be kept perfectly level and rigid, was open to question. Some engineers had contended that the thick tar found in the hydraulic was not due to the heat of the retorts. From “King's Treatise on Coal Gas,” he learnt that some had tried increasing the size of the hydraulic, or elevating it some distance above the retorts. Others had tried a continual stream of gas liquor, or occasional doses of hot water from the boiler, as a preventative of the formation of pitch. The drawing off of the tar from the bottom of the main instead of the top had also been practised; but yet the prevention of pitchy accumulation had not been completely attained. It was caused by the retention of the tar in the main, and by the passage of hot gas through this comparatively stationary tar, which evaporated the more volatile constituents. It was the hot gas, and not the radiated heat from the setting that did the mischief. By making the hydraulic so shallow as only to allow about 2 inches of tar below the bottom of the dip-pipe, it was stated that the tar kept perfectly fluid; there was no thick tar or crystals of ammonia; not a single stopped dip-pipe; and rarely a stopped

ascension pipe. Whilst not disputing that the choking of ascension and dip pipes might be due to the close proximity of the hydraulic to the retort-bench, and that therefore nothing would be gained by shifting it, he thought that the top of the retort-bench was not a desirable situation for the hydraulic. Again referring to "King's Treatise," he found it set forth that the standards supporting the hydraulic should have a substantial bearing on the piers separating the ovens. But he questioned whether a substantial bearing on the piers, which were part and parcel of the beds, and liable to movement with their expansion and contraction, was possible. The party walls needed renewal at times, and then there was anxiety and risk; strutting, slinging, and other means being resorted to, in order to maintain the hydraulic in safety. All this might be avoided by supporting it on girders or columns independent of the brickwork; and he had adopted this plan. At his works the hydraulic was supported on girders and columns absolutely free of the retort-bench; and the whole alteration for seven beds of five cost less than £40. This idea was not new. In fact, it was old, and had been condemned, on the ground of the prejudicial effect of the heat when drawing and charging, and the inconvenience of the projecting columns. But he found that the heat when drawing and charging was felt less on the platform which he had placed in front of the bench for the support of the hydraulic than in the orthodox position of the hydraulic; and the platform was far more convenient for the workmen than the hot brickwork on the top of the setting. It had been standing for six years; and although made of wood, and only 3 feet above the highest mouthpiece, it had never caught fire.

The arrangement of separate chimneys to each bed, and the fact that the beds were of different heights, interfered with the use of buckstaves and bracing in the usual manner; and he resolved to do without them. In "King's Treatise," again, it was stated that some considered tie-bars, &c., to be unnecessary, because they were liable to expand with the heat, and were sometimes burnt away altogether. But it was further stated that if they were fixed in proper position either above the brickwork, or if embedded well out of the reach of the heat from the flues, there was no danger of burning away; also, that they must be braced transversely as well as longitudinally, if they were to endure the wear and tear of many seasons, and prevent the piers from bulging, which would produce openings and crevices that would admit air and injure the draught. He might therefore ask if a long tie-bar did not allow a great deal of expansion? Also whether, apart from the hydraulic, the middle or inside beds were not supported by their neighbours one against the other; and therefore if it would not suffice to buttress the end beds only? And when a retort-setting was taken down, if the temporary strutting usually put up was intended only to support the hydraulic, or on account of expansion. Was not the matter of checking the expansion by means of tie-bars a question of degree only; for the heated brickwork must "go" somewhere, and he thought the only consideration was, "which way?" The point he had therefore to decide was whether, after relieving himself from care about the hydraulic, he need trouble about bracing the retort-bench? After four years work without bracing, he found that the inside walls remained plumb, and the end ones only went over about 2 inches in a height of 9 feet. The face ends of the piers had come forward about 3 inches, which would have been a bad job for the hydraulic if it had been supported on them. The expansion of the retorts was not more than formerly, but still he was convinced that some bracing was better than none at all, as it would curb the expansion to some extent, and so he determined to brace up again over all. As before mentioned, the formation of his bench did not admit of the usual kind of bracing; and he also wished to avoid the necessity for strutting when re-setting. He hit upon a plan by which each bed was held together independently of its neighbours. Each pier projected 2 inches at front and back, to allow of the fixing of angle-irons which were held together by diagonal tie-bars across the top. The cost of this arrangement was less than £45 for the seven beds.

The President having opened the discussion with a few remarks, Mr. Walter Fiddes, of Bristol, said that he had tried some settings of through retorts without bracing, but cracks appeared; and he found it advisable to put up buckstaves and tie-bars. He had also experienced considerable advantage from having large lumps of fire-clay of special pattern made for placing on the piers before the arches were turned, to take the springing of the arch. Cast-iron buckstaves would snap suddenly; whereas wrought-iron ones buckled and gave way gradually. He found that the expansion of the bracing when taking up a setting was about 3 inches, and the arch would rise or lift to the extent of 2 inches; so that it was necessary to gradually let out the screws when lighting up, and the reverse when letting down. After trying various devices, he preferred this plan, also adopting arrangements to let the heat down as gradually as possible—such as stopping all access of air, &c. By this means, he was able to get the retorts to last 1200 or 1400 days, counting working time only. He had used separate short chimneys to each bed for 40 years; and strongly recommended them as securing better heats with less fuel. Mr. J. Lowe, of Weymouth, said that, having been troubled with the breaking of cast-iron buckstaves, he had used wrought-iron ones made of two second-hand railway metals clamped together. These could be bought at 80s. per ton or so; and a 10-foot buckstave would only cost about 21s. They answered admirably. Where 14-inch party walls were used, and the bottom retorts were set close to the outside, it was necessary to keep the ascension-pipes out a few inches from the setting

sufficient to just clear the buckstave. Mr. S. W. Durkin, of Southampton, had long felt the need for supporting the hydraulic independently of the setting, especially in the case of long benches; and it was necessary to re-level at each time of lighting up. Some years ago he was much troubled with thick tar; but by adopting a simple plan for taking the tar off from the bottom of the hydraulic, he had quite cured that. He also connected a pipe from the liquor pump with the hydraulic; and was thus able to wash out the whole, overflows and all, with liquor every day. He remembered when iron retorts were used; and they did not strain the benches so much as the clay through retorts, which were brought more immediately in contact with the arches. In some double benches of iron retorts, the tie-bars were built in the brickwork; and when taken out it was found they had entirely rotted away. After trying various kinds of cast-iron buckstaves, all of which gave trouble by sudden breakage, he adopted wrought-iron ones; and these lasted well. He had some that had been in use for 20 years. He quite agreed with Mr. Jervis that the brickwork would "go" somewhere; and he condemned the plan of burying tie-bars in brickwork. They should always be in sight and clear of everything. The President, in closing the discussion, said that he had for some time taken his tar from the bottom of the hydraulic; and perhaps that was why there was little trouble with pitch at his works. Where tie-bars passed through brickwork, he had tried to protect them by surrounding them with drain-pipes; but still they would occasionally break at the point of fiercest heat.

NEWS FROM AN OLD MEMBER.

At this stage of the proceedings, the Honorary Secretary read a letter from a former member, Mr. Walter Thomas, now of Vancouver, British Columbia, in which he described his experiences in establishing a gas-works in the town. He had been compelled to erect the greater part of the works with his own hands, not having skilled labour; but they were now in working order, and successfully competing with electricity.

MR. DAVIS'S PAPER.

Mr. W. Davis, of Poole, next read a paper, entitled "A Remedy for Naphthalene." In the course of it, he remarked that some years ago he had to work a set of four purifiers, each 10 ft. square, which were so fixed that the inlet-pipes from a hydraulic centre-valve had to fall into the vessels. Consequently, whenever these were emptied, there was an accumulation of tarry matter to be cleaned out. Matters were further aggravated by the fact that the scrubber was small (only 18 feet high by 6 feet in diameter), and only about 25 feet away from the centre-valve; so it was only to be expected that a large quantity of condensable matter should be carried forward, and deposited at the bottom of the purifiers. As an improvement on this state of things, some 16-inch pipes that happened to be in stock were utilized to form a sort of condenser, being packed from bottom to top with 9 inch by $\frac{1}{2}$ inch boards, cut to the length of the diameter of the pipe, and placed crossways. A large rubbing surface for the gas was thus afforded; and this appliance was fixed between the scrubber and the centre-valve. It was found to be effective in removing condensable matter, and also proved to be useful in another and unanticipated way. Great trouble had previously been experienced with naphthalene; the connecting pipes of the station meter being frequently choked, and the inlet and the outlet pipes of the holders were also a constant source of trouble from the same cause. After the fixing of these pipes—which he termed "depositors"—the trouble from naphthalene entirely ceased. On studying the subject of the formation of naphthalene in gas-pipes, he concluded it must be formed by synthesis; the presence of moisture being a factor in its production.

During the discussion, the President remarked that he was not so much troubled with naphthalene as formerly. When a part of the condenser was out of use, he had known the meter-connections to be choked in a month. But, by attending to gradual condensation, although using the same kind of coal and under the same circumstances of working, he had prevented it, and had not experienced any stoppage on his works for quite 20 years. Mr. J. H. Cornish, of Bridgwater, was much troubled with naphthalene some years ago. The holder-connections were both choked; and he admitted steam to clear them, which caused the pipes to leak inside the tank, and put him to a great expense. But after adopting a foul main, and more gradual condensation, he completely got rid of naphthalene. Mr. R. Beynon, of Torquay, said that he had not quite succeeded in getting rid of naphthalene; but intended to enlarge his foul main. During the winter of 1885, he experienced great trouble in the mains and services. He was then advised to cover his condenser, which was an annular one. The next winter he covered up the condenser with sacking. The result was that, where he formerly had a dozen complaints or so per day, he now had only one or two. He now found most trouble in the autumn—from August to November. This he ascribed to the greater ranges of temperature which obtain at this period of the year. Mr. Crowe, of Wellington, wished to ask Mr. Jervis if the alteration in his hydraulic had caused any trouble with naphthalene. A friend of his worked with the hydraulic placed down the middle of the retort-house between two rows of retort-benches; and he was much troubled in this manner, and blamed the position of his hydraulic for it. Mr. Jervis said that he did not know what naphthalene was. Mr. A. Thomas, of Cowes, observed that some years ago he was periodically annoyed by the complete stoppage of a particular length of main about half a mile from the works. He could cure it for the time by pouring hot water in, or with the force-pump.

He afterwards erected a foul main, and enlarged the condenser at the works, and this completely cured it. Mr. Durkin remarked that he found trouble from naphthalene in the autumn, or whenever there was hot sunshine in the day and cold nights. Last winter a 16-inch pipe on the works was choked. It was deep in the ground; and he thought a tidal influence kept its surroundings damp and cold. He had great belief in the foul main, and doubted whether the one he had was large enough. Mr. Fiddes cited a case of two mains near the Houses of Parliament in London, which ran parallel, one of which gave great trouble from naphthalene, while the other was always clear. In the past he had had great difficulty with it; but since six larger mains had been used—24-inch in place of 9-inch or 10-inch—this was greatly obviated. He remembered that at one works it was a regular practice to clean out the holder-connections every Sunday. In one case the pipes remained clear for six years; and then stopped quite suddenly. He used vapour of naphtha, conveyed to the bottom of the pipes by a 1½-inch wrought-iron pipe carried down inside, to dissolve the deposit; and by this means, the pipes could be cleared in two hours. He had observed that when the temperature of the water in the holder tanks fell below 56°, there was a deposit of naphthalene formed. If they escaped at the works, they had it in the mains and services. When the main was exposed to moisture in low ground, the deposit was liable to accumulate; and he had also observed that the streets lamps would dwindle from this cause in regular lines—sometimes in a north-easterly direction, sometimes in another. This led him to think that magnetic influences might have something to do with the formation. Mr. Davis, in reply, thought that his argument as to the effect of moisture in the formation of naphthalene had been well supported in the discussion.

GASHOLDERS WITH SPIRAL GUIDES.

Mr. W. Gadd, of Manchester, then explained his system of constructing gasholders without the usual guide-framing; illustrating his remarks by two models, representing a single-lift and a three-lift holder respectively. He stated that he proposed to support the holder entirely from the bottom curb. The rollers were placed tangentially by preference, but could be radial if desired; and the guides, instead of being vertical, were disposed at an angle of from 45° to 60°—forming, in fact, a deep thread of a screw. Each roller was a point of support, so that the holder was held in just as many places round the ring as there were rollers. Each point of support formed a solid bearing, rendering the whole as stable as if resting on the floor. The entire structure—holder and tank—might be pushed over as if in one piece. The holder formed a cantilever of the elbow kind; the height being the extent of one limb, and the diameter that of the other. Therefore, if the wind pressure was concentrated near the top, the resisting leverage would still be much longer than the acting leverage. In this respect it was just the contrary to holders supported in the usual way; for the shallower he made the holder, the stronger it was. He then illustrated the power of his frame to resist unequal loading (such as an accumulation of snow on one side of the holder) by means of weights, and pointed out that under any circumstances, the strain on the guides was perfectly vertical. There could be no tilting, because the guides pointed in opposite directions on opposite sides of the tank; and therefore the rollers were gripped, as between the blades of a pair of shears. The principle of his invention was not affected by the manner in which the rollers and guides were designed—for instance, the rollers might be fixed on the tank and the guides on the holder, if preferred.

A conversational discussion took place on the action of the models, and the applicability of the invention generally, at the close of which the President thanked Mr. Gadd for his kindness in attending the meeting, and expressed the opinion that the models before them were a type of what the gasholder of the future would be.

MR. THOMAS'S PAPER.

Mr. A. Thomas, of West Cowes, read a paper describing "A Pressure-Gauge having no Fixed Joints." He commenced by referring to the importance of pressure-gauges on gas-works, and proceeded to notice the defects inherent to those generally in use—such as liability of the glass tubes to breakage, difficulty of cleaning, and high cost. In order to get rid of these objections, he had made many experiments, which had resulted in the production of the apparatus specimens of which were before the meeting. They consisted simply of two glass tubes one inside the other, with metal mountings, a specially-designed scale, graduated either upwards or downwards, and having no fixed joints.

Mr. J. J. Jervis, said he had very much pleasure in testifying to the efficiency of Mr. Thomas's gauge, having used one similar to it for six years, which he exhibited to the meeting. Mr. Lowe also showed a similar gauge, consisting of a glass tube graduated, and immersed in a narrow glass cylinder, which he said he had used in connection with the exhaustor for five years, to indicate either vacuum or exhaustor. He liked the principle very much; and strongly recommended it. Mr. Durkin also made a few remarks. The President observed that Mr. Thomas had certainly shown them a gauge that was a great improvement on the usual form of the apparatus.

CONCLUDING BUSINESS.

Mr. Lowe proposed a vote of thanks to the gentlemen who had come before them with papers and descriptions of apparatus that day, and thus contributed to make it a very successful meeting; and he specially referred to Mr. Gadd, who had travelled from Manchester at a day's notice. Mr. White seconded the proposition,

and it was carried by acclamation. Mr. Gadd having appropriately responded, the services of the President during the past year were acknowledged by a hearty vote of thanks, on the proposition of Mr. T. Hardick, of Salisbury, seconded by Mr. Crowe. In reply, the President proposed a vote of thanks to the Honorary Secretary and Treasurer, which was seconded by Mr. Durkin, supported by Mr. White, and carried unanimously. Mr. Humphrys acknowledged the vote; and the business portion of the meeting terminated.

The members and visitors subsequently dined together, under the chairmanship of the President. An excellent dinner was served in a room elegantly decorated for the occasion; and after the removal of the cloth, the usual toasts were given and responded to.

THE BRITISH ASSOCIATION AND STANDARDS OF LIGHT.

It may be remembered that a Committee appointed by the British Association for the Advancement of Science have for some time had under consideration the subject of standards of light. A report was presented to the Association at their meeting in Manchester last year, when the Committee stated that they had been anxious to carry out experiments on the various standards in use, but had been unable to complete their investigations owing to want of funds. The General Committee thereupon granted a sum of £100 for the purpose; and the matter stood over for further inquiry. The report of the Committee containing the results of the experiments they have since conducted was read by Professor George Forbes at the meeting of the Association at Bath on Monday last week. The full text of the document has not yet been published; but we are in a position to lay before our readers some of the results recorded therein.

The Committee confirm the conclusions arrived at by Mr. W. J. Dibdin in the report presented by him to the Metropolitan Board of Works.* They have included the following sources of light in their numerous experiments:—Ordinary candles, made by Messrs. Miller and also by Messrs. Brecknell and Turner; spermaceti candles of large diameter, six to the pound made by Messrs. Miller; the pentane standard; the pentane lamp; and the amyl-acetate lamp. The results of 118 experiments with each of these supply matter for the first appendix to the report.

With regard to the use of candles as a standard, it is stated by the Committee that the objections are numerous; but, as they are well known, only some of the more glaring are mentioned—such, for instance, as the fact that both the spermaceti and the wick are of indefinite chemical composition, so that so-called "standard" candles, conforming to the definitions of the Act of Parliament, can be made which vary largely in light-giving power. The Committee note with emphasis that the illuminating power of a candle in a closed photometer, or in any small ill-ventilated room, is considerably less than in an ordinary room. They also point out that the illuminating power of the candle is subject to fluctuations from minute to minute, owing to the variation in length and form of the wick, and to the filling and emptying of the cup of the candle according to the movements of the surrounding air. There is a point in the manufacture of spermaceti which is here noted. Manufacturers endeavour to remove the liquid portions of the spermaceti (what is called "sperm oil"), and obtain the "dry" spermaceti as free from it as possible. The resulting product has a higher melting point; and therefore burns with less facility. The manufacturers have now so far succeeded in this direction that candles have to be made with larger wicks; the result being that they give less light for a given consumption than candles with smaller wicks. Thus the effect of the improvement in spermaceti has been that standard candles give less light than they gave ten years ago, and probably still less than they gave at earlier dates, when the average consumption of candles of six to the pound was 140 grains per hour.

Professor Violle's standard of molten platinum is, in the opinion of the Committee, not a practical standard of light, although they are quite prepared to agree to the adoption of the light emitted by a square centimetre of molten platinum as a unit, but not as a standard of light.

There appears to be no prospect of any reliable electric standard of light, inasmuch as with incandescent lamps variations in the light are caused by the blackening of the glass bulbs surrounding the carbon filament and by the wasting of the filament. Moreover, the amount of radiation from the carbon depends upon the extent of its surface as well as upon the treatment to which it has been subjected.

With regard to the amyl-acetate lamp, the Committee remark that it is very constant; but its red colour is a serious objection to its use. This conclusion has been arrived at as the result of a very large number of experiments.

Mr. Vernon Harcourt's pentane standard the Committee consider as reliable and convenient; fulfilling the conditions required in a standard of light, inasmuch as it has no wick, and consumes a material of definite chemical composition. The experiments show that no alteration of light occurred when the specific gravity of the pentano was 0.632 or 0.628, instead of the specified value 0.630. The Committee note that the pentano standard is not the only possible standard which could be made possessing the necessary qualifications, but it is the only one that has come under their notice; and therefore they urge most earnestly the importance of undertaking such action as is possible to ensure the immediate rejection by the Board of Trade of the parliamentary candle as a

* See JOURNAL, Vol. L., p. 290

standard of light, and the adoption of the pentane standard in all future work.

In Appendix I., the results of the photometric observations made with the various sources of light are given; whilst Appendix II. deals with the results of experiments made with incandescent platinum. The photometrical observations were made with Mr. Dibdin's four-way photometer. As a standard of light, the flame of an Argand burner consuming coal gas enriched by being passed over pentane was employed. It was kept at a height of 3 inches, and only light from the middle of the flame fell on the discs. Candles were burnt at the first arm; the pentane lamp at the second (alternate reading being taken); the third arm had the amyl-acetate lamp; and the fourth, the pentane standard. Readings with the last two were also made alternately by a second observer simultaneously with the readings from the first and second arms—the observers from time to time changing their posts. In 118 complete candle tests, 86 differed by 1 per cent. from the day's average; 57 differed by 2 per cent.; 19 by 5 per cent.; and variations of 9 and 10 per cent. were occasionally registered. With the amyl-acetate lamp a difference of 2 per cent was obtained four times out of 118. The pentane lamp differed twice by only 1 per cent. from the average; and the pentane standard only once. Incandescent platinum, tried in various ways, proved extremely troublesome, and was even then very unsatisfactory as a source of illumination for purposes of measurement.

No discussion followed the reading of the report, although it was invited; but a vote of thanks was unanimously accorded to its author.

GASEOUS FUEL.

As briefly intimated in last week's JOURNAL, among the papers read before the Mechanical Science Section of the British Association, at the recent meeting in Bath, was one by Mr. J. EMERSON DOWSON, M. Inst. C.E., on the value of gas as fuel.

The author stated that at the York meeting of the Association in 1881, he explained an apparatus for making cheap heating gas by passing steam and air through incandescent fuel. Since then the apparatus has been considerably improved; and the gas made in it has been much used, not only for driving engines but for heating in many industrial processes. The composition of the gas necessarily depends somewhat on the quality of the coal used, and on the condition of the fire; the average composition being much the same, whether the gas is made at the rate of 1000 cubic feet per hour in a small generator or at the rate of 15,000 cubic feet per hour in a large one. In 1881, it was necessary for gas-engines to use five volumes of this generator gas for one of ordinary lighting gas to develop the same power. But since then some important modifications have been made in the "Otto" engines; and it is now necessary to use only four volumes. In 1881, only one engine of 3½-horse power had been worked with the author's gas; but since then a large number of engines have been worked with it—one indicating over 80-horse power. For more than four years Messrs. Crossley, the English makers of the "Otto" engines, have used this gas exclusively at their works for an average power of 150-horse power; and after a careful trial extending over 35 weeks, they have found that the fuel consumption was only 1·3 lbs. per indicated horse power per hour.* At these large works there is no chimney except in the blacksmiths' shop. Returns sent by eleven users of "Otto" engines working regularly in different places with the author's gas, and averaging 35-horse power each, show an average fuel consumption of about 1·3 lbs. per indicated horse power per hour, which is less than half that required for the best steam-engines of equal power. The results of other tests were given; and seeing that all have been obtained under practical working conditions, the record is certainly satisfactory. Many letters have also been received testifying to the ease with which the gas plant can be managed.

The author considers himself justified in saying that gas-power is now fairly launched in competition with steam-power; and he thinks, with the late Professor Fleeming Jenkin, that eventually the former will to a great extent supersede the latter. The author also thinks it tolerably sure that even better results than those already recorded will be obtained when an engine is really designed to give the best effect with generator gas. It is well known that in the "Otto" engines, each new charge of gas is diluted with a portion of the products of combustion from the previous charge; and this answers very well for ordinary lighting gas. But as generator gas (such as the author's) has only about one-fourth the explosive power of the other gas, it is a disadvantage to dilute it with products of combustion; and he feels confident that makers of engines will, sooner or later, find it expedient to design all engines of large power specially for cheap generator gas. The best fuel to use for making the gas is anthracite, as it does not yield tar or other condensable products, and does not cake in the generators. Ordinary gas coke can also be used with certain precautions.

Several instances were given of the use of this gas for heating of various kinds. At the Gloucester County Asylum it has been used daily for about five years. All the kitchen-work for the staff and inmates is done with it; and there is no ordinary fire in the kitchen. About 300 quarter loaves are baked with the gas every day, at a cost of about 1s. only for fuel. The gas is also used for two 12-horse power (nominal) "Otto" engines, which pump water and drive a dynamo for electric lighting. This gas is used on a

large scale at the cocoa-works of Messrs. Van Houten and Son, Messrs. Cadbury, and Messrs. Russ-Suchard and Co. Messrs. Onderwater and Co., of Dordrecht, use it for heating the drying-chambers in their starch-works. Messrs. Guittet, of Herblay, have for some years used it for making varnish; and they not only effect a considerable economy, but they avoid all risk of fire, which is a great consideration in varnish-works. This gas is also used by the Société Nestlé for soldering their condensed-milk tins; and more recently it has been adopted by Messrs. Huntley, Bourne, and Stevens, of Reading, not only for soldering, but for heating a large number of ovens in which japanned and varnished goods are stored. Messrs. Hillman, Herbert, and Cooper use this gas at their Coventry works and in Germany, for brazing with blow-pipes the joints of bicycles and tricycles, as well as for enamelling. On the Continent several firms use this gas for singeing silk yarns and textile fabrics. It is also used by several linen manufacturers in the north of Ireland for tentering, which they formerly did with hot air. The cost of the gas somewhat depends on that of the fuel; but, speaking generally, the equivalent of 1000 cubic feet of ordinary lighting gas costs from 6d. to 1s.

In the course of the discussion on the paper, Sir F. Bramwell spoke of the quantities of coal, especially slack and refuse, which, on account of their cheapness, were consumed in engines; and he characterized this as a careless waste of a valuable inheritance. Any invention that stopped this waste of coal, and made it impossible for an ignorant and careless man to use more than a certain amount of fuel, was, he considered, a great source of good. Mr. Fletcher asked Mr. Dowson whether he had considered the possibility of saving the ammonia produced with the gas. Professor Shaw remarked that carbonic oxide was largely present in the generator gas; and that this was a most dangerous poison. He thought it reflected great credit on Mr. Dowson that no accidents had happened where his plant had been installed. Mr. Williams said he had read that in one town in the United States, where this generator gas had been used, more deaths were caused by it than by ordinary gas in the whole of the States. Mr. Dowson, in reply, said that the quantity of ammonia was so infinitesimally small when the gas was made from anthracite (which was the material generally used), that it would not pay to seek for it. There was no disguising the fact that there was danger attending the use of carbonic oxide; but there was also danger with electricity and gunpowder when improperly handled. The best thing to do was to recognize the danger, and to take due precautions. It was very satisfactory to find that in such an Institution as the Gloucester County Asylum the gas had been in use for five years without any trouble being experienced.

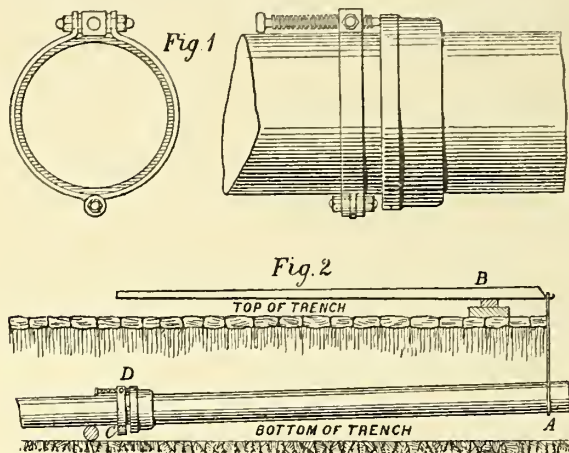
DEVELOPMENT OF THE RUSSIAN OIL TRADE.—In the course of an article recently contributed to the *Newcastle Chronicle* by Mr. Charles Marvin, on the subject of the expansion of Russia in the Black Sea, he referred as follows to the trade of the oil region:—"Four years ago there was not an oil-tank at Batoum. I have lately received from there large photographs of some of the 47 now in position, holding collectively 20 million gallons of oil. Fifteen tank steamers, constantly running, and some of them holding 1 million gallons of oil, are insufficient for the growing demands of the trade. Nor is this activity confined to Batoum. From Poti an export of manganese oil has sprung up rapidly approaching 100,000 tons a year. Soukhum Kalé, twice the scene of a desolating Turkish descent, seems destined to share this general prosperity. A project is afoot to connect it by a branch line with the Trans-Caucasian Railway, and provide the latter with three outlets instead of two." The article was written just after the opening of the Novorossisk Railway, which taps the Black Sea petroleum region, and provides Russia with a new outlet for oil and liquid fuel, auxiliary to the Caspian supply now finding its way to Europe *via* Batoum.

SIR F. BRAMWELL'S INAUGURAL ADDRESS.—Confirmatory of the opinion expressed in our own columns last week as to the character of the address with which Sir Frederick Bramwell "edified" the British Association at the recent Bath meeting, the *Builder* says: "It is natural that daily newspaper critics should felicitate Sir F. Bramwell on having, in the words of one journal, made the presidential address of the British Association 'intelligible to ordinary readers;' and if the British Association were an institution for the popularization of science, this praise would, no doubt, be much to the point. Sir F. Bramwell's address was certainly intelligible to anyone, and formed a somewhat dramatic and occasionally humorous summary of the bearing of engineering and constructive improvements on the conduct of everyday life and occupation; but to our thinking something higher than this is to be looked for in the opening address of the British Association for the 'Advancement of Science.' The annual meetings of the Association tend to become more and more a kind of mere scientific amusement in the eyes of many of those who attend them—a form of mild dissipation; and however much this may be practically and unavoidably so in regard to a proportion of the audience, it is not desirable that Presidents of the Association should assist this tendency by reducing the presidential address to a piece of popular gossip on some of the superficial aspects of science. The address in question was, no doubt, amusing to many of those who listened to it, but it was not calculated to maintain the status and dignity of the annual meetings of the Association; and we hope its character will not be taken as a precedent for future addresses."

* This figure, was wrongly given in our brief report last week as 13 lbs.; and the error has been pointed out by Mr. Dowson for correction.

A NEW PIPE EXTRACTOR.

The extraction of cast-iron gas and water mains from the lines in which they lie in the trenches, is always a tedious business; but it is greatly expedited and cheapened by the simple device shown in the accompanying illustration, which is the invention of Mr. James W. Helps, Engineer of the Croydon Gas Company. The implement comprises a hinged clip for the main (which must, of course, be kept in different sizes to suit the diameters of pipes to be dealt with), and a forged block with a hand-screw, shown in



position at D in fig. 2. The method of application is as follows: Having uncovered a few lengths of main, the whole or a part of one pipe must be removed by the usual method of cutting out, so as to make a break in the line. The free end of the main is then slung as shown at A (fig. 2), so that it can be sprung by the lever B, worked from the road level, sufficiently high to permit of the introduction of a stout block, as at C, underneath the end of the next pipe. The clip, with the screw drawn back, is then tightly clasped round the spigot end of the second pipe, near to the face of the socket to be disconnected, as shown in fig. 2. The free end of the main is then again raised by the lever (or by tackle if it is a very large pipe), and allowed to drop suddenly upon the block C. The effect of this jar, repeated once or twice if necessary, will be to loosen the joint and draw the socket away from the top side. The screw is then turned until it bears against the face of the socket, and the process of lifting and dropping the main is repeated. The effect of this will be to still further loosen the pipe, which will be prevented by the screw from regaining its original position; and will therefore be drawn out somewhat at the bottom. A repetition of the process of lifting and dropping the pipe, and tightening the screw by hand whenever there is room for it to advance, will infallibly force the end pipe off the spigot without injury to either piece. The lead will, of course, be easily recovered. In turning the screw, no force is necessary; the hand being quite sufficient, as its object is not to push off the socket, but only to take up the slack caused by the repeated jarrings. Pipes can be drawn in this way in one-third or one-fourth the time required for the ordinary process of cutting out, besides saving all breakages of tools, &c. The device is in constant use at Croydon and elsewhere, and will be found of great advantage wherever any length of main has to be drawn.

NEW GAS ANALYSIS APPARATUS.—At the recent meeting of the British Association at Bath, Dr. W. W. J. Nichol showed a gas analysis apparatus, consisting of two parallel tubes communicating by means of stopcocks at the top and bottom respectively. One of the tubes is the measuring, the other the absorbing vessel. The apparatus may be readily used, and is suited for an analysis where accuracy approaching that obtained with the Bunsen apparatus is desired.

THE MINERAL PRODUCTION OF THE UNITED STATES.—Advance proofs have been received by *The Times* from Mr. David T. Day, Chief of the Division of Mining Statistics and Technology, United States Geological Survey, containing a summary of the statistics of the mineral production of the United States in 1887. The digest summarizes results which will also appear, in a more extended form, together with detailed statistics and descriptive and technical matter, in the forthcoming volume entitled "Mineral Resources of the United States, 1887." The aggregate value of the production in 1887 is stated to have reached \$538,056,345. The weight and value of the metallic products are given; and then follow the non-metallic mineral products, which are treated in like manner. The following are three of the items which fall under the latter head, and the figures in regard to which may be of interest to our readers:—Coal of all descriptions, 123,965,255 short tons (increase over 1886, 16,283,046 tons), valued at the mines at \$173,530,996 (increase, \$26,418,241). Petroleum, 28,249,543 barrels of 42 gallons each, value \$16,949,726; the increase over 1886 being only 139,428 barrels, with a decrease in the average value of 1½ cents per barrel. The production of natural gas in the United States in 1887 was equivalent to 9,055,000 short tons of coal displaced. This, at an average value of \$1 50c. per ton, would make the value of the coal displaced by natural gas (which is the measure of the value of the gas) \$13,582,500. In 1886 the corresponding quantity was 6,353,000 tons, worth \$9,847,150.

ELECTRICAL MATTERS AT THE BRITISH ASSOCIATION MEETING.

In addition to the references to electric lighting matters made at the recent meeting of the British Association at Bath by the President (Sir F. Bramwell), in his Inaugural Address, and by the President of the Mechanical Science Section (Mr. W. H. Preece), in his address to that Section—both noticed in the *JOURNAL* last week—several other subjects in this department of science were brought forward, which may now be dealt with together.

THE ELECTRICAL TRANSMISSION OF POWER.

The first matter to claim attention is the discourse delivered by Professor W. E. Ayrton in the Drill Hall, on the evening of Friday, the 7th inst., on "The Electrical Transmission of Power." The gathering was fully as large, and almost as brilliant, as on the occasion of the delivery of the presidential address; and the elaboration of the subject by the lecturer gave rise to a most successful series of experiments, in which many striking and wonderful effects were produced by the electric machines and other apparatus exhibited on the platform and on the intervening space between it and the audience. The President of the Association (Sir F. Bramwell) occupied the chair; and, in introducing the lecturer, paid a graceful tribute to his services in the cause of scientific education and science generally.

Professor Ayrton began his address by asking "What is power, and why should we wish to transmit it?" Power, he said, had one very definite meaning in science, and several rather vague meanings in practice. By power, an engineer understood the rate of doing work. To factories, power was indispensable. The looms, the lathes, or whatever the machinery used in the factory might be, must either be worked by hand or by foot in the old style, or it must be connected with the steam, gas, or water engine in the new. In America there are 6000 electric motors working machinery; in Great Britain hardly 100. But it was not only in transmitting the power from the steam, gas, or water engine of a factory to the various machines working in it, that electricity could be utilized. An incredible amount of power was daily running to waste in this and other countries, because many of the rapid streams of water were too far away from towns for their power to have been hitherto utilized. Assuming, as a low estimate, that a large well-made steam-engine burnt only 2 lbs. of coal per horse power per hour, the coal consumption which would be equivalent to the waste of power at Niagara would exceed 150 million tons per annum, which at only 5s. or 6s. per ton meant some £40,000,000 sterling wasted. It was a well-established fact that large steam-engines could be worked more economically than small ones; and that therefore, if it were possible to economically transmit the power from a few very large steam-engines to a number of small workshops, there would be a great saving of power as well as of time.

There were four methods of transmitting power to a distance: (1) By a moving rope; (2) by air compressed or rarefied at one end of a pipe operating on an air-motor at the other end; (3) by water forced through a pipe working a water-motor; (4) by electricity. For short distances of about a mile there was no system of transmitting power in a straight line along the open country so cheap to erect, and so economical of power, as a rapidly-moving endless rope. But the other systems gave much greater facilities for distributing the power along the line of route, were much less noisy, and far surpassed wire-rope transmission in economy. Distribution of power by water pressure was the plan that had hitherto found most favour in this country. The economy of this system was so marked, and the success that had attended its use so great, that, did he not feel sure that electricity offered a grander system still, it would be with fear and trembling that he should approach his subject. Some six years ago *Punch* drew the Giant Steam and the Giant Coal looking aghast at the sucking babe Electricity in its cradle. That babe was a strong boy now. Let the Giant Water look to his laurels ere that boy became a man. For the electric transmission of power even now bade fair to surpass all other methods in economy in the consumption of fuel, more perfect control over each individual machine, ability to bring the tool to the work instead of the work to the tool, and greater cleanliness. There was one more advantage possessed by this method of transmitting power to which no other could lay claim. The power which during the daytime might be mainly used for driving machinery, could, in the easiest possible way, be used during the night for giving light. By turning a handle one way, the electric current coming by one wire and returning by another, worked the electric motor; by turning it the other way, the current which came and returned by the same wires as before, kept the electric lamp glowing. It might be said that the transmission of power by coal gas fulfilled this condition; but so also did the transmission by a loaded coal waggon. In both these cases, however, it was fuel itself that was transported, and not the power obtained by burning it at a distant place.

From this point, the lecturer proceeded to examine in detail the electric transmission of power. This power, he remarked, of producing an action at a distance of many yards, or it might be many miles, by aid of electricity, without the visible motion of any substance in the intervening space, was by no means new. But until about ten years ago, the facility that electricity gave for producing signals almost instantaneously at a great distance, was the main thing thought of. The electric power consumed for sending telegraph messages was so small, the amount of power lost *en route* comparatively so valueless, that the telegraph engineer had no need to trouble himself with those considerations that

govern us to-day when we are transmitting power large enough to work a factory or an electric tramway. In the last three of the systems on his list, some form of power—such as flowing water or the potential energy stored up in coal, wood, zinc, or other fuel—had initially to be utilized. This power was given to some form of air, water, or electric pump, which would transfer the power to the air, water, or electricity by which it was conveyed to the other end of the system. There it was re-converted into useful mechanical power by means of an air, water, or electric motor. The lecturer then described the improvements effected in motors. It had been shown, he said, that, since the power developed by the generator and motor depended on the product of the current into the electric pressure, while the loss when power is transmitted through a given wire depended on the square of the current, and was independent of the electric pressure, the economical transmission of power by electricity on a large scale depended on the use of a very large electric pressure and a small current, just as the economic transmission of such power by water depended on the use of a very large water pressure and a small flow of water.

Proceeding to speak of the methods by which electrical transformation may be effected, Professor Ayrton said that in America alternate-current transformers were, owing to the remarkable enterprise of Mr. Westinghouse, used to light 120,000 incandescent lamps in 68 towns. The efficiency of a well-made alternate-current transformer was very high; being no less than 96·2 per cent. when the transformer was doing its full work, and 89·5 per cent. when it was doing one-quarter of its full work. It certainly seemed most remarkable, and reflected the highest praise on the constructors of electrical machinery, that motor power could be converted into electrical power, electrical power at low pressure into electrical power at high pressure, or electrical power at high pressure into electrical power at low pressure, or, lastly, electrical power into motor power, in each case with an efficiency of 94 per cent. As a further illustration of the commercial importance of electric transformation, the lecturer showed some experiments on electric welding—one of the latest developments in electrical engineering. To weld a bar of iron 1 square inch in section requires a gigantic current of some 13,000 amperes. To convey this current even a few yards would be attended with great waste of power; consequently, while an enormous current is passed through the iron to be welded, only a comparatively small current is transmitted along the circuit from the dynamo to the welding apparatus. [Mr. Fish, the representative of Professor Elihu Thomson, of America, to whom this apparatus is due, then showed the welding together of two bars of square tool steel, the edge of each bar being $\frac{3}{4}$ inch; the operation being entirely completed in 15 seconds. For this experiment an alternate current of 20 amperes was produced by a dynamo placed at some distance from the building; and this current was converted, by the transformer on the platform, into one of 9000 amperes—large enough for 12,000 incandescent lamps, if they were placed parallel and the current divided among them. He then welded some thicker bars; and lastly two pieces of aluminium.]

After describing in detail the improvements made of late years in dynamos and motors, the lecturer called attention to the perfection to which the system of economical distribution with accumulators, originally proposed by Sir William Thomson in 1881, has been brought by Mr. King, the Engineer to the Electrical Power Storage Company. On this point he remarked that in less than twenty years from Gramme's practical realization of Pacinotti's invention, we have power transmitted over considerable distances by electricity, with only a total loss of 25 per cent.; whereas the combined loss in an air-pump and air-motor, or in a water-pump and water-motor, is 40 per cent., irrespective of the additional loss by friction or leakage occurring *en route*. We could not help feeling, he continued, that we were rapidly arriving at a new era; and that it would not merely be for the inauguration of the quick transmission of our bodies by steam, or the quick transmission of our thoughts by telegraph, but for the economical transmission of power by electricity, that the Victorian Age would be remembered. To burn coal to work dynamos, and to use the electric current to light our houses and our streets, was clean and economical; to use the current to warm our rooms was clean but wasteful, on account of the inefficiency of the steam-engine. But when the dynamos were turned by water power which would otherwise be wasted, the electric current might be economically used, not merely to give light, but also to give heat. And when the electric transmission of power became still more perfect than at present, even to burn coal at the pit's mouth, where it was worth 1s. a ton, might, in spite of the efficiency of the steam-engine being only one-tenth, be the most economical way of warming distant towns where coal would cost 20s. a ton. Let them think what this would mean. It would mean no smoke, no dust, a reform effected commercially which the laws of the land on smoke prevention were powerless to bring about—a reform effected without the intervention of the State, and therefore dear to the hearts of Englishmen.

But of all the many commercial uses to which the electric current might be put, probably, after the electric light, electric traction had, Professor Ayrton went on to remark, most public interest. While it cost 6d. or 7d. to run a car one mile with horses, it only cost 3d. or 4d. to propel it electrically. The lecturer proceeded to describe the "series" system of propelling electric railways, at work in America at Denver (Colorado); stating that a "series" electric tramway 12 miles long, on which 40 cars are to be run, is in course of construction in Columbus (Ohio). The first

track on which electric trams were run in series was the experimental "Telpher Line," erected in Glynde in 1883, under the superintendence of the late Professor Fleeming Jenkin, Professor Perry, and himself, for the automatic electric transport of goods. In addition to the small waste of power and consequent diminished cost of constructing the conductors that lead the current into and out of the passing trains, the system had another very marked advantage. Some years ago it was pointed out that when an electric train was running downhill, or when it was desired to stop the train, there was no necessity to apply a brake and waste the energy of the moving train in friction, because the electric motor could, by turning a handle, be converted into a dynamo, and the train could be slowed or stopped by its energy being given up to all the other trains running on the same railways, so that the trains going downhill helped the trains going uphill, and the stopping trains helped the moving trains. Economy was one feature that gave electric traction the right to claim attention; safety was another—human fallibility, in fact, was eliminated. It might be interesting to mention that the last difficulty in telpherage, which consisted in getting a proper adhesion between the driving-wheels of the locomotive and the wire rope, had now been overcome. After several years of experimenting we had in telpherage, he ventured to think, at last a perfectly trustworthy, and at the same time a most economical method of utilizing distant steam or water power to automatically transport our goods, and in time it might even be our people, over hills and valleys without roads or bridges, and without interfering with the crops or the cattle or the uses to which the land might be put over which the telpher trains pursued their snakelike way. We had, in fact, the luxury of ballooning without its dangers.

ELECTRIC LIGHTING IN AMERICA.

This was the subject of a paper read by Professor Forbes in the Mechanical Science Section on the 10th inst. He observed that on landing in England, people were particularly struck everywhere with the dimness of the lighting in our public thoroughfares. In America they could not go to a single town without seeing abundance of arc lighting in the streets. He did not speak simply of the influential towns, such as New York, Philadelphia, or Boston, but in many of the out-of-the-way places in most distant parts of the States. Where gas had never penetrated, there the electric light had fixed its position, and was being used frequently. The chief progress in central station work had been in three directions—(1) arc lighting; (2) incandescent lamps with the wire system; and (3) incandescent lamps with converters on the Gaulard-Gibbs system. The number of arc lights was now about 300,000. He particularly commended to notice the growth of incandescent electric lighting. He said it had been estimated that there were $2\frac{1}{2}$ million incandescent lamps used in the United States; and he believed the factories at that moment were capable of turning out 10,000 of such lamps every day. The annual increase in the number of incandescent lamps in the States must be counted by millions per annum. The growth of central station lighting was in great measure attributable to the efforts of Mr. Westinghouse. This gentleman had devoted himself very earnestly to the improvement of this system. Towns in America did not now order the separate apparatus for starting a central station, but were supplied with the whole station complete ten days after ordering. At the present moment about 300,000 lamps were being lighted by Mr. Westinghouse's alternating current plant. It had been said that in England they did not go ahead so much as people did in America; and he attributed much of the hindrance to English progress to the iniquitous Electric Lighting Act. Proceeding to comment on the American system, Mr. Forbes pointed out the small use made of accumulators in the States, where they were regarded as very unreliable in their action. Electricity of high potential was supplied by the stations; and by the introduction of an induction apparatus, it was converted into a harmless strength for consumers' use. Dealing with the various forms of electric machinery and its adjustment, Mr. Forbes urged the advantage of several medium-sized dynamos, rather than putting the whole work on to one large machine, which would be uneconomical when working at less than its maximum power. He advocated the use of 50-volt lamps rather than those of 100 volts, as being the result of American experience. American engineers had, he said, arranged to produce 1000 volts, instead of 2000, which was the custom in England.

ELECTRICAL DISTRIBUTION AND MEASUREMENT.

These subjects were dealt with in papers read before the same Section by Mr. H. Edmunds and Mr. W. Bayley Marshall—the latter for the author, Mr. W. Lowrie.

Mr. Edmunds first glanced at the questions of direct supply, and then at secondary generators. He showed that both these systems were dependent upon the regular work of the machinery at the central station. To remove this difficulty, his system of using secondary batteries had been brought into use. Groups of cells were placed in various portions of the district to be lighted; each group being divided into a given number of sections. If the group was divided into four sections, it was arranged that three should be sufficient to supply the local demand, while the fourth was being charged from the central station. The newly-charged section was switched on to the local supply, and another section charged; and thus a constant supply was maintained. The action was automatic—the strength not being allowed to fall below a certain point. The author claimed that the system was advantageous, owing to the even pressure of the current supplied to the lamps, the moderate

size of the conductors, the safety, and the absence of risk of failure of supply.

Mr. Lowrie, in his paper on "The Measurement of Electricity in a House-to-House Supply," described a method designed by him and his colleagues for the purpose of measuring alternate currents as used for house-to-house distribution with the converter system. He said it was well known that with such a system it was possible to get a current first in one direction and then in the opposite direction, and any chemical effect of the one current was destroyed in the reverse action. Messrs. Lowrie, Hall, and Kolle proposed to insert in the main an accumulator, having an electro-motive force of 2 volts. This force during one half-alternation aided the ordinary current; during the other half it opposed it. Thus if the original electro-motive force was 100 volts, this became when aided 102 volts; when opposed, 98 volts. If a depositing cell were placed in circuit, deposition would at one time take place due to the electro-motive force of 102 volts, and during the reverse action of only 98 volts; leaving the action of 4 volts over one-half the time—that is, of 2 volts over the whole time—and this gave the means of exact measurement required.

In proposing a vote of thanks to the readers of the papers, the President (Mr. W. H. Preece) said he desired to protest against the idea that the inaction in regard to electric lighting in this country was solely due to the Electric Lighting Act of 1882. This Act was in no sense or shape an interference with the action of corporations. Some fifty or sixty corporations obtained Provisional Orders under the Act, but never carried out the powers conferred by their Orders. The fact was that electric lighting had not even yet become sufficiently advanced for corporations to be justified in investing the money of the ratepayers in it. It was impossible not to be impressed with the wonderful activity of the Americans; but he considered that in this country it was best to work slowly and with certainty, as was being done at the present time. In a year or two they would be able to learn all that was necessary in England; and they would then go ahead, and establish a system infinitely better than anything now existing.

THE SCHÜLKE GAS-LAMP.

Among the many regenerative lamps to which attention has been lately drawn, one that appears worthy of special notice is the Schülke lamp. The good principles underlying the construction of the lamp have more than once been pointed out by us; but it has been principally in connection with lamps of the larger types. Too little attention has hitherto been paid to the perfecting of small regenerative lamps, to replace the ordinary flat-flame burners of everyday life; and serious objections have been found to nearly all those which have aimed at this end. The Schülke system has been adopted in this latest form of the lamp; but the details have been considerably modified and improved by the Woodhouse and Rawson Manufacturing Company, who have been at work many months on the small type of lamp, with a view to producing an efficient, durable, and cheap lamp of small consumption. The regenerative portion of the lamp consisting of pure nickel, porcelain, fire-clay, and asbestos would appear to promise it a long life; while the burners which are the ordinary flat-flame steatite type are shown by experience to be more lasting, and to give less trouble, than any form of perforated ring-burner. The air spaces are all full and large, so that choking is impossible; while the size of the lamp is probably less than that of any other lamp of equal consumption. Owing to the form of burner employed, the flames are of remarkable steadiness, and in draughty passages, and similar positions, scarcely a flicker can be seen. The 4-foot type of lamp has been carefully tested by one of our leading authorities; and it has given a duty of between $5\frac{1}{2}$ and 6 candles per cubic foot of gas consumed—without reflectors of any kind, and burning gas of the quality usually supplied in London. This result is remarkably high, and will probably lead to the adoption of a still smaller type where less illumination is required.

The Schülke Gas-Lamp Company, whose offices are at No. 11, Queen Victoria Street, E.C., are now turning their attention to the question of lamps for street lighting; having, we learn, worked out a simple and easy plan of lighting the lamp by the ordinary method, and so overcoming one of the principal stumbling blocks to the employment of the regenerative system for the lighting of public thoroughfares.

THE REPLENISHMENT OF UNDERGROUND WATER SUPPLIES.—This was the subject of an instructive paper read at the recent meeting of the British Association at Bath by Mr. Bailey Denton, C.E., F.G.S. The author drew attention to the capabilities existing of replenishing the subterranean supplies of the water-bearing strata by shafts sunk down to the line of their saturation; taking the Thames and its basin to illustrate his views. He referred to an opinion given in his evidence before the Royal Commission on Water Supply in 1867, that if towns on the banks of rivers were to lift their sewage and foul liquids on to absorbent lands lying 100 to 150 feet above them, they would not only free the rivers from pollution, but help to maintain their overflow with certainty. Winchester, Basingstoke, and other towns situated on the chalk, had adopted this mode of sewage disposal without injurious effect; and the author submitted that while such instances testified to the purifying powers of aerated chalk, they afforded proof that when superfluous waters were let down into the water-bearing strata from above, they would *pro tanto* spread, and naturally raise the line of saturation and the outflow of springs.

RESERVOIR GALLERIES AND CONDUITS IN NAPLES.

In a recent number of the *Engineering and Building Record* of New York, an article appeared on the above subject, translated from a paper by M. Flamant, in the *Annales des Ponts et Chaussées*. The particulars given below are taken therefrom.

Among the works executed in 1882-4 for the distribution of the Naples water supply, the special features of the reservoirs are sufficiently interesting to be here described. Instead of building them at great cost of solid masonry, advantage has been taken of the sand-rock formation to excavate in the heart of the mountain vast galleries which serve for reservoirs. In this way complete solidity was assured and simplicity of construction, as well as the great advantage of protecting the enormous quantities of water from the influences of exterior temperature, since the receptacles were constructed at a great depth below the surface of the ground.

The most important of these reservoirs—that for low and mean services is dug in the hill of Capodimonte, and is composed of five grand parallel galleries at a mean depth of 164 feet. They are 35·4 feet high by 30·33 feet wide, separated by a solid wall of rock 30·33 feet in thickness. The three first galleries are each 836 feet long; and the united length of the other two is 1217·4 feet—making a total of 3725 feet wide.

The depth of the water being 26·25 feet, gives a total capacity of 21,187,000 gallons. The surface of the galleries up to 1·64 feet above the water is covered with Grenoble cement from $\frac{1}{2}$ inch thick above to 2 inches below, applied in two coats, of which the second is composed of equal parts of sand and cement. Aération is secured by seven air-shafts. The working apparatus is placed in three service galleries, separated by partitions of natural rock, superimposed above each other, and having a direction perpendicular to that of the reservoir galleries. The high-service reservoir is similar, but has a capacity of only 5,295,000 gallons.

These reservoirs are supplied by the Cancellò syphon, which discharges 26,500,000 gallons of water daily. It is composed of three conduits, one of 2·3 feet internal diameter for the upper reservoir, and two others, each 2·62 feet, for the lowest mean services. The length of the first is 14 miles; and it discharges 60·3 gallons per second. Each of the other two is 11·6 miles; and they together discharge 245 gallons per second.

These conduits are exceptional from the great pressures they sustain at their lowest points where the heads are 610 feet and 361 feet for the small and large ones respectively. The thickness

was calculated by the usual formula $e = \frac{H D}{2 R}$ where e is the thick-

ness in millimetres and H the head and D the diameter—both in metres; R being the maximum strain per square millimetre, taken at 2485 lbs. per square inch. For the 27 $\frac{1}{2}$ -inch conduit, a thickness of $\frac{3}{4}$ inch was used for all heads up to 295 feet, gradually increasing for greater heads until a thickness of 1·46 inches was reached for the maximum head of 613 feet. Similarly, for the 31 $\frac{1}{2}$ -inch conduit the thickness was 0·8 inches for all heads up to 295 feet, with a maximum thickness of 1·02 inches for a head of 377 feet.

The pipes were furnished by the Terni shops, and, except where it exceeded 25 atmospheres, were proved at the shops to a pressure of double the working strain; and after being set, each section was again tested to a pressure five atmospheres greater than the computed head for that place. The conduits were put in operation by means of an 8-inch pipe parallel to the 27 $\frac{1}{2}$ -inch conduit, and connecting its highest and lowest points. Each conduit can be operated independently of the others. The water is introduced from below; and the air escapes through vents at all the summits, and at distances not exceeding 1640 feet apart in the horizontal portions. The sections of the pipes weighed upwards of two tons each; but the difficult operation of laying them was successfully accomplished, and they have been working without any accident since 1885.

THE PROPOSED GAS MANAGERS' ASSOCIATION FOR THE EASTERN COUNTIES.—We learn from Mr. H. Wimbhurst, of Sleaford (who is acting as Honorary Secretary *pro tem.*), that the preliminary meeting of gentlemen interested in the scheme for founding a Gas Managers' Association for the Eastern Counties will be held at Peterborough to-morrow week (the 26th inst.) at 1 o'clock.

WATER SUPPLY PROJECTS FOR JAPAN.—The Belgian Chargé d'Affaires at Yokohama has announced a project for the distribution of water in a number of Japanese towns. The town of Yokohama was last year benefited by a system of water supply, the plans and carrying out of which were placed in charge of General Palmer, an English engineer, engaged specially for this purpose by the Governor. The enterprise was apparently successful; and, encouraged by the example set before them, the municipal authorities of several other large towns have been studying the means of executing similar works. In fact, at Kobe, Osaka, and Hakodate, the preparatory plans and estimates have, it is stated, already been arranged. At Tokio also, the capital of the Empire, a similar project is under consideration; but it is uncertain whether the Government itself will undertake the carrying out of a system of water supply, or entrust the work to a company. The principal difficulty at present seems to be the means of raising the necessary funds; and it is estimated that a sum of 6 million yens (or about £1,000,000) will be required. Tokio actually has a population of 1,000,000 people; and, according to the present project, the water supply would have to be based on a population of 2,000,000.

Register of Patents.

GAS-LAMPS.—PUGH, R. W., of Pendleton, near Manchester. No. 13,862; Oct. 13, 1887. [11d.]

This invention is applicable more particularly to pillar and bracket lamps; the object of the invention being to adapt such lamps to burning gas on the "regenerative" principle. It is also applicable to suspended lamps and lamps for outside use.

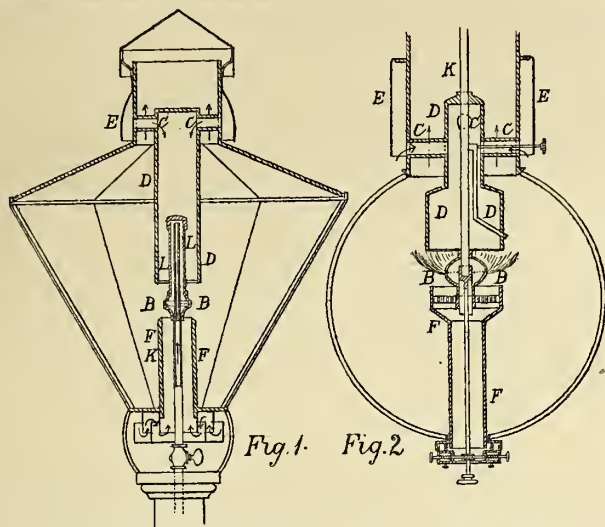
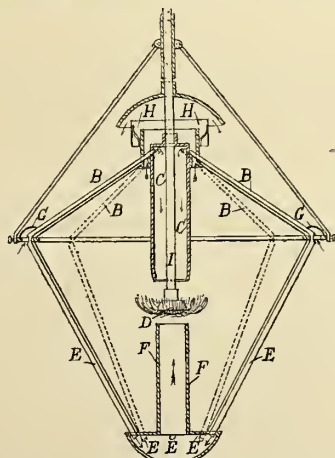


Fig. 1 represents a vertical section of a pillar or street lamp with a polygonal glass body, air-tight excepting at the top and bottom. To supply air to the top of the flame above the burner B, a number of tubes C are employed, opening outwards, and radiating towards a vertical central tube D (of larger diameter), which passes downwards to a small distance above the top of the burner. Over the entrance to the mouth or outward ends of these radiating tubes is fitted a shield or baffle-plate E, to protect the inlets from any sudden rush of wind. Under the burner or burners a central tube F is fitted, similar to the one above, and terminating just below the burner. This is to supply air beneath the flame. Below this tube (the lower end of which is open) a shield is formed at the bottom of the lamp, so as to protect the entrance to the tube—which is the air-inlet—against rough winds or sudden rushes of air. This shield is made of metal rings or plates, some of which are fastened to a disc above, and alternate ones to the bottom of the lamp. The edges of these discs pass each other, but allow a sufficient space for the passage of the air into the mouth of the tube F beneath the burner or burners. The gas-supply pipe K in this case passes upwards through the bottom of the lamp to the burner; or it may pass downwards from above, as in some of the other forms of lamp. In the former case the supply-pipe is carried up above the burner, the upper part being of a smaller diameter; and this part is enclosed in an outer pipe L, so arranged that the gas is compelled to pass up to the top of the inner pipe, and down the hollow space between the two pipes, before it can arrive at the burner B. In this way the gas becomes heated before it mixes with the warm air supplied by the tubes D and F; and the brilliancy of the light is increased.

In a modification of the above (represented in fig. 2) suitable for suspension from the ceiling of an apartment or building, for the purpose of diminishing the shadow on the ceiling, the reflector which is usually employed inside the glass around the upper margin, is dispensed with; and the glass is made more globular than hitherto. This reduces the diameter of the top of the lamp, and consequently the shadow on the ceiling; and to complete the effect, the tube or warm-air cell D, which is above the burner B, is brought to a greater depth than usual in the globe—thereby causing the rays of light to spread more freely.

GAS-LAMPS.—PUGH, R. W., of Pendleton, near Manchester. No. 13,940; October 14, 1887. [8d.]

This invention, relating principally to outside pillar and bracket lamps, consists of a method of constructing such lamps so as to adapt them to the regenerative principle.



The illustration represents a vertical section of an outside bracket suspended lamp with polygonal outer glass or body, and radiating tubes B corresponding with the angles of the glass body, and open at both ends. The outer ends of these tubes are open to the atmosphere, while

the inner ends are connected to a larger central tube C, which passes downwards and terminates just above the top of the burner D, so as to supply air to the upper side of the flame. Other radiating tubes E are carried downwards from the same point along the angles of the glass body, and communicate with another similar central tube F, which is carried upwards from the bottom of the lamp to supply air to the lower side of the flame. Over the entrances to the mouths of these radiating tubes, a shield G is formed, so as to protect the inlets from currents of air. Above the upper central tube, is a chimney H, to allow the products of combustion to escape. In this form of lamp, the heat from the flame acts upon the upper central tube; and thus warms both the air and the gas in the supply-pipe I before they arrive at the burner.

In some cases in suspended lamps, where the gas-supply pipe is brought down from above, there is placed at the lower end of the gas-pipe an enlargement forming a cell or regenerator for heating the gas, and also serving to spread the flame and reflect the light. In this modification the upper central tube C and radiating tubes B and E are dispensed with. All the air enters at the bottom, and is there divided. A portion passes up an inner tube, and through the centre of the circular burner to the upper part of the flame; while the other portion passes upwards between the tubes, and supplies the lower side of the flame. The burner is provided with a hollow wall; and the gas passes into it through cross tubes.

The patentee also describes the application of this principle to a pillar lamp, wherein the gas-supply pipe is carried up from beneath. In this case the air also enters from below; one portion passing upwards through the centre of the burner around the gas-pipe. The upper part of this gas-pipe is enclosed within a second pipe, the top of which is enlarged so as to form a cell or regenerator for heating the gas. It also serves to spread the top of the flame. A slight distance above the cell is placed a cap; leaving a space between for the circulation of air, so as to keep the gas from becoming over-heated. This cap also forms a reflector for the light. The burner is further fitted with a cross-pipe, through which the gas passes from the outer gas-pipe after it has gone through the regenerator; so that the gas becomes further heated before it issues from the burner, and mixes more freely with the heated air.

GAS-ENGINES.—BARKER, T. B., of Birmingham. No. 14,027; Oct. 15, 1887. [8d.]

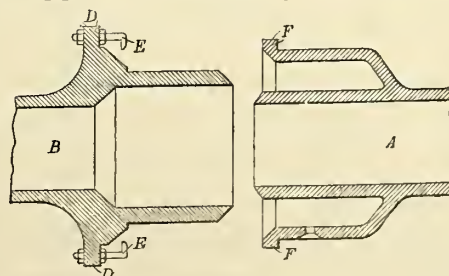
This invention consists primarily of certain improvements on patent No. 1388 of 1881, which described mechanism for igniting the mixture of gas and air in the cylinder of the engine, consisting essentially of a rotating disc having a series of equidistant radial slots. The rotary motion of the disc is intermittent, and is produced by a pawl acting on a ratchet formed on the periphery of the disc; and the ignition of the charge is effected when, by the motion of the disc, one of the radial slots in the disc is brought between a stationary ignited gas-jet and a passage opening in the charged cylinder.

The first part of the present invention has reference to this igniting mechanism; and it has for its principal object to prevent the noise attending the working of the mechanism as originally constructed. Accordingly the radiating slots in the rotating disc are made of much larger capacity than in the original invention; the slots constituting small gas chambers. Instead of the slots simply opening a communication between the igniting gas-flame and the charged cylinder of the engine, each slot as it approaches the igniter flame is caused to receive a charge of gas; and in passing the flame the charge becomes ignited. By the motion of the disc, the charged slot (the gas in which has been ignited) is rapidly brought to the opening in the charged cylinder of the engine, the detonating mixture in which is ignited by the flame carried by the slot. By this arrangement, the ignition of the mixture in the cylinder is effected, practically speaking, noiselessly. The igniting flame is situated in a small chamber formed in a fixed plate or disc, against which the rotating slotted disc works approximately gas-tight.

The second part of the invention has for its object to bring to rest the rotating slotted disc when, by the action of the governor, the cylinder of the engine is not being charged with gas. For this purpose, a lever is so connected with the governor that, as the balls of the governor rise, the long arm of the lever rises; and as they fall the arm descends. The short arm of the lever is connected with an incline, to which it communicates a sliding motion. As the balls of the governor ascend and cut off the supply of gas to the cylinder of the engine, the incline is made to advance under the end of the pawl, which actuates the rotating slotted disc, and raises the pawl out of range of the ratchet teeth on the periphery of the disc. The disc is consequently not actuated by the pawl; and the wear and tear of the disc is arrested and the waste of the igniting charges of gas prevented. When by the diminished speed of the engine, the governor balls descend and restore the supply of gas to the cylinder, the incline by which the pawl was supported out of action is at the same time withdrawn; and the pawl again coming into action, the igniting mechanism is operated. The supply of gas to the cylinder and the working of the igniting mechanism thus take place simultaneously.

JOINTINGS OF PIPES.—FEATHER, T., of Mirfield. No. 9278; June 26, 1888. [6d.]

The illustration shows longitudinal sections of portions of the two outer ends of a pipe constructed according to this invention.



These outer ends form a socket as well as a spigot for each other; and they are of somewhat a bevelled shape, in order to form a kind of

seating for the corresponding parts. On the pipe B are formed two three, four, or more lugs or ears D to which are attached the hooks E, made so that they will easily engage with the projecting parts F. In order to enable the parts to thus engage with each other, openings G are made, so as to allow the convergent ends of the hooks to pass through; and by means of the parts F having their edges somewhat of voluted or spirally-inclined form, when the pipes A and B are placed in such relative position that the hooks E have passed through the openings G, it is only necessary to partially rotate one or the other of the pipes to cause them to be properly joined.

CARBURETTING GAS-LAMPS.—Kitson, A., of Philadelphia, Pa., U.S.A. No. 10,043; July 10, 1888. [8d.]

This invention is particularly adapted for enriching a heavy combustible gas with the vapours of solid crystalline hydrocarbon.

Heretofore (says the patentee) in enriching gas-lamps, where solid hydrocarbons have been used, it has been customary to liquefy the top layer of the hydrocarbon in the vessel, by conveying heat to it directly—by the heated gas, by conduction by means of heated metal inserted in the material, or by liquefying the entire mass of hydrocarbon in the vessel; whilst the gas requiring to be enriched has hitherto been brought in contact with the top layer of hydrocarbon, where it has mixed with the volatilized matter. Considerable time also must always elapse after lighting the burners, before the process of carburation commences; and in cases where the gas pressure has been very low, the process has failed to act completely, while with a consumption of less than 3 feet per hour, no lamp hitherto constructed has been able to operate successfully. Again, says the patentee, while it is quite desirable to enrich low-grade combustible gases (such as producer gas, or mixtures thereof with water gas) for illuminating purposes, it has been found impracticable to accomplish this object with the carbureting attachments now in use, since they are constructed to conduct gas up to the burners from the carbureting vessel, and are for enriching coal gas requiring only a small addition of illuminants. Coal gas possesses sufficient affinity for the vapours of naphthalene used in these lamps, to carry the proper proportion thereof up to the burners; but producer gas is not only almost without illuminating qualities, but contains a comparatively large percentage of nitrogen and other heavy gas, which have no affinity for the hydrocarbon vapours, and will not, therefore, be enriched in the ordinary lamp to a sufficient degree to yield, in combustion, the necessary illuminating power.

The object of the present invention is, therefore, to provide means (in addition to the gas itself) for conducting hydrocarbon vapours directly into the burner tube and down to the burner; also to provide a method of carburation which will operate effectively with every kind of combustible gas, which will work well on very low gas pressures, and which will carburet a small as effectively as a large quantity of gas. Another object is to simplify the construction of the lamp, make it compact and convenient to manipulate, and further to provide for quickly starting the carbureting operation after lighting the gas at the burner.

According to one plan of operation, the bottom layer of crystalline hydrocarbon is caused to be liquefied by heat; and a thin stream of the liquid is conducted by gravity into a tube or chamber, containing a capillary material, which is heated by the flame of the burner, and through which the gas to be enriched or carburetted passes on its way to the illuminating burner. In this chamber, leading to the burner, the liquid becomes instantly vaporized by the heat; and the resulting vapour is carried on down to the burner. According to another plan of operation in connection with a slightly modified construction of lamp, provision is made for melting a portion of the solid hydrocarbon, and conducting the liquid by a fibrous capillary conductor into the heated descending tube, wherein the vapours given off from the capillary conductor mingle with the gas to be enriched, and flow readily therewith down to the burner. As soon as the burner is lighted, the small amount of hydrocarbon lodged in the vaporizing chamber, or the capillary conductor in the burner-tube, is vaporized; and the carbureting operation immediately commences.

APPLICATIONS FOR LETTERS PATENT.

12,864.—PRICE, H. A., and TURNER, H. C., "Improvements in atmospheric gas-burners for lump asbestos fires in register and other stoves." Sept. 6.

12,880.—HEMPEL, E. J., "An improved device for opening, closing, and securing the glass shades or globes of Wenham lamps, and lighting and otherwise manipulating the same." Sept. 6.

12,901.—BOUCH, W. B., and GREENE, T. A., "Improvements in air-feeds for gas-burners." Sept. 6.

12,940.—BARKER, G., "Improvements in Argand lamps." A communication from James P. Bixby. Sept. 7.

13,023.—CHANDLER, S., sen., CHANDLER, S., jun., and CHANDLER, J., "Improvements in and applicable to gas-lamps." Sept. 8.

13,050.—LANGBERG, O., "Improvements in apparatus for generating illuminating gas and gaseous fuel, and for burning the latter." Sept. 10.

13,051.—FOULON, P. J., and CONSTANTINE, G. B., "An improved Argand lamp burner." Sept. 10.

13,056.—TURNER, H. C., and PRICE, H. A., "Improvements in gas-burners for incandescence fires." Sept. 10.

13,057.—LIVSEY, G. T., "Improvements in gasholder guiding apparatus." Sept. 10.

13,074.—KUSNEZOFF, W., "Improvements in apparatus for the purification of gas." Sept. 10.

13,147.—DOMS, L., "Improvements relating to the carbureting or naphthalizing of gas, and to devices or apparatus therefor." Sept. 11.

13,160.—HILL, A., "Improvements in atmospheric gas-burners." Sept. 12.

13,181.—BEARD, R. R., "Improvements in gas regulators or governors." Sept. 12.

13,235.—WANKLYN, J. A., and BYRON, W. A., "Improvements in gas-engines." Sept. 13.

13,238.—THOMSON, A., "Improvements in mechanical stokers." Sept. 13.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

SPIRAL-FRAMED GASHOLDERS.

SIR,—In the last issue of the JOURNAL, a correspondent has described a discovery he has made of a special variation of my invention of the spiral-framed gasholder for dispensing with the external or upper framing altogether. In this rather obvious variation, your correspondent proposes to simply reverse the method described by Mr. Newbigging in his paper read at Doncaster, on the 25th of August last, by which act that gentleman voluntarily did me a great kindness, in a very masterly manner.

I quite agree with your correspondent as to the possibility (and perhaps, in some cases the advisability) of so proceeding with my invention; only, unfortunately for him, his suggestion is somewhat late in the field, as I have described that and other variations in the specification filed in the Patent Office, and which is now accepted. I send you herewith a copy of this specification wherein you will find the particular variation referred to by your correspondent.

There are other variations, which may prove interesting, even if they be not often employed. But they may nevertheless anticipate those ingenious attempts which are often made to evade a patent, and thus open up the possibility of obtaining the results of great study, labour, and cost, without involving the necessity of paying the inventor or his enterprising associate the legitimate reward for the same. I say this, however, without in the slightest degree imputing any such motive to your frank correspondent.

Manchester, Sept. 13, 1888.

W. GADD.

GAS ANALYSIS.

SIR,—I am obliged to Mr. Whieldon for his criticism of my article on the above subject. Stated shortly, he says:—(1) Is not the gas-bottle too large? (2) Is not the surface exposed to the confining liquid more with this bottle than with a smaller one? (3) Can percentages above 25 per cent. be determined? (4) Does not the gas-bottle closely resemble Mr. Wanklyn's? (5) Are the connections of india rubber? (6) Are not the solutions exposed to the air for a considerable time? (7) Are not the injurious solutions sucked off by the mouth? (8) The solutions are similar to Professor Wanklyn's? (9) The gas, when tested for ammonia is exposed to the absorbing influence of water; and in the test for sulphuretted hydrogen, it is washed and the washings lost. (10) Why is naphtha preferred to bromine and fuming sulphuric acid? (11) Is potash or ammonia used for titrating sulphuric acid? (12) It is difficult to read absorption. (13) Corrections for temperature and pressure would be erroneous where the gases are estimated by absorption. (14) Can hydrogen and marsh gas be tested for by this bottle?

In reply I may say: (1) The size of the bottle is of little importance so long as it is not unwieldy. (2) The surface exposed to the confining liquid is not greater in proportion to the gas present than with a smaller bottle. (3) I might have added that, for percentages above 25 per cent., a separate measure is required, connected in the same manner as the burette shown at M [see sketch given with article]. The water-lines should be equalized by raising or lowering this measure. (4) If my gas-bottle very much resembles Mr. Wanklyn's, surely it does not detract from its usefulness. (5) The connections are made of indiarubber tubing; and there is no difficulty with them. (6) The solutions are not exposed to the air for more than two minutes. The burette is only used when it is necessary to measure the solutions. (7) If it is necessary to suck off the injurious absorbents, then an aspirator of some kind can be used. (8) The absorbents used by me are not new; but they are not in general use. (9) The gas is only exposed to the surface of the water for a very short time. I think Mr. Whieldon must have misread the test for sulphuretted hydrogen. (10) I prefer naphtha because it is not nearly so injurious as bromine and fuming sulphuric acid. (11) Either potash or ammonia can be used; but I prefer ammonia. (12) The bottle is held in the stand, and can be lowered into the trough with great ease; and if the trough is placed on a level stand, the bottle must be vertical. (13) The bulk of the gas should certainly be corrected to standard temperature and pressure, as well as the results obtained by absorption. (14) I should think hydrogen and marsh gas might be tested for by this bottle; but I have not yet done so. Will Mr. Whieldon explain what he means by "at a slight under-pressure."

In conclusion, I would say that this class of bottle, although not absolutely accurate, is found to be sufficiently so, and is very convenient for all tests made on the works.

WILLIAM G. HICKS.

Ramsgate, Sept. 14, 1888.

OBLIGATIONS OF THE CHAIRMEN OF GAS COMPANIES.

SIR,—Kindly spare me space for a brief notice of the article in the *Financial News* (which you have reproduced) on the subject of my letter to you hereon.

While thoroughly endorsing my views in general, the article misquotes my statement. The *Financial News* makes me say that "the cost of coal was lower in the half year immediately preceding the period which the Chairman was discussing, as well as in the half year ending June 30—a period to which Colonel Makins made special reference." This is sheer nonsense. If the "cost of coal" had been lower at the two antecedent periods referred to, there would have been no reduction, but, on the contrary, an increase. My statement was (as shown by the figures) that the "reduction" in the net cost of coal had been exceeded in the two previous half years—which is a very different thing. That the *Financial News* should have committed such an error is, to me, quite as startling as was the subject of my remarks.

Surely such an authority should have figures at their fingers' ends, and not be obliged to fall back upon the halting device of saying "if the statistic is right." I can only conclude that the "calculating boy" of the *Financial News* was incapable of finding the differences respectively, between 78-55d. and 63-82d., 76-08d. and 62-54d., and 63-82d., and 53-38d. (the figures for the June half years of 1886-7-8, and the December half years of 1886 and 1887), and of seeing for himself that

14.73d. and 13.54d. were greater than 10.44d.—all these being arrived at by simple subtraction. Otherwise the *Financial News* must have taken my figures, without verification, upon the principle that any stick is good enough wherewith to beat a dog.

Further the *Financial News* is good enough to regard me as a shareholder in the Chartered Company whose wits and memory were too defective to permit me at the meeting to catch the Chairman tripping—notwithstanding my distinct disclaimer. If that were true, my statements would have no weight at all in support of its own views. As a matter of fact, when I wrote to you, I had never either seen or spoken to the Governor of the Chartered Gas Company, nor yet to the Chairman of the South Metropolitan or any other Gas Company, to my knowledge. I am in the strictest sense of the words, a typical "Outsider," as I am not a shareholder in any Company whatsoever. *Pace the Financial News*, therefore, I still claim to be neither more nor less than what I have signed myself—to wit, an

Sept. 12, 1888.

OUTSIDER.

THE EDGERTON PHOTOMETRICAL SLOT.

SIR,—In your issue of July 24, under "Notes," you describe an "Edgerton" slot-chimney, and say: "It is admitted that the principle of the Edgerton standard is identical with the Methven standard, which must have suggested it." I think you are in error as to the Methven slot suggesting the Edgerton standard. I believe that Mr. Edgerton antedated Mr. Methven in the use of an opaque chimney with slot, for testing gas against itself.

In 1877, in the New Orleans Gas-Works, I used this standard myself; it having been prepared by Mr. Edgerton. He tells me that his first burner with an opaque sleeve, with slot over the chimney, was made in 1875; and I have in my possession a photograph of it, taken in that year.

Mr. Edgerton has told me that in 1875 he exhibited the standard at the meeting of the American Gaslight Association, in New York, at which, I believe, Mr. D. Bruce Peebles, of Edinburgh, was present.

I respectfully request that you will give this correction a place in your columns.

Philadelphia, Aug. 30, 1888.

WALTON CLARK.

INQUIRY CIRCULARS AGAIN.

SIR,—The following questions were sent to me in a circular form without even a stamped envelope for reply:—

1. Do you, in supplying the return of the profits of your gas-works, make a deduction in the assessment for gas used by the Corporation for public lighting purposes?
2. Do you make a deduction for depreciation of plant and machinery apart from, and in addition to, the annual outlay for repairs and maintenance of works.
3. What is the rate per cent. on the value of the plant and machinery you deduct for depreciation?
4. What descriptions of gas apparatus, plant, and machinery, do you include in the valuation upon which the deduction is based?

I hope that, as circulars of this description are received, they will be exposed before being consigned to the waste-paper basket; so that professional men who understand their business may have a fair chance of continuing to earn their living.

Sept. 12, 1888.

ENGINEER.

SMALL-BORE WATER-METERS.

SIR,—I notice a large number of $\frac{3}{4}$ -inch water-meters are offered for sale by one of the Corporation Water-Works in England. Being interested in the use of small meters, it would confer a benefit, not only on myself, but many of your readers, if interchange of opinion might be obtained through the *JOURNAL* on the merits of employing small-bore meters. I see the last patent applied for a water-meter is supplied by a $\frac{1}{2}$ -inch service-pipe; and these are about to be introduced into a foreign water-works for the general supply to the inhabitants. My own experience of $\frac{1}{2}$ -inch meters proves that, with moderately hard unfiltered water, the $\frac{1}{2}$ -inch apertures, and the small working parts, soon become corroded—rendering so small a machine useless.

Sept. 12, 1888.

MAINS.

THE SUPPLY OF OIL GAS AT COLINSBURGH.—"Utility" (whose letter on this subject was published last week, with an editorial note appended to it) writes to justify the opinion he gave of the "news article" which appeared on page 427 of the *JOURNAL* of the 4th inst., to the effect that it was of our own construction and "somewhat prejudicial to the gentleman whose name was freely used therein." Our correspondent writes: "The 'article' begins by referring to your readers as *our readers*; and next, you say there has been 'communicated to one of the Edinburgh newspapers,' 'results,' which you do not give. But you go on to 'broadly' give your deductions from those results, elsewhere reported; and, in doing so, you place the unsupported testimony of an ordinary unskilled gas consumer against the tabulated facts and experience of a gentleman who has by force of circumstances made oil-gas manufacture and distribution a practical study, and, further, one who, being a lawyer and banker, his judgment and figures are entitled to the respect usually accorded to an intelligent mind." The word "broadly" (in connection with the deductions from the experiments in question) was made use of in the original correspondence by Mr. Dawson—the very gentleman whose cause our correspondent is taking up; and who, it may be remarked, has evidently not been misled, as "Utility" would have us believe that he has been, by the way in which the communications to the Scotch newspapers were referred to in our columns.

THE WALSALL GAS UNDERTAKING.—At the meeting of the Walsall Town Council on Monday last week, on the recommendation of the Gas Committee, authority was given to raise £5000 of additional capital for the purposes of the gas undertaking, and towards defraying the cost of the new gasholder and tank.

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

WEDNESDAY, SEPT. 12.

(Before Mr Justice DENMAN, Vacation Judge.)

BLAKER V. HERTS AND ESSEX WATER-WORKS COMPANY, LIMITED.

Mr. INGPEN, appearing for the plaintiff (who sued on behalf of himself and all other debenture holders in this Company), to-day moved for the appointment of a Receiver and Manager of the undertaking of the defendants. In 1883, the Company issued debentures to the amount of £6250; these being a first charge upon the undertaking, land, works, plant, property, and effects, both present and future of the Company. The principal of each debenture was payable on July 1, 1888, and interest at the rate of 5 per cent. half-yearly; but default had been made in payment of the principal, and one-half year's interest was in arrear. The whole of the share capital had been fully paid-up; and it was necessary, in order to carry on the undertaking, that the Company should obtain large advances of money. In 1885 an Act was passed extending the borrowing powers of the Company by an issue of £12,250 of debentures. This power the Company was desirous of exercising; but, of course, they could not give a prior charge to that of the plaintiffs, who refused to assist in the carrying out of the arrangements for obtaining fresh capital.

Mr. BRAY, who appeared for the Company, said he was willing to consent to the appointment of a Receiver.

Mr. INGPEN said he was instructed to ask for the appointment of a Manager as well as a Receiver. The Company had suggested that the debenture holders should exchange their debentures for those of the new issue. But this proposal had not been acceded to; and the Directors had sent out a circular in which they stated that nothing could be done unless the existing debenture holders would exchange their debentures, and that the only alternative appeared to be the winding up of the Company, as it was impossible to go on with the business without more plant and money. As the Company could not carry on its business, the debenture holders had a right to take possession, and carry on the concern with a view to protect the property over which they had a first charge. Under these circumstances, he asked for the appointment of Mr. Evans as Receiver and Manager.

Mr. BRAY submitted that it was not the practice of the Court to appoint a Manager.

JUSTICE DENMAN pointed out that the Directors had admitted they could not carry on the business of the Company.

Mr. BRAY suggested that the Secretary should be appointed, in which case the expenses would be considerably reduced.

JUSTICE DENMAN said he was of opinion that the plaintiffs were entitled to have a Receiver and Manager appointed; but the proper course was to refer the matter of the appointment to chambers, and this he should adopt.

DAMAGE TO WATER-MAINS BY A THUNDERBOLT.—During a fearful thunder-storm which raged over Toulon and its environs on the night of the 25th ult. a thunderbolt fell upon the buildings of the General Water Company, which are situated about three-quarters of a mile from the city. It penetrated into the principal main of the town as well as into the two mains for serving the town of Seyne, which are both on the road to Dardennes. The large reservoirs below were completely emptied, on account of the bursting of the great central pipe; and the water precipitating into the valley has caused considerable damage.

KESWICK GAS COMPANY.—The report of the Directors of this Company which, with the accounts for the year ending June 30 last, was submitted to the shareholders at their first ordinary general meeting after the passing of the Company's Act (which received the Royal Assent on the 28th of June), held on the 4th inst., stated that there was a balance to the credit of the profit and loss account of £732, which, added to £347 brought forward, made a sum of £1079 available for distribution. A dividend at the rate of $\frac{6}{11}$ per cent. per annum was declared, and a bonus of 1 per cent. per annum added. This absorbed £618; leaving a sum of £461 to be carried forward.

AN ELEPHANT IN A GAS-WORKS.—A large elephant, belonging to Messrs. Sanger and Son's circus, temporarily stationed at St. Ives, Hunts, broke out of its quarters last Thursday morning, and committed a great deal of damage. It broke down two or three gates and some fencing, demolished a brick wall, and entered the premises of the St. Ives Gas Company, where, by withdrawing a plug, it wasted about 2000 feet of gas. Finding its way to the retort-house, it gave the man in charge a tremendous scare; and he lost no time in placing a good distance between himself and the unwelcome visitor. After doing considerable damage in the neighbourhood of the works, the animal was captured with some difficulty, and taken back to the circus.

STOCKTON AND MIDDLESBROUGH WATER SUPPLY.—At the meeting of the Stockton and Middlesbrough Water Board on Monday last week, the annual accounts of the Board, which were presented, showed that the total expenditure, exclusive of rent, rates, and taxes, had been £7625 18s. 11d. which was a considerable decrease as compared with previous years. The cost of pumping per 1000 gallons during the current half year, exclusive of uncontrollable expenditure in the shape of rates and taxes, has been 0.579d., or a decrease of 0.081d. on the cost under the Company in 1874-5. The usual report from Mr. J. Mansergh, the Board's Engineer, was submitted, showing that satisfactory progress was being made at the Hury reservoir, and the various other works in course of construction.

NORTHERN COAL TRADE.—The condition of the steam-coal trade does not show great variation during the last few days; the price being maintained at about 7s. 6d. for best Northumbrian qualities. Small steam-coal is abundant, and the price is weak. In the Durham coal trade there is considerable activity. As expected, the Newcastle gas-coal contract has been placed at an advance which may average about 3d. per ton. Some parts of it have been given out at last year's average rate; but on the whole it may be said that the price is now 6s. 1½d. delivered. But this is not a very high rate; and if it be supposed that the railway carriage averages 6d. per ton, it will be seen that the coal-owner does not obtain a very large price. Gas coal is increasing in demand with some rapidity just now; and there are all the indications of a good season's trade. Many of the leading contracts for this class of coal are now fixed, and some of the most important collieries have about booked the extent of their output; so that it is possible the prices will be dearer for the coal that is not contracted for. Manufacturing coal is now being arranged for for next year; and most of the works which use Durham coal have had to pay from 3d. to 6d. per ton more than the last time of contracting. In some other branches the coal trade shows an improving tendency. Household coal, however, is an exception; and the finer weather will further depress this class of coal.

Miscellaneous News.

THE CHARGES AGAINST THE HALIFAX GAS-WORKS OFFICIALS.

RESIGNATION OF MR. W. CARR.

It will be remembered that at the meeting of the Halifax Town Council on the 5th inst., as reported in the JOURNAL last week, the Corporation Gas Engineer (Mr. W. Carr) was called upon to take proceedings against the *Pall Mall Gazette* for the statement made in the columns of that paper in June last in regard to the coal contracts of the Corporation, or to send in his resignation. It was stated in a paragraph at the end of our report that, according to the Halifax Correspondent of the *Bradford Observer*, Mr. Carr had decided on adopting the latter course. As will be seen by the following correspondence, which has been forwarded to us for publication by Mr. Carr's Solicitors (Messrs. Storey, Bedford, and Willans), this statement was correct. In asking us to insert the letters, Messrs. Storey say they may "confidently appeal to the public to suspend their judgment in the matter for the present, and wait until they have furnished to them something more solid and reliable than mere innuendo."

[ENCLOSURES.]

Keighley Walton, Esq.

Halifax, Aug. 31, 1888.

Dear Sir,—Both before and since our Mr. Storey's conversation with you and the Mayor this morning, we have given our best consideration to the proposal made by the Committee that our client, Mr. Carr, should commence an action against the proprietor of the *Pall Mall Gazette* for libel. As our Mr. Storey stated to you, we have all along advised our client that an action would not lie; and in this we are borne out by the very opinion of Counsel which you have taken on behalf of the Corporation. This being so, we fail to perceive what good could be done by taking proceedings which must inevitably prove abortive. Our client is prepared to meet any direct charge which may be formulated; but he would be wanting in self-respect were he to take umbrage at a paragraph in a newspaper which points at no one particularly, and should therefore be treated with supreme indifference. If there is anything which can be said to reflect unfavourably on our client's conduct as the Corporation's Gas Manager, let it be known, and, if untrue, it shall be met at once; or if there is any charge to be made, let our client have the particulars, and he will then be in a position to meet his accusers face to face. This is the position he takes; and sooner than depart therefrom, he would prefer tendering his resignation to the Council, to be dealt with as, after due consideration, may be thought advisable. We think, in the course we have taken, we have advised our client for the best, and do not hesitate to accept any responsibility which may consequently rest upon us.

(Signed) STOREY AND CO.

Keighley Walton, Esq.

Halifax, Sept. 5, 1888.

Dear Sir,—This matter [the "gas scandal"] is, we understand, to be discussed in Committee (Council) this evening. Should the necessity arise for our Mr. Storey to attend before the Committee for the purpose of explaining our client's position, he will be ready to do so.

(Signed) STOREY AND CO.

Keighley Walton, Esq.

Halifax, Sept. 12, 1888.

Dear Sir,—Our client, Mr. Carr, has conferred with us in reference to the resolution of the Council passed on the 5th inst., calling upon him either to commence an action against the *Pall Mall Gazette* or resign his position as Gas Manager. Notwithstanding all that was advanced in alleged justification of the course the Council were taking, our client is still advised that no action can possibly lie against the proprietors, printers, or editor of the *Pall Mall Gazette*; and therefore to commence the proceedings required by the Council is out of the question. We addressed a letter to you on the 31st ult., which we are surprised to find was not communicated to the Council, and consequently could not be taken into consideration by the members of that body. Further than this, although you knew our Mr. Storey was prepared to attend before the Council, for the purpose, if necessary, of explaining our client's position, he was not called upon, but excluded from the Council Chamber during the discussion; thus leaving our client practically unrepresented. Under these circumstances, and for the reason given in our letter to you, our client has no alternative left him but, through us, to resign his position as Gas Manager; this being the only dignified course a man of Mr. Carr's position and reputation can take. In accepting the alternative given him, our client reserves to himself the right of enforcing against the Corporation such claims as the action of the Council may enable him to make.

(Signed) STOREY AND CO.

Town Clerk's Office, Halifax, Sept. 13, 1888.

Messrs. Storey, Bedford, and Willans, Solicitors.

Dear Sirs,—I am in receipt of your letter of yesterday's date. Your letter of the 31st ult. was handed to the Mayor, who used his own discretion as to its being read to the Council. You are mistaken in stating that I knew your Mr. Storey was prepared to appear before the Council. I did not receive your letter until after the close of the Council meeting; but I am authorized by the Mayor to state that such a course would not have been permitted.

(Signed) KEIGHLEY WALTON.

Keighley Walton, Esq.

Sept. 13, 1888.

Dear Sir,—We note the contents of your letter of this morning, which, with copies of our letters to you, we propose inserting in the newspapers, so that the public may know the exact position our client, Mr. Carr, has taken.

(Signed) STOREY AND CO.

The following paragraph appeared in the *Bradford Observer* last Friday:—"It is now generally expected that the Mayor will, as soon as practicable, sign the indemnity to Mr. Thomas King Fox, of the Silkstone Colliery Company, near Barnsley; and Mr. Fox will then forthwith, according to the terms of the indemnity, give the names and addresses of the persons against whom he alleges malpractices, together with details and particulars of such charges. There is a considerable undercurrent of sympathy in the district with Mr. W. Carr, and the ratepayers are very loud in expressing their opinion that the matter should be sifted to the bottom, and that Mr. Carr's resignation should not in any sense be allowed to operate to the advantage of other persons against whom malpractices are alleged, and who, it is understood, are quite equal financially to the task of vindicating their characters and reputations."

CRYSTAL PALACE DISTRICT GAS COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held last Friday, at the Albion Tavern, Aldersgate Street, E.C.—Mr. FREDERIC LANE LINGING in the chair.

The SECRETARY (Mr. Magnus Ohren, Assoc. M. Inst. C.E.) read the notice convening the meeting; and the Directors' report and the statement of accounts, an epitome of which appeared in the JOURNAL for the 4th inst., were taken as read.

The CHAIRMAN in moving—"That the report of the Directors and the balance-sheet, examined and signed by the Auditors, be received, adopted, and entered on the minutes," said that the Directors entertained the hope that the results of the past half-year's working had met with the shareholders' approval; for not only had they been enabled to earn the dividends upon the whole of their capital, but were able to carry the sum of £3686 to the next half year. The figures in the accounts stood somewhat thus: Their profit, including the interest upon the reserve fund, amounted to £17,311, and the dividend would absorb £13,625; leaving the balance he had mentioned to be carried forward. This balance, added to that brought from the half year ending Dec. 31, 1887, gave them an available floating asset of very nearly £5000; and therefore the Board thought they were supported in the announcement of a further reduction in the price of gas to 2s. 8d. per 1000 cubic feet, to take effect from the close of the present quarter. Should the coal dues cease to exist in the course of next year, there would come to the revenue of the Company a sum more than sufficient to enable them to lower the price to 2s. 7d. per 1000 cubic feet. This asset, which the Board hoped would be realized, would, in their particular case, go to the gas consumer, because, as the shareholders were aware, by the Acts of the Company they had no sliding scale; and therefore they were unable to raise the dividend as they reduced the price of gas. Perhaps it might not unfairly be assumed that the shareholders indirectly benefited by these reductions, because lowering the price of gas necessarily stimulated consumption. Increased consumption, of course, required more plant; and this additional plant compelled the Directors to call upon the shareholders to provide the money to enable them to carry out the work. Thus he considered that indirectly the shareholders benefited to a certain extent. Perhaps in the history of gas manufacture there never was a time like the present when it was so advisable for those who had the control of gas interests to endeavour to reduce the price of gas to the lowest possible point; and he knew full well that the directors of gas companies and their chief officers were imbued with this feeling, and he knew they had exerted themselves in every possible way to carry it out. They need not be at all alarmed at electricity or those cheap oils which were coming into competition with gas. At the same time, he thought it would be sheer folly for them to ignore the fact that the electric light was now a light of continuity, which it had not been up to within a recent period. But it was a costly light; and therefore only within the control of those who were indifferent to the expense. As regards petroleum, however, this he knew was coming into competition—not so much perhaps in the Metropolis as it was in the provinces, to his knowledge. Although he alluded to these things—and it was well to keep them in sight—he had unbounded faith in gas. He believed it would maintain its position, and continue in that healthy prosperity which now surrounded it. Upon a former occasion, when he had the privilege of addressing the shareholders, he referred to their coal arrangements; and he did so because coal was necessarily of very vital importance to the Company. He then mentioned certain savings the Board had been enabled to make; and he was glad to say he could continue upon this score, and now announce that they had effected a further saving in the cost of the coals in the shape of freight. With the shareholders' permission, he would take the two previous years, and compare them with the present half year. Their coals cost them in the year ending December, 1886, 15s. 14d. per ton; and for the year ending December, 1887, 14s. 5½d.; but for the half year under consideration they had only cost them 13s. 11d. He did not know whether they would be able to effect another saving under this head; but the shareholders might be assured of this, that if they could do so they would. There was one paragraph in the report that he should like to briefly dwell upon—that was the one in regard to the retirement of Mr. Henry Palfrey Stephenson from the chairmanship of the Company. Mr. Stephenson unhappily had been declining in health for some time; and there was no doubt that, had his own wishes been consulted, he would have retired from the chair some twelve months or more ago. But out of deference to the expressed desire of his colleagues, he consented to continue in the office until the spring of this year, when the time came for the re-election of the Chairman for the following year. Mr. Stephenson appealed to the Board in very strong terms, and begged them not to nominate him to the position, as his health was such that he could not possibly undertake its duties. Most reluctantly they consented, but asked him to take upon himself the duties of Deputy-Chairman; and this he agreed to do. As Mr. Stephenson was not there, it would not be deemed bad taste on his (the Chairman's) part if he made a little further allusion to him. He might state to those gentlemen who were unacquainted with the early history of the Company, that Mr. Stephenson was one of its first Directors, and Dr. Hetley was another. There was no doubt that Mr. Stephenson in those early days placed the Company upon a solid foundation; and he had shown an amount of energy and loyalty to its interests which he (the Chairman) did not hesitate to say, had never been surpassed. His intellect, happily for him was as strong as ever. He need not say how gratified they were as Directors to know that they would retain the services of one whom they so esteemed and respected. Turning to the accounts, he said he did not know that he need take up much of the shareholders' time in referring to them. However, he would just allude to one or two matters of interest. As to coals, they had in this item a saving of £773, as compared with the corresponding period of last year; and then on the credit side of the account they had an increased rental of £1622. The other items on the debit side of the account were such as would necessarily vary; and they did so in this half year. Under the head of repairs to retorts, &c., there was certainly an increase of something like £700. Most of those present were well acquainted with gas matters, and were aware that in a gas-works it was impossible to get these amounts the same half year by half year; and therefore there was an increase in the six months under review. This also applied to meters, stoves, &c. With these exceptions, there were no items he need allude to on the debit side of the account. When he turned to the credit side, under the head of residual products, they would find that coke was £2565 in excess of the corresponding period of 1887. Sulphate of ammonia and ammoniacal liquor had also increased by £342. These two items made a sum of nearly £3000; and he was pleased to state that they had not had such results under the head of residual products for some time past. The coals carbonized had increased by 1125 tons; and they had sent out 12,380,000 cubic feet of gas (or equal to 3.63 per cent.) over the corresponding period of last year. The Directors were anxious about this matter; and they had hoped to show a better result. They believed they would do so in the present and future half years. As the shareholders were aware, the Company's district was a residential one,

with a large number of excessively high-rented houses. Many of these had been untenanted, from circumstances which the shareholders could quite understand. But the houses were now letting at lower rents; and therefore as the tenants came in, so would the Company receive some benefit. Their capital per ton of coals carbonized was as healthy as previously. It was only £4 16s. 7d. The gas unaccounted for over the half year was only 2·30 per cent. Among those present were gas engineers of eminence, who he was sure would appreciate the working of the Company's Engineer (Mr. C. Gandon, M. Inst. C.E.) during the half year.

Mr. GEORGE LIVESY seconded the motion, which was carried unanimously.

The CHAIRMAN then proposed—"That a dividend for the half year ending the 30th of June last be now declared, at the following rates per annum:—viz., 6 per cent. on the preference stock, 7 per cent. on the ordinary 7 per cent. stock, 10 per cent. on the ordinary 10 per cent. stock, and 7 per cent. on the new ordinary 7 per cent. shares, all less income-tax, and that the warrants for the same be forwarded by post to the proprietors, or their authorized agents, on or before the 21st inst."

Mr. JAMES GLAISHER, F.R.S., seconded the motion, which was agreed to.

Mr. HORATIO BROTHERS moved the following resolution:—"That the thanks of the meeting be given to the Directors for their able management of the affairs of the Company." He remarked that he was sure all those who had heard the lucid statement of the Chairman must have come to the conclusion that the works had been very ably managed during the past half year. For a district like theirs, which extended over a very large area, it was astonishing to him, as an old gas man, to learn that the leakage was only 2½ per cent.

Mr. LIVESY: The average is 4·5 for the year.

Mr. BROTHERS said he was speaking of the half year under review. The only thing that struck him was that, in these prosperous times, he hoped the Directors would take care that the works were kept in good order. He also trusted that the Board would treat their officers in a liberal and generous spirit. Their Secretary (Mr. Ohren) was a very able man; and as to their Engineer (Mr. Gandon), he was convinced that they could not have a better one.

Mr. R. HESKETH JONES, J.P., said he had much pleasure in seconding the resolution. As to the remarks of Mr. Brothers, he had to slightly differ from him when he appealed to the Board as to maintaining the works in good order. He (Mr. Jones) thought the half year under review indicated that the Directors had done so, inasmuch as they had expended some £700 additional for repairs and maintenance of works. In speaking of this additional expenditure, the Chairman adopted a somewhat apologetic tone, which he (Mr. Jones) did not think was at all necessary.

The motion was carried unanimously.

The CHAIRMAN, in acknowledging the compliment, observed that if Mr. Brothers would favour them with a visit to the works as an Engineer, he would see that they were in the most perfect state of preservation. The Directors frequently went through the works; and he could assure the shareholders that they would be kept up to the highest degree of efficiency, while care would be taken not to incur any unnecessary expense. Continuing, he moved a vote of thanks to the Auditors (Messrs. A. T. Layton and C. Newton) and the officers of the Company. He remarked that, as there had been a large exchange of stock, in consequence of the Royal College of Surgeons having sold out the shares left to them by Sir Erasmus Wilson, and there might be some new shareholders in the room, he would take the opportunity of letting them know how highly the Board appreciated the services of their officers. Mr. Ohren had been connected with the Company for upwards of 30 years, and a more efficient officer he thought did not exist. Mr. Gandon, their Engineer, came to them with the highest recommendations; and from that time to the present there had not been a single instance when they had to say to him: "Why have you done this; or why did you not do this?" As regards the staff under the supervision of the Secretary and the Engineer, he believed they had as good officers as it was possible for any company to have.

Mr. WESTCOTT seconded the motion, which was agreed to *nem con*.

Mr. C. NEWTON briefly replied on behalf of the Auditors and the other officers of the Company; speaking in high terms of praise of the manner in which Mr. Ohren kept the Company's books.

The proceedings then terminated.

SHEFFIELD UNITED GAS COMPANY.

THE REPORT AND ACCOUNTS FOR THE HALF YEAR ENDING JUNE 30.

The report of the Directors of this Company for the six months ending June 30 last, which, with the accounts, will be presented at the half-yearly general meeting of shareholders on the 1st prox., states that there was in this period a satisfactory increase in the receipts both for gas and residuals, and that the financial position of the undertaking is such that, after the payment of the maximum dividend, and placing £2835 11s. 7d. to the reserve fund, there will be £1138 8s. 11d. to be carried to the credit of the current half year. The Directors recommend the payment of such dividend, which will amount to £6750 on the "A" stock, £10,452 13s. 6d. on the "B" stock, £11,453 10s. on the "C" stock, and £3438 12s. on the "E" shares (£8 10s. each, £6 per share paid); amounting together to £32,094 15s. 6d. The Directors report that the policy of placing meters in consumers' houses, without making any charge for fixing, has been successful. The number of additional meters fixed during the twelve months ending in June last was 1777, against 678 fixed in the previous year. The Board have, as from Oct. 1, 1888, reduced the price of gas in the outlying districts of Dore and Totley to 2s. 2d. per 1000 cubic feet; thus making the maximum price to private consumers uniform throughout the whole of the area supplied by the Company. Under the Sheffield Gas Act, 1886, power was given to raise, by the creation of new ordinary shares, any sums not exceeding in the whole £350,000. This power has up to the present time been exercised to the extent of only £229,070; and the Company can under it still create share capital to the extent of £120,930. The Board recommend that shares of the nominal value of £6 each be created for £120,696, part of the balance, and be offered at par to the existing shareholders, in proportion, as near as may be, to the stocks and shares, or either, held by them. The accounts accompanying the report show that of the £641,895 of capital called up, £633,741 has been expended; leaving a balance of £8154. The amount received for gas and the rental of meters and stoves was £81,409 19s.; residuals produced £26,415 8s. 1d.; and a few miscellaneous items bring up the total receipts to £108,765 13s. 10d. The sum of £58,470 2s. 1d. was expended on the manufacture of gas (£32,787 being for coals), and £4944 16s. 1d. on its distribution; rates and taxes came to £6230 8s. 5d.; and management and miscellaneous expenses make a total of £74,032 13s. 6d.—leaving a balance of £34,933 0s. 4d. to be carried to the profit and loss account. The balance of this account available for dividend is £36,123 16s. The Company's reserve fund now amounts to £64,159. The quantity of coal carbonized was 77,515 tons (12,845 tons being cannel); and the residuals produced were: Coke and breeze, 47,650 tons; tar, 5256 tons; ammoniacal liquor, 2,422,000 gallons.

BRISTOL UNITED GAS COMPANY.

The report of the Directors of this Company, to be submitted to the proprietors at their half-yearly general meeting on the 19th prox., shows that there has been a profit of £30,628 on the working of the undertaking in the six months ending June 30 last, as compared with £21,140 realized in the corresponding period of the past year. There has been an increase in the quantity of gas sold, yielding an additional revenue of £3208. The amount produced by the sale of residual products also shows an advance amounting to £4037; and, by careful economy, a considerable saving has been effected in the expenditure. The Directors remind the shareholders that, with a view to the development of the use of gas for cooking, heating, and motive, as well as for illuminating purposes, a comprehensive exhibition of gas apparatus, containing the most modern appliances, was held in May last, at which lectures illustrative of the use of gas were given daily. As evidence of its success, they mention that upwards of 700 cooking-stoves have since been issued upon hire, in addition to others sold. The Directors record the retirement of their Engineer, Mr. Walter Riddes, after 44 years' service; and say they have awarded him a retiring allowance of £500 per annum. The usual dividend at the rate of 10 per cent. per annum on the nominal capital of the Company entitled thereto is recommended, subject to deduction of income-tax. The quantity of coal carbonized during the six months reported upon was 70,642 tons; the gas made being 672,490,000 cubic feet, of which 615,154,500 feet are accounted for. The residuals produced were: Coke, 48,800 tons; breeze, 6261 tons; tar, 615,354 gallons; ammoniacal liquor, 1,483,180 gallons.

FALMOUTH GAS COMPANY.

The Annual General Meeting of this Company was held on Friday, the 7th inst.—Mr. R. M. TWEEDY in the chair.

The SECRETARY (Mr. R. J. Lukey) having read the notice of meeting, the report and accounts, which were briefly dealt with in the JOURNAL a fortnight ago, were presented.

The CHAIRMAN, in moving the adoption of the report, remarked that the Company had passed through a very eventful year; and there had been many repairs and several important additions to the works. He hoped now that all the heavy work had been finished, that in the future there would not be so many repairs, as the works were now in good condition. The Assessment Committee had sought to raise the assessment on the gas-works; but the Directors could not see their way to paying more, especially as the amount proposed to be added was £200 per year. It had been referred to the County Court Judge (Mr. Morgan Howard) for arbitration; and he had not yet made his award. What was just and right they would pay. Mr. J. W. Buckley had come from Southport to manage their works, and he had had to give considerable attention to improving the retorts and to the repairing of the mains; and when he came to know the district better, he hoped to decrease the leakage, which was much higher than it should be. The profits were not so great this year as last; being £1290, as against £1552. A considerable portion of the alteration was due to the increase in the price of coal; the amount spent being £1825, as against £1581. There had also been an increase in the insurance policy. The amount received for gas had been about £170 more than last year; but the expenditure for repairs and depreciation had been very heavy. They had not written off so much for depreciation this year as they should have done, as they hoped that next year the amount would be less, and then they could equalize matters a little.

Mr. HARVEY seconded the motion, and it was carried.

The CHAIRMAN then proposed a dividend of 5 per cent. for the half year, with a bonus of 6d. per share.

Mr. NICHOLLS seconded the proposition, which was agreed to; an amendment brought forward in opposition to the payment of the bonus being withdrawn by the mover.

The retiring Director (Mr. W. S. Olver) having been re-elected, Mr. W. J. Coward and Mr. S. Tresidder, jun. (the retiring Auditors), were re-appointed to their positions; the last-named gentleman securing 1297 votes against 1252 obtained by Mr. Taylor, who was put forward as his opponent.

A vote of thanks was passed to the Chairman, and the proceedings closed.

BRISTOL WATER COMPANY.—At the meeting of this Company on Saturday, the 8th inst., an interim dividend was declared for the half year ending the 30th of June last on the £25, £20, £6, and £4 10s. ordinary shares, at the rate of 8½ per cent. per annum.

THE QUALITY OF THE NEW GAINSBORO' WATER SUPPLY.—An analysis of water taken from the deep bore-hole at Gainsbro' has recently been made by Dr. Percy Frankland. He finds that the water is palatable, and contains only a trace of organic matter; it is also free from any suspicion of previous contamination with sewage or other refuse animal substances. He says it is a water eminently free from all risk of communicating zymotic disease; and concludes an exhaustive report by saying (1) that as regards freedom from organic matter, and from evidence of animal contamination, it cannot be surpassed; (2) that in its present condition it is very hard, and that after treatment with lime it would still remain a hard water, although the hardness would be thereby reduced to about one-half its present amount; and (3) that the proportion of magnesia contained in it may be objected to, but that this objection could only be justifiably pressed if another water of practically equal organic purity, and containing little or no magnesia, were to be substituted for it. The water contains 35·4° of hardness; 16·8° being temporary, and 18·6° permanent. The quantity of solid matters per gallon is 49·97 grains. The sample was taken at a depth of 1200 feet in the new red sandstone.

SEWAGE WORKS FOR WOLVERHAMPTON.—Last Thursday, the Chairman of the Sewerage Committee of the Wolverhampton Corporation (Alderman J. Gibbons) laid the memorial stone of the new works which are being carried out at the Barnhurst Sewage Farm, near Tettenhall, about three miles outside the town. The works consist mainly of brickwork precipitation tanks, which are being made for the quiescent treatment of the liquid sewage after it has been dealt with by lime. The scheme has been undertaken to prevent a repetition of the expensive claims which have been brought against the Corporation by the owners of landed property lying along the course of the Pendeford Brook for damages caused by the fouling of the watercourse by the entrance into it of unfiltered sewage. The works now under construction will cost about £5630; but the total cost of the scheme will be something like £8300 or more, since part of the project consists in separating the storm water, which will be allowed to flow into the Smethurst and Stow Heath Brooks, which are the natural channels for it. The works consist of excavating some 5300 superficial yards of agricultural land to a depth of 6 feet, and in some portions to 6 ft. 6 in., and the division of the space so excavated into six tanks, each 150 feet by 50 feet, which will be built of Tipton bricks, with walls 2 feet thick, and resting upon foundations of 1 foot or more of concrete and 2 feet of brickwork. Taking the working depth as 5 feet, each tank will hold about 234,375 gallons; and they will be able to treat 2,000,000 gallons of sewage per 24 hours, which is the quantity of the average dry-weather flow on to the farm.

THE GAS SUPPLY OF HASTINGS.

MEETING OF THE GAS COMPANY—THE CORPORATION AND GAS TESTING.

The Half-Yearly General Meeting of the Hastings and St. Leonards Gas Company was held on Thursday, the 6th inst.—Mr. J. BROWN in the chair.

The SECRETARY (Mr. W. B. Young) having read the notice convening the meeting, the report and statement of accounts, an abstract of which appeared in the JOURNAL for the 25th ult., were taken as read.

The CHAIRMAN, in moving the adoption of the report, said the shareholders would recollect that at the meeting last September it was agreed to reduce the price of gas 2d. per 1000 cubic feet from the 1st of January; and, in addition, to pay another $\frac{1}{2}$ per cent. on the whole of the shares of the Company. He estimated then that, even if there were no increase in the working of the Company, if they did not make any more profit than in previous half years, there would still only be a deficiency of £92. As a matter of fact, however, there had been an increase of upwards of 9 million cubic feet of gas consumed beyond that which was consumed in the corresponding period last year. Therefore, instead of being £92 to the bad, they were nearly £1800 to the good. The receipts were nearly £2000 more than for the corresponding six months of 1887; and so they had not to trouble themselves about any deficiency, but could carry forward a large amount to the reserve fund. The profits on the residuals had likewise increased to the extent of £766. Therefore, the question came again before them: What were they to do with the additional profit. The Directors had come to the conclusion that, as the profits continually increased almost in arithmetical progression, they should do something with the money instead of putting it in the reserve fund; and they decided that the time had come when they might further reduce the price of gas. They had determined, from the 1st of January next, to lower the price another 2d. per 1000 feet. While this would carry an extra $\frac{1}{2}$ per cent. profit to the shareholders, he should like to point out that it was the gas consumers who obtained the greatest advantage. When 2d. per 1000 feet was taken off the price of gas, it represented nearly £1200; whereas the increase of dividend only amounted to £400. One matter to which he wished to call their attention was the way in which a great many people compared the Hastings Gas Company with other companies as to the amount of dividend declared. But in these matters they must take each company on its own footing, as there were many ways in which one differed from another. One of the principal features in the case of the Hastings Company was the large amount which had to be paid as duty to the Corporation, and which amounted to about £3200 a year. If the Company could get rid of this, they would then be quite able to reduce the price of their gas 3d. per 1000 cubic feet. There was, he believed, scarcely a case in the country in which the raw material of manufacture was taxed to the extent of 45 per cent. on the prime cost. There was another point about the coal duty to which he desired to draw their attention. It had been going on for some time; but he could not find out anything about the origin. They had to pay 2s. 5½d. a ton on the coal brought in; but they only received 1s. 8d. a ton for coke taken out. He had been to the Town Clerk about it, and also to the Collector of Coal Dues; and they could not say anything as to why it was so. If they paid 2s. 5½d. when coal was brought in, he thought they should receive the same amount when it was taken out. As it was, they lost 9½d. on every ton of coal they sent out of the town, and this was a very serious drawback. It placed them at great disadvantage when competing with coal merchants outside the town. The proprietors would perhaps remember that in London an agitation had been going on against the coal duties; but there it was only a question of 1s. 1d. It would make a great difference to the Hastings Gas Company if the coal duty in the town could be got rid of. There was another point, and that was the testing of the gas. They were well aware that the Corporation had lately taken up the case of the consumers, and had appointed an inspector of their own to test the gas. He objected to the conduct of the Corporation in this matter. If the Council had the interest of the consumers at heart, and brought a man down to Hastings, the least they could do would be to publish the reports, and let people know what he said. But the Corporation had not done so. Because the report was a good one, they kept it quiet. If it had been a bad one, the report would very soon have found its way into the papers. It had been kept till the 27th of June, and not published. He did not think this was fair. The Council wanted to get a second report, to see if it was a bad one; but, as it happened, it was better than the first. Still they had not published it. He, however, should do so. He had the reports in his hand, and he was going to read from them. That of the 27th of June stated that the illuminating power of the gas was 15·53 candles; the standard of the Company being 15 candles. The sulphur was 11·6 grains, whereas the Act allowed 25 grains. The ammonia was 1·4 grains. The report also stated that there was a slight trace of sulphuretted hydrogen. He strongly objected to this. Mr. Botley, the Engineer and Manager, and the other analysts in their employ said that there never was a trace of sulphuretted hydrogen; and tests had been made for some months past, and yet no trace could be found. The Corporation Gas Examiner, however, had been clever enough to find it. But he (the Chairman) maintained that this gentleman did not test the gas fairly; for he left the test-paper for sulphuretted hydrogen in the gas for 20 hours, whereas the Act of Parliament stated that it should only be left in for three minutes. The report for the 28th of August had not yet been published. It showed that the illuminating power was 15·41 candles; the sulphur, only 9·8 grains; and the ammonia, 0·6 grain. This was almost nothing; and there was no trace of sulphuretted hydrogen. He thought that, so far as the Company were concerned, they had come triumphantly out of the test. He did not think, however, that the Corporation had acted fairly in keeping back the reports instead of publishing them. It was a public matter; and the results should be made known.

Mr. STUBBS (the Mayor) expressed the opinion that the Chairman had gone a little out of the way to attack the Lighting Committee of the Corporation. As far as the Council were concerned, they were willing, on behalf of the inhabitants of the borough at large, to appoint a gas inspector, as they felt that it would be for the public benefit. There was nothing to compel them to publish the inspector's reports; and they only waited for the money to enable them to do so. Personally he thought they should be published. With regard to the coal dues, that was a very difficult question, but he did not think Mr. Brown's arguments would carry weight. It was a great benefit to the town that there should be coal dues; and if the money was not raised in this way, it would come out of the rates. It was a question for all to consider whether it was not an advantage that there should be some revenue from coal. What was left after the manufacture of gas was really a profit to the Company; and therefore he thought the shareholders should not grumble because they had to pay. As to the reserve fund—

The SECRETARY: It is a floating balance.

Mr. STUBBS agreed that it was; but he said he should like to see it in a rather better position. Floating balances varied from day to day. The shareholders could not, he thought, see from the balance-sheet where it was, or that it was in such a position that they could draw a cheque

on it. It would be much better, in the next accounts, to show of what the balance consisted, so that it might be put in tangible shape. He had great pleasure in seconding the motion for the adoption of the report, which he should like to be put a little more clearly.

Mr. WALTER observed that the report was drawn up in accordance with the Act of Parliament. If the shareholders cared to take the trouble, they could learn from the balance-sheet the position of the Company. Nobody could be dissatisfied with the report. Dividends of 6½ and 11½ per cent. were paid; and there was to be a reduction in the price of gas next January. Whether or not it would be possible to grant the consumers any greater concession in price, the Chairman knew better than he did. The reduction promised was a small matter, seeing that they had £23,000 to deal with. He thought it extraordinary that the duty paid by the Company on their coal should be nearly half its prime cost; but he considered that, on the whole, the shareholders might congratulate themselves on the position of the undertaking.

The CHAIRMAN (referring to the remarks of the Mayor) said he thought that if his Worship had looked into the accounts, he would have seen that they were audited, and that the balance-sheet showed all about the reserve fund.

Mr. STUBBS: I want it shown in a more tangible form.

The report was then unanimously adopted.

The retiring Directors (Messrs. Thorpe, Gray, and Weston) were then re-elected; and Mr. F. Ransom was appointed an Auditor in place of Mr. F. Bennetts, who had retired on account of ill-health, and to whom a vote of thanks was accorded for his services.

The usual complimentary vote of thanks was accorded to the Chairman, and the proceedings closed.

At the Meeting of the Hastings Town Council on the following day—the Mayor (Mr. Stubbs) presiding—the Lighting Committee reported that since the appointment, on the 1st of June last, of Mr. W. C. Young, F.I.C., F.C.S., as Gas Examiner, he had twice tested the gas at the works of the Hastings and St. Leonards Gas Company, and had reported the result as follows:—June 25: Illuminating power, 15·53 candles; sulphur, 11·6 grains per 100 cubic feet; ammonia, 1·4 grains per 100 cubic feet; slight trace of sulphuretted hydrogen. Pressure, at 9 p.m., June 25, 2·8 inches; June 26, at 3·50 p.m., 1·5 inches. Aug. 25 and 27: Illuminating power, 15·41 candles; sulphur, 9·8 grains per 100 cubic feet; ammonia, 0·6 grain per 100 cubic feet; no trace of sulphuretted hydrogen; day pressure, 1·5 inches; night pressure, 3 inches. Mr. Young stated, in regard to his first report, that as the Company's Act requires the gas to be wholly free from sulphuretted hydrogen, they had failed in this respect. He added: "The sulphur, ammonia, and sulphuretted hydrogen tests extend over a period of 20 hours; so that the above results represent the average amount of impurities contained in the gas supplied between about eight p.m. on the 25th, and four p.m. on the 26th of June."

Mr. JENNER, in moving the reception of the report, remarked that he was placed at a slight disadvantage in not having seen that morning's local journal, which gave a report of the Company's meeting on the previous day. He understood the Lighting Committee were dealt with somewhat harshly. He believed one great fault they were charged with was that they did not bring forth the report of the Gas Examiner soon after it was received by the Committee. The reason was simply this: The Committee did not receive the report of the test until after the agenda papers had been returned for the Council meeting. It would have been somewhat out of order if it had been brought forward without having been noticed on the agenda. They certainly had no idea whatever of keeping back the report because it was a good one. He believed the Chairman of the Company had said that if it had been a bad one they would have given it at once. This would not have altered the case at all. But that afternoon they had the advantage of having the reports side by side, together with the requirements of the Gas Act. Now, he was of opinion that both reports were very satisfactory indeed. The Act required the Company to supply gas of 15-candle illuminating power. In the first report they had 15·53 candles. This was very gratifying indeed. The sulphur was considerably below the amount allowed by the Act; it was 11·6 grains, compared with 25 grains per 100 cubic feet. The presence of ammonia, about which, he believed, there was no restriction, was very small. The most objectionable part was the sulphuretted hydrogen. The Act required that it should be quite absent. In the one report there were slight traces of it; but in the second none. The illuminating power of the gas in the second report was not quite so good; but the difference was very slight, and the quality was considerably above the standard required. The sulphur had been reduced from 11·6 to 9·8 grains, and the ammonia to 0·6 grain. He thought this report was a very satisfactory one, and one which would compare most favourably with the gas supply of any town in the kingdom. It was also satisfactory because it showed that the Directors of the Gas Company had acted upon the information contained in the first report. As to the pressure, it was considerably beyond that required by the Act. If the pressure was really acting injuriously upon the gas consumers, it was their own fault, because they could regulate the supply if they chose to do so. He was glad that the returns were as satisfactory as they had turned out to be. He trusted the Company would feel that the thing had worked so admirably that they might be induced to still further reduce the price of gas at no very distant time. He was quite sure their interests would not suffer by such a course.

Mr. REVILL seconded the motion. He said he agreed in the main with what had fallen from the Chairman of the Lighting Committee; but he wished to know whether there was any regulation with regard to the pressure of gas in the mains. He had heard many large consumers say that, although the price was less than formerly, the charge for the quantity consumed did not diminish in any way, and that this was accounted for by the extra pressure put on by the Company. He thought this was a point which should, if possible, be taken in hand by the Committee.

Mr. B. F. MEADOWS read the clause in the Company's Act relating to the pressure—viz., that it should be not less than 6·10ths in the day, and 8·10ths at night.

Mr. REVILL: There is a minimum, and not a maximum.

Mr. JENNER remarked, as to the publication of the reports, that he would endeavour in future to have each one brought up at the Council meeting following the date of its presentation.

The report was adopted.

THE COST OF THE TRANSFER OF THE SHEFFIELD WATER-WORKS TO THE CORPORATION.—The minutes of the Water Committee of the Sheffield Corporation which were presented at the meeting of the Town Council last Wednesday, included a detailed account of the parliamentary costs incurred in promoting the Sheffield Corporation Water Act and opposing the Sheffield Water Bill of last year, and of the costs of the polls of owners and ratepayers on the Corporation Bill. The account shows payments amounting in the aggregate to £12,544, in addition to £1900, the cost of the proceedings under the Borough Funds Act. A sum of £2862 was returned as the cost of witnesses.

STRIKE OF GAS STOKERS AT SALFORD.

The stokers employed at the Regent Road Gas-Works of the Salford Corporation (about 80 in number) have left their employment in consequence of the introduction of changes in the work of the retort-houses by Mr. Shoubridge, the new Engineer and Manager. It appears that under the old arrangement, a stoker's daily task was to charge a certain number of retorts with coal amounting in all to 2 tons 5 cwt., and draw and quench the coke. In addition to this he had to wheel the coke, which amounted to about 27 cwt., to the heap in the yard, to wheel in his coal, and attend to one of the furnaces; so that the weight handled per shift was: Coal loaded up, wheeled into the retort-house, and charged into the retorts, 2 tons 5 cwt.; coke wheeled out, 1 ton 7 cwt.; furnace refuse wheeled out (say), 2 cwt. For this work he received 5s. The new arrangement consisted in subdividing the work into four classes—(1) stokers, who simply charged and drew the retorts, and quenched their coke; (2) coal wheelers; (3) coke wheelers; and (4) firemen, for the furnace work proper. The firemen and stokers, being skilled men, were paid the same rate as before—namely, 5s. per day. The coke wheelers, who handled about 5 tons of coke, received 4s. 3d. per day. The wheeling of the coal was done at a piecework rate per ton. It is considered by the Manager that the new system is really better for the men than the old one, because the stokers and firemen are not obliged to go out of the retort-house during their work, whereas before they were compelled to leave the retorts every few minutes, and wheel their coke into the yard in all states of the weather. Notwithstanding that the quantity of material handled is really less than under the old system, the men assert that it is physically impossible for them to work under the new. One feature of the latter system is that the work is done in six shifts, each lasting about three-quarters of an hour. The stoker then rests for about an hour and a quarter, when he begins another spell in the same way; so that he gets altogether about five hours' work and seven hours' rest in the twelve-hour shift. The men gave the Gas Committee seven days' notice, which expired in some cases at six o'clock on Thursday night, and in others at six o'clock on the following morning. Before the expiration of the notices a proposal was, we understand, made that they should withdraw them, in order to afford time for discussion of the matter in dispute. This they declined to do; and the Committee have therefore been obliged to obtain other men to carry on the work. A large number of applications have been received from stokers in different parts of the country; and the Committee do not anticipate any difficulty in filling the vacant places.

THE BURY CORPORATION GAS-WORKS ACCOUNTS.

The Borough Auditor for Bury (Lancs.) has presented to the Town Council his report for the year ending March 31 last, in the course of which he gives the following tabulated statistics:—

The rental for the past year, including meter-rents, is	£27,696 19 0
Residual products, &c.	8,978 12 2
	£36,675 11 2
The cost of manufacture and distribution and expenditure on buildings and plant charged to revenue amounts to	28,079 3 6
Leaving a gross profit of	£8,596 7 8
From this is deducted—	
Interest on loans and stock	£3,644 16 7
Rebate on stock issued.	100 0 0
Sinking fund	3,140 9 0
And carried to reserve fund, raising it to the maximum of £5000	1,605 11 10
	£4,909 17 5
Leaving a net profit of	£105 10 3

One moiety of which, £52 15s. 2d., is taken to general rate, and the other moiety is added to the previous year's revenue balance. This method of treating the profits (says Mr. Merchant) is in pursuance of a resolution passed by the Council on the 1st of December, 1887. The books and the bills sent to consumers show the amount due for gas at 2s. 11d. per 1000 feet; and a deduction of 4d. per 1000 for share of profits. This 4d. has not, however, been taken out of the profits; therefore the rate should have been stated simply as 2s. 7d. per 1000. This anomaly, he says, is no doubt explained by the resolutions as to the price of gas for the year having been passed before the Council had finally dealt with the year's statement of accounts.

THE GAS QUESTION AT BIRKENSHAW.

Last Thursday, in compliance with a numerously signed requisition of occupiers and property-owners to the Chairman of the Birkenshaw Local Board, a well-attended meeting was held in the Temperance Hall, "for the purpose of considering the gas question, the offers made by the Gomersal Gas Company to supply gas to the consumers in the district, the present excessive prices charged by that Company, and the advisability of adopting other means of lighting the district, either through the aid of another company, or otherwise, as may be determined." The Chairman of the Board (Mr. T. Pitts) presided. Mr. B. Crowther, as Chairman of the Gas Committee, read some correspondence which had passed between the Gomersal Gas Company and the Local Board in their endeavours to get suitable reductions. Special attention had been given to the question by the Local Board; and they, along with some of the largest consumers in the district, had waited upon the Gomersal Company, who had issued a revised scale which was only an advantage to the largest consumers. These terms were considered unsatisfactory. The terms which the Gomersal Company had offered to the Board were then submitted, as follows:—Under 100,000 cubic feet per annum, 11d. discount per 1000, 3s. 3d. net price; 100,000 to 500,000 cubic feet, 1s. 2d. discount, 3s. net; 500,000 to 1,000,000 cubic feet, 1s. 5d. discount, 2s. 9d. net; 1,000,000 to 1,500,000 cubic feet, 1s. 8d. discount, 2s. 6d. net; 1,500,000 cubic feet and upwards, 1s. 11d. discount, 2s. 3d. net. On receipt of the amended terms, the Board and the large consumers referred to decided unanimously that, whilst thanking the Company for the small concessions, they could not accept them as a satisfactory settlement, and advised the Company to effect a further reduction. What the consumers asked for was a reduction of 3d. per 1000 feet on the two scales. The Gomersal Gas Company had replied, stating that, inasmuch as they had made reductions amounting to 1s. 3d. per 1000 cubic feet during the last few months, which they did not consider a slight concession, and having carefully gone through the case, the Directors could not make any further alteration. They quoted a number of gas companies and local boards whose charges were in excess of the Gomersal prices, but had carefully avoided, so the speaker said, quoting either the prices of the Drighlington and other companies whose scales of charges were less than their own. Mr. Crowther advised the meeting to agree, if possible, with the Gomersal Company; and if this could not be done, they ought, he said, to consider the question of providing their own gas-works, though the Board would only act in accordance with the expressed wishes of the meeting. After several consumers had spoken in opposition to the Gomersal prices, it was resolved—"That in the opinion of this meeting the revised

terms of the Gomersal Company cannot be accepted as satisfactory, and that the Local Board be urged to strongly adhere to the resolution adopted by them, and not to light the public lamps in the district until a concession be made." A further resolution was adopted, urging the Local Board to ask Mr. Matthew Hillas, of Tong (who, it may be remembered, receives a supply from the Bradford Corporation), if he would be prepared to serve Birkenshaw as well as Tong Street. It was stated that several of the consumers, including members of the Local Board, had discontinued to use gas; and these expressed their determination to adhere to this practice. Thanks were given to the Chairman and the various speakers, and the meeting closed.

THE WOLVERHAMPTON CORPORATION AND THE GAS COMPANY.

THE SPECIAL COMMITTEE'S REPORT.

At the Meeting of the Wolverhampton Town Council on Monday last week—the Mayor (Alderman J. Jones) presiding—the report of the Special Sub-Committee appointed "to consider the question of the supply of artificial light for the use of the inhabitants of the borough, and to obtain such professional advice with reference thereto as they might think fit," was presented. The report was given in the JOURNAL last week.

Mr. IRONMONGER, the Chairman of the Committee, moved—"That the report of the Special Gas Committee, this day presented to the Council, be adopted; and that, in accordance with the recommendations therein contained, a deputation, consisting of the Streets Committee and the Chairman of the Special Gas Committee, be and they are hereby empowered to meet the Directors of the Gas Company, with a view of obtaining the concessions embodied in the report, or such other terms as they may consider satisfactory, relative to all or any of the matters dealt with in the report, and to cause the corporate seal to be affixed to any agreement which may be necessary to give effect to any negotiations between the Committee (as representing the Council) and the Gas Company, and that, in case satisfactory terms cannot be arranged with the Gas Company, the whole question be referred to the General Purposes Committee to take such action thereon as they shall think fit." He said that he did not propose to trouble the Council with very many remarks concerning the report, as it was of sufficient length itself. It dealt with the question fully, and gave the views of certain experts who had been consulted, together with the criticism of the Gas Company. Since the publication of the report, he had received further information, which he would lay before the Council, and which was confirmatory of what was stated in the report. After referring to the paragraphs in the report which dealt with the mode of lighting by electricity, he remarked that the Committee had obtained very valuable information from 87 towns. He had before him certain bills and charges issued by various corporations and companies. From them he found that at Nottingham the price of gas per 1000 cubic feet was from 2s. 2d. to 2s. 4d.; whilst the price at Wolverhampton was 2s. 6d. with 16²⁵-candle light. There were four points to which he wished to call their attention—namely, the price of gas, the illuminating power, meter-rent, and discount for cash payment. The consumers in Wolverhampton did not obtain discounts, and had to pay meter-rent. At Nottingham the quality of gas supplied was equal to 18¹/₂ candles; but there was no discount given, and meter-rent was charged. At Bradford the price was 2s. 3d. per 1000 cubic feet; the candle power 18¹/₂; and discount was allowed according to the quantity of gas supplied—the discount varying from 2¹/₂ to 12¹/₂ per cent. At South Shields the price was 2s. 3d. per 1000 cubic feet, with a discount of from 7¹/₂ to 20 per cent. At Wigan it was 3s. 1d., subject to a discount of 4s. in the pound; and the illuminating power of the gas was equal to 19¹/₂ candles. At Leeds the price was 1s. 10d.; illuminating power 19-10 candles; and the discount 5 per cent. for cash in a month, or 2¹/₂ per cent. in two months. The charge at Leicester was 2s. 4d. net; and the illuminating power, 18 candles. At Walsall, 2s. 5d. net; and the illuminating power was 16¹/₂ candles. At Tipton the price was 2s. 5d.; illuminating power, 17¹/₂ candles; and the discount, 5 per cent. At West Bromwich 2s. 5d. was charged; with an illuminating power of 16¹/₂ candles; and 5 per cent. discount. Birmingham charged 2s. 3d.; the illuminating power was 17¹/₂ candles; and the discount was 5 per cent. At the four last-named places—viz., Walsall, Tipton, West Bromwich, and Birmingham, there was no charge for meters. He thought when they looked at the question of meter-rent, it was one which should be very seriously considered. The meter was for the protection of the Gas Company; therefore, he thought, they should not ask the gas consumers to pay for that protection. The returns he had given were in favour of Wolverhampton; but in some cases they were less favourable as regards quality and price. There was nothing in the situation or circumstances to prevent Wolverhampton doing as well as other boroughs. There was another item worthy of consideration, and that was the payment by the Gas Company of 10 per cent. dividends free of income-tax. This was a matter which was gone into in 1866 when the concern and business of the gas undertaking was inquired into at the Quarter Sessions. From 1852 to 1866 the Company paid on behalf of the shareholders no less than £3610 16s. 9d. in income-tax. The amount paid by the Company upon the last half year out of their profits represented two-thirds of a penny per 1000 cubic feet; and this would have done something towards a penny reduction in the present price of gas. They were told that £2672 had recently been taken from the reserve fund to make up the deficiency on profits, which sum would represent 1'83d. per 1000 feet, almost equal to a reduction of 2d. This was of sufficient importance to call for the attention of the Corporation, especially when they were assured by the Town Clerk that, in his opinion—having regard to the decision in a case which had been brought before the Quarter Sessions—it was illegal. Upon that he (Mr. Ironmonger) was prepared to stand. Then there was another matter which was of great importance, and that was with regard to the working of the Company. He contended they had a right as consumers, and especially the Corporation, as protectors of the public, to see that the Company did not abuse the privileges given to them by Act of Parliament. Certain privileges had no doubt been put into the hands of the Company; and evidently it was the intention of the Legislature in limiting the dividend that the utmost care should be exercised in the manufacture and distribution of gas, so that, when they had earned their 10 or 6 per cent. as the case may be, they should devote the additional profit to the benefit of the consumers. The Accountants engaged by the Committee, who had had a long experience, had made some very strong remarks about the matter. With regard to the cost of coal and the yield of gas, the Wolverhampton Gas Company did not compare favourably with the other boroughs and companies which were called in review. The average cost of coal per 1000 cubic feet of gas for eight corporations quoted was 12-57d., and 13-80d. for ten private companies; whereas the Wolverhampton Gas Company reached 17-60d. By the latter Company coal was used for fuel instead of coke; and the revenue from coke was a material element in the calculation. Taking the same eight corporations, the average cost of coal, less residuals, averaged 7-31d.; the ten companies, 7-62d.; whereas the Wolverhampton Company ran up to 12-26d. When they had looked at the accounts of their neighbours for 1887, they found that Walsall stood at 7d. and

Birmingham at 5.59d.; so the comparison made between Wolverhampton and Birmingham in the reports for 1886 was borne out by the same comparison in 1887. In regard to the gas sold, Wolverhampton stood better in 1887 than in 1886; but even now was still a very large percentage behind the figures representing other towns, both local and distant. From the Board of Trade returns for 1885, Wolverhampton looked peculiar, compared with the filed accounts presented to the Clerk of the Peace. The latter showed the amount of coal carbonized to have been 51,600 tons; whilst the former showed the quantity to have been 41,220 tons, or a difference of 10,380 tons. It seemed strange that the Gas Company should have sent out figures showing such a large discrepancy. Then there was a great difference in the figures relating to the amount of gas sold. According to the Wolverhampton filed accounts, the quantity was 338,826,000 cubic feet in 1885; and from the Board of Trade returns it was 349,000,000 cubic feet—showing an excess of 10 million cubic feet. He did not bring these forward as accusations—they might be mistakes; and he only mentioned them as being a passing discrepancy worthy of notice. The question of fittings was a mystery. He took it that the rental of the meters had nothing to do with the fittings; and the explanation of the Gas Company was unsatisfactory in this respect. The general conclusions of the Committee fully expressed all their wishes; but there was one point with respect to illuminating power which demonstrated the ingenuity of the Company when they had to deal with a Committee who had not fully gone into the matter. The Company had said that if in Wolverhampton the gas was tested at the works, as they stated it was in Birmingham, the results would be equally favourable to those of Birmingham. This statement satisfied the Streets Committee; but the fact was that the Birmingham gas was tested in different parts of the borough, and the statement of the Company therefore fell to the ground. The Company had simply ignored and snapped their fingers at the Corporation; and probably were at that moment perfectly calm and at ease about this matter, thinking that the Corporation had been giving themselves unnecessary trouble. He hoped the recommendation of the Committee would be adopted, and that the Company would accept the suggestion that the time had arrived when, in common with all other commercial undertakings, they should recognize the demands of the times and act accordingly. He thought that 2s. per 1000 feet, with 5 per cent. discount, and no charge for the meters, would be a fair price; and there was a feeling that the Company might do this, and still maintain their dividend and put something to their reserve fund. The Committee had done their duty in inquiring into the matter; and he trusted the Company, in their own interest and that of the public, would accept the expression of public opinion as now marked by the Council. It was the duty of the Corporation to make arrangements for periodically testing the gas in different parts of the borough. They had a very large claim irrespective of all other consumers. They paid no less than £1000 a year, and ought to be served at a considerable reduction in the price of gas. This was their personal business; but they had a much larger scope, and that was the protection of the inhabitants of the borough.

Mr. MARSTON seconded the motion.

Mr. SAUNDERS thought the Council were very much indebted to the Committee for their report, which he should support. But he considered the question arose whether the Corporation could not entertain the idea of lighting independently of the Gas Company. He was of opinion that the Company should pay their own income-tax.

Alderman GIBBONS said the Committee deserved great credit for having prepared the report; but they seemed to have gone into a lot of details almost unnecessarily. They would never be able to influence the Gas Company until they could compete against them. He thought the Committee ought to have paid more attention to the electric light. He would not dream of lighting 60 miles of streets by electricity; but he thought

that the centre of the town might be so lighted. He was sure tradesmen would take to it, if it would compete against the gas; and it would add greatly to the attraction of the town.

Mr. WILLIAMS did not think the Committee's report would at all influence the Gas Company. He had heard the question argued out before by the Streets Committee, who had done all they could to secure a reduction; but the reply of the Company to their arguments was that if they reduced their charge to the Corporation, they would have to increase it to the ratepayers to make up for it. He did not think the Committee had followed out their instructions. Those instructions were that they should inquire into the artificial modes of lighting the borough. The question of the electric light had not, in his opinion, been fairly dealt with. The Chairman of the Committee had said he could give the amount which it would cost to put down an installation of the electric light. Why did he not do so? The first paragraph of the report was about oil-lamps. In 1789 that would have been a proper matter for consideration—(laughter)—but he did not think they ought to go back to such things as that now. He did not consider the report worth the paper it was printed on. The Company would never take any notice unless some alternative scheme were brought forward.

Mr. COUSINS thought the report of the Committee must commend itself generally to the Council. If the Company were not prepared to deal with the Committee in a reasonable manner, then would be the time for them to adopt a plan such as that foreshadowed by Mr. Williams.

Alderman WRIGHT considered the Committee had not dealt with the matters they were appointed to deal with. They had done a good deal to prove an indictment against the Gas Company, which came to comparatively little. His view of the matter was that if the Corporation were to deal with the Gas Company, it must be on the lines suggested by Alderman Gibbons. They must find something the price of which was below gas at 2s. per 1000 cubic feet. He believed that the electric light was at present so hampered by patents that they would not be able to sufficiently popularize or cheapen it to make it compete with gas. If they could induce the Gas Company to reduce the price of gas, he should not grumble; but he was afraid that they had no more chance of doing so than they had previously. The allowance of discount was a very fair thing; but whether or not they would get it was another matter. If the Company did not charge meter-rent, the money would be put on in another way. He did not care so much for a reduction of the price of gas, as 2s. 6d. per 1000 cubic feet was not such a ruinous price; but he would like to have the gas purer. He was afraid that nothing would come out of the report of the Committee.

Alderman DICKINSON thought the report might be very useful in that it contained a good deal of information as to the working of gas companies. If what Mr. Ironmonger had said was true, it seemed a reflection upon the management of the Wolverhampton Gas Company; and the Company would have to meet these matters publicly, and in a straightforward manner. They would not be content to go on paying 10 per cent. if the business was badly managed. It was absolutely necessary that the Company should be managed as efficiently and as economically as possible. If the concessions asked for were granted, he thought there ought to be representatives of the Council in the Gas Company to look after the interests of the Council. The Company already recognized the principle in so far as to send in a report. He was of opinion that it was unfair that the public should pay income-tax in connection with the Company.

Mr. TATE considered that the thanks of the town were due to the Committee for the report they had presented. He believed the introduction of electric lighting would bring the Gas Company to a better sense of their situation.

The resolution was then amended to read, "subject to the approval of the Council," and was carried unanimously.

BEAUTIFUL TAR.

SONG OF AN ENTHUSIASTIC SCIENTIST.

Air—"Beautiful Star."
[From Punch.]

Beautiful Tar, the outcome bright
Of the black coal and the yellow gas light,
Of modern products most wondrous far,
Tar of the gas-works, beautiful Tar!
Tar of the gas-works, &c.

In fancy's ear thou seem'st to say,
"Follow me close, I am bound to pay.
On me experimenters freely try;
For if there's a *multum in parvo*, 'tis I."
Tar of the gas-works, &c.

Men told us once, with a cheek quite calm,
Of the things that the Arabs could get from the palm;
But that fraud botanic is distanced far
By the modern marvel, the black Coal Tar.
Tar of the gas-works, &c.

House and garments, victuals and drink,
The nomad got from the palm, I think;
But as source of beauty, and bliss, and balm,
Coal tar from the palm-tree must bear the palm.
Tar of the gas-works, &c.

Protoplasm? Oh, that's played out;
The true protoplasm is Tar, do doubt.
As "promise and potency," Tar must take
What vulgar sciolists call "the cake."
Tar of the gas-works, &c.

There's hardly a thing that a man may name
Of use or beauty in life's small game,
But you can extract in alembic or jar
From the "physical basis" of black Coal Tar.
Tar of the gas-works, &c.

Oil and ointment, and wax and wine,
And the lovely colours called aniline;
You can make anything, from a salve to a star,
If you only know how to, from black Coal Tar.
Tar of the gas-works, &c.

'Tis found the basis of all things sweet;
Sugar is settled, and beet is beat;
The Western root and the Eastern cane
With ubiquitous Coal Tar contend in vain.
Tar of the gas-works, &c.

You can carry the stuff in your pocket or hat,
And it will not hurt you, or make you fat;
Of saccharine matters the wholesomest far
Is the stuff extracted from black Coal Tar,
Tar of the gas-works, &c.

The very bees mistake it for honey!
'Tis a fount of pleasure, a mine of money;
And the Bounty question without a jar
Will soon be settled by black Coal Tar,
Tar of the gas-works, &c.

Triumph, O Tar! Stuff half divine!
The world's whole interests soon will twine
Around thine essence the subtlest far,
Tar of the gas-works, black Coal Tar—
Tar of the gas-works, black Coal Tar!

AUSTRALIAN GASLIGHT COMPANY.—The report of the Directors of this Company for the six months ending June 30 last stated that the net profits, with the balance brought forward, amounted to £49,450, out of which a dividend at the rate of 7½ per cent. was recommended. This would absorb £46,453; leaving a balance of £2987 to be carried forward. The Engineer (Mr. T. J. Bush) reported the plant to be in good order; and the erection of the new retort house and holder at Mortlake was proceeding to his satisfaction.

PUBLIC LIGHTING DISPUTE AT BEWDLEY.—The week ending on the 8th inst. was one of almost complete darkness in the streets of Bewdley during the night time, for, owing to the dispute which has existed between the Corporation and the Directors of the Gas Company in regard to the charge to be made for lighting the public lamps, there was no illumination of the streets, with two exceptions (one near the Town Hall), which, however, served to make the surrounding darkness more painfully evident and keenly felt. The difference between the two bodies was one of 3s. per lamp; and the Corporation expressed their determination either to enforce their own terms or resort to oil-lamps. A *modus vivendi* has, however, been arrived at; and on the evening of the 8th inst. all the lamps were lighted, much to the satisfaction of the residents and the safety of the borough. The Directors of the Gas Company had not increased their charge; but the Corporation felt that the time had come when some concession should be made. The price previously paid was £4 3s. for a season of eight months; the lamps not being lighted on two nights before, and for an equal period after the full moon. This was at least equivalent to a charge of £4 4s. for the year, which was looked upon as much above the average charge made in other towns.

THE BOLTON GAS COMMITTEE AND THEIR STOKERS.—As already intimated in the JOURNAL, the Gas Committee of the Bolton Corporation have come to an arrangement with the stokers on the question of the terms of their employment and the mode of carrying out the work. It was reported to the Council last Wednesday, that the Committee had resolved that the Engineer should be allowed to arrange for the employment of some of the stokers on eight hours' service, and others on twelve hours' service, at his discretion; and that this arrangement had been agreed to by the stokers.

THE OIL LIGHTING AT ERITH.—At the meeting of the Erith Local Board on Monday evening last week, among other accounts ordered to be paid was one of £188 6s. 11d. to the Defries Public Lighting Company, on account of oil-lamps, &c. It was stated that some of the lamps were not lighted on several nights; and a conversation arose with reference to the correspondence which had taken place between the Clerk and the Defries Company on this matter. In the contract which had been signed by the Company, it was stated that a penalty of 2s. 6d. per night shall be imposed for each lamp that was not lighted; and the Company objected to this penalty being enforced, as they said the lamps had been wilfully put out, after being lighted, by some evil-disposed person. The Chairman said an inspection had been made by order of the Board, by persons specially appointed, between eight and eleven o'clock on two nights, and on each of these nights five or six lamps were not lighted. The lamp at the Public Hall was not alight four nights in succession; and as the light there could not be got at except by using a ladder, it could not be tampered with in the way suggested by Messrs. Defries. The question of dealing with the Company in this matter was deferred for decision in Committee.

THE TOWN OF COWPEN IN DARKNESS.

AN EXTRAORDINARY DEMONSTRATION.

Last Tuesday night there was witnessed in the Northumbrian town of Cowpen one of the most extraordinary demonstrations which have ever taken place in that part of the country. It was a public protest, on the part of the inhabitants, against the conduct of the Local Board in throwing the town into darkness, in consequence of a dispute they have been engaged in with the Gas Company as to the terms on which the latter are to light the public lamps. It is unnecessary to enter into particulars of the quarrel; suffice it to say that the result is that there is no public light of any kind in the township, and therefore, in the language of a local paper, "pedestrians of the night run the chance of breaking their necks at every whistitch." As a matter of fact, the daughter of a working man in the town had her foot seriously injured owing to the darkness of the streets; and it was owing to a suggestion of her father that a public demonstration was made. The idea was taken up by two or three of the tradesmen, and the affair organized by them. It is easily understood that business men, with shops on the principal thoroughfares should feel indignant at the action of the Board, which is daily depriving them of a large section of their previous patronage. On Friday and Saturday nights this is especially found to be the case; and miners will not come into, and spend their money in a town in a state of the most absolute darkness. A copious stream of ready cash is thus diverted in other directions every week-end. It has been stated by one tradesman that the town suffered a loss of £500 in a fortnight owing to the decreased expenditure caused by the non-lighting of the streets. The first indication of what was going on was the appearance in almost every shopkeeper's window, on the night preceding the demonstration, of a long yellow bill, couched in amusing phraseology, inviting the inhabitants to take part in a "grand installation ceremony of the new light," to take place on the next night; the procession to start from the Market Place at 8.30. The order of the procession was set out at great length. The first contingent was to consist of four showman's naphtha lamps; the second, of a metal band of juvenile artists; the third, stable lanterns; the fourth, ships' port and starboard lights; the fifth, railway signal and danger lamps; the sixth, Davy lamps and "Betties;" the seventh, household lanterns; the eighth, 50 superfine dips; the ninth, turnip lanterns. In a note appended to the order of procession it was stated that "a stopping halt" would sometimes be made, when search parties would be sent out to "try and discover the missing brains of the Cowping Lokil Broad." It was further set forth as follows:—"The procession will proceed by way of the principal streets in Waterloo and Cowpen Quay, returning to the Market Place, where a resolution highly eulogistic of the enlightened policy of the Will-o'-the-Wisps who boss Cowping, and of the electrical conduct of some of the fellows, will be submitted for the enthusiastic and loyal acceptance of the assembled millions. Every man-jack who has the unspeakable satisfaction of possessing a lantern of any sort is requested to bring it properly trimmed, but not lighted, to the Hedley Fountain at 8.15. Don't forget to bring a match; or if you can afford it, two. Be desperate and fetch T-W-O matches. The signal to light up will be given at 8.30 punctually, and will consist of one loud, dead-awakening howl from the splendid metal band. Trim your lamps and be ready!" The local paper from which the foregoing particulars have been taken states that although many who perused the bill were not inclined to take seriously what it set forth, a sufficient amount of curiosity was aroused to induce some thousands of spectators to assemble on the following evening in the Market Place, which by half-past seven was inconveniently crowded. The spectators, growing impatient, amused themselves by taking up the names of certain members of the Board, and howling at them; so that it was deemed advisable to commence proceedings. Just before eight o'clock, from 70 to 100 miners went down to a private house in the town, where about 300 torches had been stacked, and each man brought away two or three with him. As the town clock struck the hour, the men in the van of the procession lighted up; those behind quickly imitating them. In less than five minutes, we are told, the street was "one tremendous blaze of light, and a seething, struggling mob, consisting of thousands of people, was discovered following on behind the torch-bearers." Fortunately, the crowd was orderly and good-humoured; and having perambulated the town, the procession dispersed, without any breach of the peace being committed, or any mischief done. A good deal of horse-play was, of course, indulged in; and this was to be expected. Altogether, however, there is no doubt that the demonstration was a sound and emphatic protest by the tradesmen of the town against the action of the Local Board; the Directors of the Gas Company having had nothing whatever to do with it. It should be mentioned that the Local Board have been entertaining a project for lighting the town by means of electricity; and a futile attempt was made by a few members who have identified themselves with the scheme to get up a counter-demonstration. A placard besring the inscription, "The Electric Lighting Brigade—Death to King Bunkum and Tin-ribs," was borne along by a lad, followed in an aimless manner by about a dozen children. This noble army endeavoured, as far as their feeble lungs would allow them, to send up a cheer. But they had to give way before the stronger forces, and were seen later on with tattered banner, torn pinafores, and besmeared faces. As to this electric lighting project, it seems that the negotiations have come to a complete deadlock. The Electric Company require the Board to enter into a seven years' lighting contract; to guarantee the annual payment to the Company of a sum of £920, or thereabouts; a local Company to be formed to take over the contract, &c. on the lines of Barnet; the local Company to be allowed seven years for the purchase, at £920 a year, of the plant, &c., with which the Electric Company will equip the concern; and on the payment of this £6000 odd the Electric Company will finally hand over the concern to the local Company. The Board cannot say that they have the support of the local press in this matter; for the last issue of the *Blyth Examiner* contains a couple of columns of matter specially bearing on the Barnet experiment, in which this unfortunate undertaking is held up as a caution to the Cowpen authority. The article concludes as follows:—"We do not know that we shall now trouble ourselves much further about the craze of the Cowpen Board upon this subject. We have done a good deal to enlighten the mental darkness of the members, and have by no means exhausted ourselves of all we could say, and of all that it seems desirable the members of the Board should know—for they evidently know precious little of what they so lightly have taken in hand. But we must now leave them mainly in the hands of their indignant constituents. They are not sustained by public opinion in their course of action; and if members have personal animosity against the Gas Company, it is the most unwarrantable thing in the world that they should use the official position in which the ratepayers have placed them, to carry out, a scheme that has no better element in it than private revenge." It is believed that another and larger demonstration will take place next Thursday night, when something like 500 torches will be employed. It will remain to be seen what steps the Local Board will take in face of this forcible expression of public opinion on their proceedings. In closing our notice of this extraordinary affair, it may be well to mention again that these demonstrations

are not got up in favour of gas, but simply as a protest against the darkness in which the Local Board have chosen to involve the district. The leaders of the movement declare that, so far as they are concerned, it is immaterial whether the place is lighted by electricity, gas, oil, or even farthing candles; but they are determined that it shall be lighted, and they intend to "demonstrate" until it is. Let the Board, then, at once return to gas, satisfy their constituents, and put an end to all this turmoil.

METROPOLIS WATER SUPPLY.

According to the returns furnished to the Registrar-General by the London Water Companies, the average quantity of water supplied daily to the Metropolis in the past month was 172,869,385 gallons, as against 177,602,556 gallons in the corresponding month of 1887. The number of houses served last month was 741,399, or 233 gallons per house, and 29.9 gallons per head of the population. In August, 1887, the number of houses supplied was 728,469; and the quantity of water allowed for each person 31.3 gallons. Of the entire bulk of water supplied last month, 85,944,463 gallons were drawn from the Thames, and 86,924,922 gallons from the Lea and other sources.

Dr. E. Frankland, in the course of his report to the Registrar-General on the quality of the Metropolitan water supply last month, makes the following remarks:—"The average proportion of organic matter in the Thames water sent out by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies, which had in the previous month exhibited an increase, suffered in August an almost equally marked diminution; the latter being most conspicuous in the samples of the West Middlesex and Grand Junction Companies' supplies. All the samples were clear and bright. The water principally derived from the Lea, and distributed by the New River and East London Companies, contained less organic matter than any of the Thames supplies. Both samples were clear and bright. The deep-well waters of the Kent and Colne Valley Companies and of the Tottenham Local Board of Health contained, as usual, only a very small proportion of organic matter; and the Colne Valley Company by softening their supply with lime thereby rendered it also of excellent quality for washing and all other domestic purposes. The sample of the Colne Valley Company's supply was very slightly turbid, apparently due to the presence of a trace of carbonate of lime in suspension."

EAST LONDON WATER-WORKS COMPANY.

HALF-YEARLY REPORT OF THE DIRECTORS.

The report of the Directors of this Company to be presented to the proprietors, together with the accounts, at the half-yearly general assembly on the 2nd prox., is as follows:—

The accounts for the half year ending the 24th of June last are here, with submitted. The comparative revenue and expenditure are—

1888—Revenue from all sources for half year ending			
Midsummer	do.	do.	£123,927 8 0
1887—Do.	do.	do.	124,554 3 6
		Increase	£2,373 4 6
1887—Expenditure for half year ending Midsummer—			
Maintenance			£41,298 9 4
Management			9,686 12 5
			£50,980 1 9
1888—Expenditure for half year ending Midsummer—			
Maintenance			£39,892 5 0
Management			8,832 0 3
			48,724 5 3
		Decrease	£2,355 16 6

The Directors deem this increase of revenue as being moderately satisfactory, having regard to the deplorable condition of some branches of industry in the Company's district. The decrease of expenditure is exceptional, and arises from certain work carried out by the Company appearing to the credit of "Maintenance."

The expenditure on capital account (£17,558) arises from the continuation of the works in hand, and which are now in a forward condition. The new triple-expansion engines at Waltham Abbey have been tested, and found to work satisfactory; and the well and the tunnels in the chalk will, it is hoped, be completed during the present month. The sinking of the large wells at Walthamstow and Lea Bridge is being pushed forward as rapidly as the difficult nature of the work will admit.

The quantity of water pumped was 7,182,563,971 gallons, as against 6,952,914,841 gallons in the corresponding period of last year. The new services laid on numbered 1945, as against 1938 in 1887. The total number now in supply is 161,732. The whole of the water delivered by the Company has been certified as pure and well filtered.

A further sum of £53,000 of debenture stock will be issued by tender in December next, under the terms of the Company's Act.

The Directors regret to announce the resignation of their old friend and colleague, Mr. Thomas Mashiter, who held a seat at the Board for 39 years, but whose failing sight prevents him continuing to exercise the active part he has always taken in the administration of the Company's affairs. The vacancy thus created will be filled up at the meeting.

It is recommended that a dividend upon the ordinary stock of 3½ per cent. for the half year (less income-tax) be declared, payable on the 9th of October. This will absorb £60,219 6s. 9d.; leaving an unappropriated balance of £11,087 3s. 1d.

COMMENCEMENT OF A MAIN-DRAINAGE SCHEME FOR BELFAST.—Last Wednesday the ceremony of cutting the first sod of the new main-drainage works which are about to be constructed for Belfast was performed by Mr. W. McCammond, J.P., the Chairman of the Town Improvement Committee of the Corporation, in the presence of a large assemblage of persons. The section of the work now commenced will cost about £35,000; the entire undertaking, of which the Borough Surveyor (Mr. J. C. Bretland) is the Engineer, being expected to entail an outlay of £300,000.

STAFFORDSHIRE POTTERIES WATER-WORKS COMPANY.—Last Friday week a special meeting of this Company was held at Hanley, for the purpose of authorizing the raising of additional capital by the issue of new ordinary stock. The Chairman (Mr. J. Bull) briefly explained the purpose for which the meeting had been convened. The Directors, he said, proposed to offer £30,000 by the issue of ordinary stock, which amount, it was estimated, would be sufficient to meet their requirements up to next June or the end of the year. Out of the general account it was estimated that parliamentary and other expenses would reach £15,000; and in addition to this the extensions at Hatton would amount to about £10,000. So that the sum proposed to be raised would fully provide for what was required. He proposed—"That the Company be authorized to raise the sum of £30,000 by the issue of new ordinary stock, to be offered by public auction in pursuance of the Staffordshire Potteries Water-Works Act, 1883." In reply to a shareholder, the Chairman said the new stock would rank precisely the same as the old stock for dividend up to 7 per cent., which would be the maximum. The motion was carried unanimously.

LONDON WATER COMPANIES' DIVIDENDS.

The closer anyone looks into the financial constitution of the Metropolitan Water Companies, the more convinced will he be, says the *Financial News*, of the inconvenience arising from their lack of uniformity in regard to capitalization and the distribution of dividends. Nowadays, it is true, Parliament keeps a watchful eye upon the provisions of the Special Acts which are from time to time obtained by the Companies; but no amount of modern vigilance can remove the effects of the laxity which prevailed in bygone years.

The West Middlesex Company can boast of an Act passed in 1806, when it was provided, on the incorporation of the Company, that the subscribers should "be entitled to, and receive the entire and net distribution of an equal proportionate part" of the profits, according to the amounts of their several contributions. This method of distribution was continued when, in 1810, and again in 1813, enlarged powers were conferred upon the Company. Even in 1852, when the most important of this Company's Special Acts was obtained, no express provision was made as to dividends. The capital was then fixed at £506,800, divided into 8300 shares of £61 each. Eight years later, power was taken to raise further capital to the extent of £180,000, either on mortgage or by the issue of new shares, preferential or otherwise. At the same time it was enacted that if in any year the profits were not sufficient to pay the full preferential dividend for such year, the deficiency should not be made good out of the profits of a subsequent year, nor out of any other funds of the Company. Capital issued under a subsequent Act, that of 1869, stands upon a different footing. The sum of £300,000 then authorized, might be issued either as ordinary or preferential, and, as regards debenture stock, the Act provided that the Company might attach "such fixed and perpetual dividend as they think fit."

Of course, the involved provisions which are to be found in some of these Special Acts are to be attributed to the peculiar notions and the grammatical idiosyncrasies of dead-and-gone Parliamentary Agents. Lucidity and uniformity were not the objects which these gentlemen seem to have had in view. The terms of the Special Acts obtained by the Grand Junction Company appear to us to compare favourably with some of those to which we have drawn attention. This Company's Act of 1855 enacts in plain phraseology, that the prescribed rate of profit shall be as follows:—"As regards the sum of £546,000, £10 in the £100 by the year; and as regards the residue of the capital, £7 10s. in the £100 by the year." This is language which whosoever reads can understand; and references to the general law at once become superfluous. The Special Act of 1868, which brought the capital of the Grand Junction Company up to £1,000,000, is no less successful in telling proprietors what their rights are in regard to dividend; and the same may be said of the Act obtained in 1878. It was then necessary to introduce certain qualifications; and it was, therefore, provided that if in any year the net revenue applicable to dividends should be insufficient to pay the full rates previously prescribed, the revenue should be applied in the first place in payment of dividend on all the ordinary paid-up capital up to 7 per cent.; next in payment of a further dividend up to 10s. per cent. on the ordinary paid-up capital created under the earlier Acts; and the balance in payment of dividend upon ordinary paid-up capital entitled to a higher rate than 7½ per cent.

The Lambeth Company's Acts also are not difficult to understand; and we observe that power was conferred upon the Directors to declare interim dividends, so long as they shall not reduce in any way the Company's capital. The Special Act of 1871 has no direct bearing on the adjustment of capital or the distribution of profits.

It now only remains to refer to the financial foundations of the Chelsea Company. The capital and stock of this undertaking are mainly regulated by the Special Act of 1852—that is to say, the general provisions of the Water-Works Clauses Act of 1847 were then incorporated. In 1864, when further powers were acquired, no express reference was made to the General Act as affecting the new capital then to be created. But in 1875 it seems to have been thought expedient to frame the Special Act differently; and, accordingly, we find that the provision of the General Act of 1847, with respect to the amount of profit to be received by the proprietors, was then incorporated. Thus, it will be seen that, in regard to the Chelsea Company, the general law as to the prescribed rate of dividend has been adopted in the Acts of 1852 and 1875; and in the Acts which do not in terms incorporate the general law, there are no express regulations as to dividends. It seems to follow, therefore, that the distribution of profits is regulated entirely by the provisions of the Water-Works Clauses Act of 1847.

THE ASHFORD (KENT) GAS COMPANY AND THE LOCAL BOARD.—There is some suggestion of the purchase by the Local Board of the works of the Ashford (Kent) Gas Company, whose annual meeting was recently held, when a dividend of 7½ per cent. was declared, and a considerable amount of the available profit applied towards the reduction of the debenture debt.

MR. SAMUEL HAYWARD AND THE SALFORD CORPORATION.—Mr. Hayward has called our attention to a letter addressed to one of the local papers in reference to the recent proceedings in the Salford Town Council regarding the costs in the action brought by him against the Town Council. In the course of the letter, he says: "The statement that the action brought against the Salford Corporation by Samuel Hayward 'was dismissed' is not correct. The action was commenced by me in August last year, and continued up to May last. It was only in the early part of that month that I learned the main defence of the action was that the agreement to engage my services to assist the Investigation Committee was not under the Corporation Seal. It was a quibble simply. On learning this I wrote to the then Town Clerk, pointing out to him that the main charges in my account received his approval before being rendered; and it was hardly decent for him to set up such a defence."

THE ELECTRIC LIGHTING EXPERIMENT AT LEAMINGTON.—At the close of the meeting of the Leamington Town Council on Monday evening last week, an animated discussion took place in Committee on the vexed question of the electric lighting of the town, for which, it will be remembered, Messrs. Chamberlain and Hookham, of Birmingham, are the contractors. After the letter of Messrs. Shippey Bros., to which reference is made in our "Electric Lighting Memoranda" to-day, had been discussed, Alderman Gilbert moved a resolution to the effect that Messrs. Chamberlain and Hookham be requested to meet the Council in 14 days from that date, to explain fully what course they intend to take to improve what is now considered to be the insufficient lighting of the main thoroughfare of the borough. It is said that this resolution was not seconded until after considerable discussion; and then Dr. Thursfield moved an amendment that an expert be called in to determine the quality of the light now being supplied, and whether it is of the illuminating power specified in the contract. A second amendment was moved to the effect that an estimate be invited from Messrs. Chamberlain and Hookham for the erection of eight arc lamps to be fixed on the Parade as an experiment. This was carried after two hours' discussion.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

This has been the week of valuation courts and the fixing of assessments. Of the former only three cases have come before the public in my district; and of the latter, so far as I can gather, except in special circumstances, the tendency appears to be to lighten taxation—one of the elements enabling this to be done being the reduced charge for public lighting. The appeal by the Stirling Gas Company against the raising of the valuation of their works and plant from £1300 to £1600, without there being any change of circumstances, is the most important of the valuation cases. The Magistrates fixed the valuation at £1500; and notice of appeal was given. There is frequently a disposition on the part of Magistrates, sitting as a valuation court, to try and humour both the assessor and the appellant by fixing a sum midway between the disputed points; and this appears to have been done in the present case. The weakness of the decision seems to be that tenants' profits, over which there has in other cases been so much discussion, have been left out of account. The Assessor allowed deductions for maintenance and interest on capital; and then took the balance of gross profits as the sum at which a tenant would rent them. The Magistrates allowed £100 more than the Assessor. But even that would be an inadequate return to a tenant; and therefore, if the case is taken to a Superior Court, there should be no difficulty on the part of the Company in making good their contention. Another case, that of Strathmiglio, in Fifeshire, was heard at Cupar on Tuesday. It was a small affair; the Company asking that their works should be valued at £55 instead of £72. The ground of the appeal was declining business; the actual profit for the past year having been only £40. This year, it was stated, if there should be any profit, it has been agreed not to divide it. The Court reduced the valuation to £60. At Burntisland, owing to the opening of other docks in the Firth of Forth, there is a declining business at the port. The Valuation Court accordingly reduced the valuation of the harbor; but, on what grounds it is difficult to say, they advanced the valuation of the gas-works and plant from £420 to £626 10s.—an increase of £206 10s. The works have not been improved during the year. This looks as though the authorities were attempting to make up for their loss of revenue from the harbor by laying it on to the gas-works. If this be their object, it is, in one aspect, a tribute to the vitality of the gas industry that it should be selected to bear the extra burden; but, on the other hand, it is another instance, already too common, of crippling the gas supply in the interest of other public objects.

Another question, akin to the valuations of gas-works, which cropped up at the Stirlingshire Valuation Court is the valuation of electric lighting plant. The proprietor of Blair Lodge School has this season greatly enlarged his premises, at a cost of more than £7000, of which sum £1400 is set down as the cost of introducing electric lighting into the institution. In respect of the improvements, the Assessor proposed to raise the valuation from £285 to £360. Even such an enlightened man as Sheriff Scott-Moncrieff thought the electric lighting should not be assessed, because (wonderful reason!) it was a luxury, and was not a source of profit. The Assessor pointed out that it saved the price of gas. With this explanation, the Sheriff became quiescent; and the cost of introducing electric light must be held to be included in the lump sum of £320, which the Court fixed as the valuation.

The Perth Gas Commission, at their meeting on Monday, instructed their Clerk to advertise for loans of money to the amount of £10,000 at 3 per cent., to defray recent parliamentary charges and the cost of extending the gas-works, and also to ascertain the terms on which an insurance company would advance the money, repayable within 30 years.

It is announced from Dalkeith that the Police Commissioners, finding, on inquiry, that the gas-engine which is employed to pump water for the supply of the town does not possess sufficient surplus power to drive a dynamo, the proposal to introduce electric lighting has been abandoned. The Gas Company is not, however, to be allowed to occupy the field so peacefully as hitherto. At Monday's meeting of the Commission, Bailie Murdoch, in view of the fact that the electric light proposal had fallen through, moved a resolution to the effect that, considering the very inferior quality of gas presently supplied by the Dalkeith Gas Company, the Commissioners, as representing the public, and as being considerable consumers, would respectfully urge upon them in future to supply gas of a purer and better illuminating kind. Mr. Urquhart seconded the motion; and after some conversation it was approved—Provost Gray remarking that he thought it too strong, but would not move an amendment, as he was sure the Gas Company would give every attention to the subject.

An extraordinary general meeting of the shareholders of the Armadale Gas Company, Linlithgowshire, was held on Tuesday, to consider whether the Company, by reason of their liabilities, could continue business; and, if necessary, to pass a resolution to have the concern wound up. Mr. J. Aitken, Airdrie, who presided, said that for the last two years the Company had not been a paying one; the reason for this being bad management, and consequent loss of consumers. They had been steadily falling into debt; and this year the outlook was blacker than ever. He thought it best for them to sell out, and run no more risk. Mr. Macdonald and Mr. Brown pressed strongly for another trial of the works for a year; and urged the necessity there was for a supply of gas in the town. After much discussion, the meeting unanimously agreed that the Company be kept going for another year.

At the annual meeting, on Wednesday, of the St. Andrews Gas Company, a dividend of £2 per share was declared, and the price of gas reduced from 3s. 9d. to 3s. 7d. per 1000 cubic feet.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

The Wishaw Police Commissioners, at their monthly meeting on Monday, had a long and lively discussion on a motion to have Craigneale and adjoining portions of the burgh provided with 30 or 40 oil-lamps. When the lighting of the thoroughfares of these districts was formerly under consideration, gas was objected to on account of the expense involved. The ratepayers in these districts contribute their due share of the burghal taxation; and yet they have hitherto been denied any participation in the public lighting provided by the rates which they have been called upon to pay. The discussion was eventually brought to a close by an amendment being adopted to the effect that the Burgh Engineer be instructed to ascertain the cost of lighting the districts in question by oil and by gas. The chief difficulty in this case is that the districts are not yet provided with gas-mains; and some time ago it was estimated that the extension of the gas supply to Craigneale, &c., would cost £668 12s.

A somewhat similar question engaged the attention of the Paisley Police Board last Monday. Certain outlying districts of the town are not lighted; and the ratepayers had naturally raised complaints to the "powers that be." When moving the adoption of the Watching and Lighting Committee's minutes, Mr. Weir referred to the matter. He said that the Commissioners knew their duty to the ratepayers in connection with

the lighting of the outlying districts of the town; but the ratepayers should know that the Commissioners were not to blame for seeming negligence, because they had waited to see if the builders of the new properties in the district referred to would put down proper footpaths before they erected lamps. It was a pity, he said, that the Commissioners had not more authority in the matter. Some discussion took place on the subject; and the opinion of the meeting was that the builders were not fulfilling their duty in erecting their tenements without forming proper roadways and pavements. It was agreed that temporary lighting should be provided during the forthcoming winter months.

A Valuation Appeal Court for the Upper Ward of Renfrewshire was held in Paisley last Monday. One of the appeals brought under consideration was made on behalf of the Pollokshaws Gas Company, against their gas-works being put on the valuation roll at £586. Mr. Gillies asked that the valuation should be fixed at £300; and the Company would not be put to the trouble of coming before the Court year after year. The true value, he held, was to take what the subjects might fairly be expected to let for one year with another; and this could best be ascertained by taking a percentage of the cost of buildings and the plant, instead of the profits made, which depended greatly on the price of the raw material and of the gas consumed. After considering the case, the Court decided to reduce the valuation to £500. On the application of Mr. Gillies, a case was granted.

On the same day, at an Appeal Court held at Dunoon, an appeal was heard from the Dunoon Gas Company. The Directors asked that the valuation of their works should be reduced from £600 to £450. Mr. Munro, who represented the Company, said that Mr. Maxtone, the Assessor, had increased the valuation of the gas-works by £150; and he was very much astonished at it, because he thought the Court last year, when an appeal was heard, had finally disposed of the case. The Court were then unanimous in their decision that the valuation of the works should be £450. There was no change in the circumstances; and yet Mr. Maxtone proposed to increase the amount by £150. If things went on in this way it would cripple the Company altogether. Mr. Maxtone replied that last year the Company pleaded so much poverty that they quite overcame him; and £100 was taken off. This year they wanted £150. Acting on his basis of calculation, Mr. Maxtone showed that the valuation of the works came to £600; and taking it on the principle laid down by Lord Fraser—viz., 8½ per cent. on the cost of the works—the valuation came to £700. Mr. Munro pointed out that in certain large towns the gas-works were only assessed on about £300. In support of his case the Assessor used a somewhat unusual argument—viz., that the increased valuation would be better for the Company when they came to hand over the gas-works to the Corporation. It naturally excited some laughter; and Provost Lyall, who was present, remarked that it would be some time before the Corporation would be prepared to buy the works. Eventually the Court restricted the valuation to £550; and Mr. Munro asked a case for appeal, which was granted.

The Glasgow pig-iron warrant market has again been very strong this week. Scotch warrants advanced in price from 41s. 7d. per ton cash on Monday to 42s. 7d. yesterday afternoon; the close being 42s. 6d. cash buyers. The price of hematite iron fluctuated between 45s. and 45s. 9½d. per ton, and in Cleveland iron the range was between 34s. 3d. and 34s. 9½d. per ton cash; the close being respectively, 45s. 8d. and 34s. 9d. cash buyers. A further advance has taken place in the prices of most of the Scotch special brands. Some considerable sales of Scotch pig iron have been made during the week on American account.

A further improvement in the local coal trade is reported, more especially in the export department. Prices all round are firming up; and to such an extent that the miners are beginning to put in a claim for an advance of wages.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Sept. 15.

Sulphate of Ammonia.—The scanty orders during the present week make one fearful lest the season's requirements should all be completed. The lateness of the harvest gave hopes of the demand coming later, yet in full vigour; but it appears now almost as if we were to be disappointed. From what can be gathered generally from consumers, they are all ready to buy forward, but only at what they term cheap prices; while in the event of the market remaining steady, they express determination to wait until the time of absolute necessity. Producers on the other hand are indifferent about making forward sales, as no advance on to-day's values can be obtained, and the great firmness of nitrate supports them in their views that sulphate cannot permanently be lower. The future seems, therefore very uncertain; and it remains to be seen how the course of the market will shape, when the production, which will be increasing again shortly, comes to be disposed of. There is very little alteration in the figures; and the market remains steady at £11 5s. to £11 7s. 6d., according to ports and delivery.

LONDON, Sept. 15.

Tar Products remain at much the same as last week's prices. Benzol, perhaps, is scarcely so strong; but anthracene and the other articles are in good demand. Prices may be taken as follows:—Tar, according to position, 17s. 6d. to 22s. 6d. per ton. Benzol, 90 per cent., 3s. per gallon; 50 per cent., 2s. 4½d. Toluol, 1s. 9d. per gallon. Solvent naphtha, 1s. 2d. per gallon. Crude naphtha, 30 per cent., 1s. per gallon. Light oil, 3d. per gallon. Creosote, 2d. per gallon. Pitch, 12s. to 13s. 6d. per ton. Carbolic acid (crude), 3s. 4d. per gallon. Cresylic acid, 9d. per gallon. Tar salts, 15s. per ton. Anthracene, 30 per cent., "A" quality, 1s. 6d. per unit; "B" quality, 1s. 3d.

Ammonia Products.—Sulphate of ammonia is firmer; and no doubt, with the sharp rise which has taken effect in nitrate of soda, sulphate will derive some substantial advantage. Prices: Sulphate of ammonia, £11 7s. 6d. to £11 10s., less discount. Gas liquor (5° Twaddell), 7s. 6d. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 1½d. per lb. Carbonate of ammonia, 3½d. per lb. Muriate of ammonia, brown, £18 per ton; white, £27. Sal-ammoniac, £30 per ton.

[From the *Chemical Trade Journal*, Sept. 15.]

Sulphate of Ammonia.—The sulphate of ammonia market is very quiet indeed; and so far as present delivery is concerned, the demand is dead—the few parcels changing hands being bought by dealers in fulfilment of previous sales made by them. To-day's price at Hull and Leith ranges from £11 5s. to £11 6s. 3d.; and although Beckett is again quoted at £11 5s., London outside makes have fallen to £11 5s. also.

Tar Products.—The benzol market remains much in the same condition as it stood last week. Perhaps, if any change has occurred, it is in the shape of increased steadiness in 90's benzol, which may to-day be quoted at 3s., and 2s. 4d. to 2s. 5d. for 50/90's. There is still a good demand for solvent naphtha and creosote for Lucigen light purposes. The anthracene market is firm; and 1s. 5d. to 1s. 6d. may be quoted as to-day's value for "A" quality in London. "B" quality is selling at 1s. 2d. to 1s. 3d. The pitch market remains as stated in our last week's report; there being no change in this direction.

OIL LIGHTING IN KENT.—The local authorities of Northfleet have had a similar experience with their contractors for lighting the public lamps with oil to that of the Erith Local Board, referred to elsewhere; and complaints as to bad lights through neglect on the part of the trimmers have of late been very prevalent. The Northfleet authorities have decided to give notice to the contractors that if the lighting is not properly and efficiently carried out, fines, according to the terms of the contract, will be enforced. The local authority of Snodland, owing to a misunderstanding with the Gas Company, have commenced to light with oil the streets under their control.

THE PUBLIC LIGHTING OF MARLBOROUGH.—At a recent meeting of the Marlborough Town Council, a letter was read from the Gas Company, submitting proposals for the lighting of the lamps in the borough all the year round, from one hour after sunset to one hour before sunrise, for 70s. per lamp per annum, or else for the adoption of the average meter system. The Town Clerk submitted a statement showing the comparative expenses and hours of lighting in various towns in the district, from which it appears that the rate at Marlborough (4s. 7d. per 1000 feet) is about the average. The present cost per lamp in Marlborough was stated to be £3 7s. 6d. per annum. The Council eventually resolved to adopt the average meter system.

THE TESTING OF THE OLDHAM GAS.—At a meeting of the Oldham Corporation Gas Committee held last Wednesday, the Chairman (Alderman Hall) reported that Mr. Estcourt, the Borough Analyst, who had been appointed by the Committee to make an independent inspection of the gas, had recently tested it at the Oldham, Higginsshaw, and Royton stations, and that he had found the illuminating power was as follows:—Oldham, 19·10 candles; Higginsshaw, 20 candles. At Royton the apparatus was being repaired. The gas at all the stations was quite free from sulphuretted hydrogen. At Oldham and Royton it was free from ammonia; but at Higginsshaw the gas was found to contain a small trace. A discussion ensued as to the advisability of retaining Mr. Estcourt's services. It was stated that the engagement entered into was in April last year; Mr. Estcourt being appointed to make two tests in the year, and to receive 20 guineas for his services; and it was added that he had made the last test entirely on his own responsibility. The Chairman said that, though personally he was in favour of the project when Mr. Estcourt was appointed, he did not now think that the Committee had derived any benefit from it. He moved that the Town Clerk write Mr. Estcourt that his engagement had expired; and this was agreed to.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For STOCK MARKET INTELLIGENCE, see ante, p. 499.)

Issue.	Share	When ex-Dividend.	Dividend of Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.					£ s. d.
GAS COMPANIES.								
590,000	10	12 Apr.	10½	Alliance & Dublin 10 p. c.	10	18½—19½	..	5 7 8
100,000	10	"	7½	Do. " 7 p. c.	10	13—14	..	5 7 1
300,000	100	2 July	5	Australian (Sydney) 5% Deb.	100	110—112	..	1 9 3
100,000	20	30 May	10	Bahia, Limited	20	23—25	..	8 0 0
200,000	5	11 May	7½	Bombay, Limited	5	7—7½	..	5 0 0
40,000	5	"	7½	Do. New	4	5—5½	..	5 9 1
380,000	Stock	29 Aug.	11½	Brentford Consolidated . . .	100	220—225	..	5 4 5
110,000	"	"	8½	Do. New	100	161—166	..	5 5 5
220,000	20	13 Sept.	10½	Brighton & Hove, Original .	20	43—45*	..	4 13 4
320,000	20	12 Apr.	11½	British	20	46—48	..	4 13 9
50,000	10	13 Sept.	11	Bromley, Ordinary 10 p. c.	10	19—21*	..	5 4 9
39,000	10	"	8	Do. " 7 p. c.	10	13—14*	..	5 14 3
323,750	10	30 May	8	Buenos Ayres (New) Limited	10	14½—15½	..	5 3 2
200,000	100	2 July	6	Do. 6 p. c. Deb.	100	109—111	+1	5 8 1
150,000	20	10 Aug.	7	Cagliari, Limited	20	25—27	..	5 3 8
550,000	Stock	12 Apr.	13½	Commercial, Old Stock . . .	100	273—278	-1	4 11 11
130,000	"	"	10½	Do. New do.	100	214—219	..	4 18 2
121,234	"	28 June	4½	Do. 4½ p. c. Deb. do.	100	123—128	..	3 10 3
557,320	20	14 June	12	Continental Union, Limited	20	45—46	..	5 4 4
242,680	20	"	12	Do. New '63 & '72	14	30—31	+½	5 8 1
200,000	20	"	9	Do. 7 p. c. Pref..	20	35—37	..	4 17 3
75,000	Stock	28 Mar.	10	Crystal Palace District . . .	100	205—215	..	4 13 0
234,060	10	27 July	13	European, Limited	10	25½—26½	..	4 18 1
120,000	10	"	13	Do. New.	7½	18½—19½	..	5 0 0
354,060	10	"	13	Do. do.	5	12½—13½	..	4 16 3
5,468,600	Stock	29 Aug.	13	Gaslight & Coke, A, Ordinary	100	252—256	..	5 1 6
100,000	"	"	10	Do. B, 4 p. c. max.	100	98—103	..	3 17 8
665,000	"	"	4	Do. C, D, & E, 10 p. c. Pf.	100	260—265	..	3 15 6
30,000	"	"	5	Do. F, 5 p. c. Pf..	100	125—130	..	3 16 11
60,000	"	"	7½	Do. G, 7½ p. c. do.	100	182—187	..	4 0 2
1,300,000	"	"	7	Do. H, 7 p. c. max.	100	167—172	..	4 1 4
463,000	"	"	10	Do. J, 10 p. c. Pf..	100	258—263	..	3 16 1
1,061,150	"	14 June	4	Do. 4 p. c. Deb. Stk.	100	120—123	..	3 5 0
294,850	"	"	4½	Do. 4½ p. c. do.	100	125—130	..	3 9 3
650,000	"	"	6	Do. 6 p. c. do.	100	175—178	..	3 7 5
3,600,000	Stock	11 May	10	Imperial Continental . . .	100	208—211	+1	4 14 9
75,000	5	14 June	6	Malta & Mediterranean, Ltd	5	5—5½	..	5 9 1
560,000	100	3 Apr.	5	Met. of Melbourne, 5 p. c. Deb.	100	114—116	..	4 6 2
541,920	20	14 June	6	Monte Video, Limited . . .	20	20—21	..	5 14 3
150,000	5	30 May	40	Oriental, Limited	5	9½—9¾	..	5 2 7
60,000	5	28 Mar.	7	Ottoman, Limited	5	6—7	..	5 0 0
420,000	100	2 May	6	People's Gas of Chicago—				
500,000	100	1 June	6	1st Mtg. Bds.	100	107—110	..	5 9 1
100,000	10	26 Apr.	6	2nd Do.	100	95—100	..	6 0 0
500,000	Stock	29 Aug.	15½	San Paulo, Limited	10	16—17	..	5 17 8
1,350,000	"	"	12	South Metropolitan, A Stock	100	306—311	-2	4 19 8
141,500	"	"	13	Do. B do.	100	243—247	..	4 17 2
550,000	"	28 June	5	Do. C do.	100	245—255	..	5 1 11
60,000	5	29 Aug.	11	Do. 5 p. c. Deb. Stk..	100	135—140	..	3 11 5
				Tottenham & Edm'tn'tn, Orig.	5	11—13	..	4 4 0
WATER COMPANIES.								
717,467	Stock	28 June	9	Chelsea, Ordinary	100	260—265	+4	3 7 11
1,720,560	Stock	12 Apr.	7	East London, Ordinary . . .	100	197—202	..	3 9 4
700,000	50	14 June	9	Grand Junction.	50	124—128	..	3 10 4
708,000	Stock	10 Aug.	10½	Kent	100	269—274	..	3 16 7
1,043,800	100	28 June	9	Lambeth, 10 p. c. max. . . .	100	260—265	+2	3 7 11
406,200	100	"	7½	Do. 7½ p. c. max.	100	204—209	..	3 11 9
200,000	Stock	28 Mar.	4	Do. 4 p. c. Deb. Stk..	100	118—122	..	3 5 7
500,000	100	27 July	12½	New River, New Shares . . .	100	347—352	..	3 8 10
1,000,000	Stock	"	4	Do. 4 p. c. Deb. Stk..	100	124—128	+1	3 2 6
902,300	Stock	14 June	6	S'hwk & V'xhall, 10 p. c. max.	100	165—170	+3	3 10 7
126,500	100	"	6	Do. 7½ p. c. do.	100	157—162	..	3 14 1
1,155,066	Stock	14 June	10	West Middlesex	100	264—269	..	3 14 4

† Next dividend will be at this rate.

THE QUALITY OF THE LONDON GAS SUPPLY

DURING THE FOUR WEEKS ENDED SEPT. 11.

[From returns to the Metropolitan Board of Works by Mr. W. J. DIBBIN, F.I.C., F.C.S.]

COMPANIES—DISTRICTS.	ILLUMINATING POWER. (In Standard Sperm Candles.)						SULPHUR. (Grains in 100 Cubic Feet of Gas.)						AMMONIA. (Grains in 100 Cubic Feet of Gas.)					
	Maxi- mum.	Mini- mum.	Means.				Maxi- mum.	Mini- mum.	Means.				Maxi- mum.	Mini- mum.	Means.			
			Aug. 21	Aug. 18	Sept. 4	Sept. 11			Aug. 21	Aug. 28	Sept. 4	Sept. 11			Aug. 21	Aug. 28	Sept. 4	Sept. 11
The Gaslight and Coke Company—																		
Notting Hill*	17.2	15.9	16.4	16.7	16.3	16.5	13.4	8.8	9.0	9.9	10.7	11.8	0.3	0.0	0.2	0.1	0.1	0.0
Camden Town	17.1	16.2	16.7	16.6	16.5	16.4	13.2	10.0	11.7	12.2	11.6	11.8	0.2	0.0	0.0	0.1	0.1	0.2
Dalston	17.2	16.2	16.7	16.7	16.4	16.3	7.3	3.9	5.5	6.6	5.2	5.6	0.8	0.2	0.3	0.4	0.5	0.5
Bow	17.1	16.3	16.8	16.8	16.7	16.5	12.2	8.8	11.5	11.6	10.7	10.4	0.4	0.0	0.4	0.0	0.0	0.1
Chelsea (Fulham)	17.0	16.6	16.8	16.7	16.8	16.7	12.3	8.6	9.4	10.7	9.2	10.6	0.4	0.0	0.0	0.3	0.2	0.3
Do. (Nine Elms).	17.2	16.6	16.9	17.0	16.8	16.9	15.0	10.1	11.7	12.1	11.7	11.8	0.4	0.0	0.1	0.2	0.1	0.1
Kingsland Road	17.0	15.9	17.0	16.8	16.4	16.1	9.6	5.7	9.2	6.7	8.4	8.5	0.4	0.0	0.1	0.1	0.2	0.3
Charing Cross (48-inch main)	16.8	15.8	16.4	16.4	16.5	16.1	12.5	6.4	8.9	10.5	9.1	8.7	0.3	0.0	0.2	0.1	0.2	0.2
Do. (district main)	17.5	16.3	16.6	16.8	16.5	16.5	13.2	9.1	9.8	11.4	11.1	10.8	0.8	0.3	0.5	0.5	0.5	0.4
St. John's Wood	16.8	16.2	16.5	16.5	16.5	16.5	12.7	7.9	9.1	10.2	8.9	9.3	0.6	0.2	0.5	0.3	0.3	0.2
Lambeth Road	16.8	15.9	16.3	16.6	16.3	16.2	13.6	9.5	10.4	12.0	11.7	11.4	1.0	0.0	0.3	0.3	0.7	0.5
Holloway	21.7	20.0	20.6	20.3	20.9	20.3	10.9	8.3	9.6	9.4	9.8	9.9	0.6	0.0	0.2	0.3	0.4	0.4
Westminster (cannel gas)																		
South Metropolitan Gas Company—																		
Peckham	16.8	16.1	16.5	16.7	16.4	16.4	10.2	8.2	9.5	9.2	9.0	8.9	0.2	0.0	0.0	0.0	0.1	0.0
Tooley Street	16.8	16.1	16.5	16.6	16.4	16.4	12.1	8.4	10.5	10.7	9.7	9.9	0.2	0.0	0.0	0.0	0.1	0.0
Clapham	16.7	16.2	16.5	16.6	16.4	16.4	12.4	7.3	10.8	11.2	9.6	10.0	0.6	0.0	0.0	0.1	0.0	0.0
Lewisham	17.2	16.2	16.3	16.6	16.5	16.6	10.0	7.2	9.6	8.5	8.4	8.6	0.0	0.0	0.0	0.0	0.0	0.0
Blackfriars Road	16.7	16.0	16.2	16.3	16.3	16.2	12.7	8.8	12.1	10.9	9.6	9.6	0.8	0.0	0.2	0.2	0.2	0.2
Commercial Gas Company—																		
Old Ford	17.5	15.7	16.6	16.3	16.4	16.7	9.0	4.5	8.0	7.4	7.8	7.0	0.6	0.0	0.2	0.2	0.0	0.0
St. George's-in-the-East	17.1	15.9	16.4	16.7	16.5	16.5	14.6	6.9	9.4	10.2	9.1	11.4	0.4	0.0	0.2	0.2	0.3	0.3

* Station closed during alterations.

SULPHURETTED HYDROGEN.—None on any occasion.

PRESSURE.—In excess on all occasions.

Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 17 grains in 100 cubic feet of gas; ammonia not to exceed 4 grains in 100 cubic feet of gas. Pressure between sunset and midnight to be equal to a column of 1 inch of water; between midnight and sunset, 6-10ths of an inch.

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TELEPHONE No. 2688.

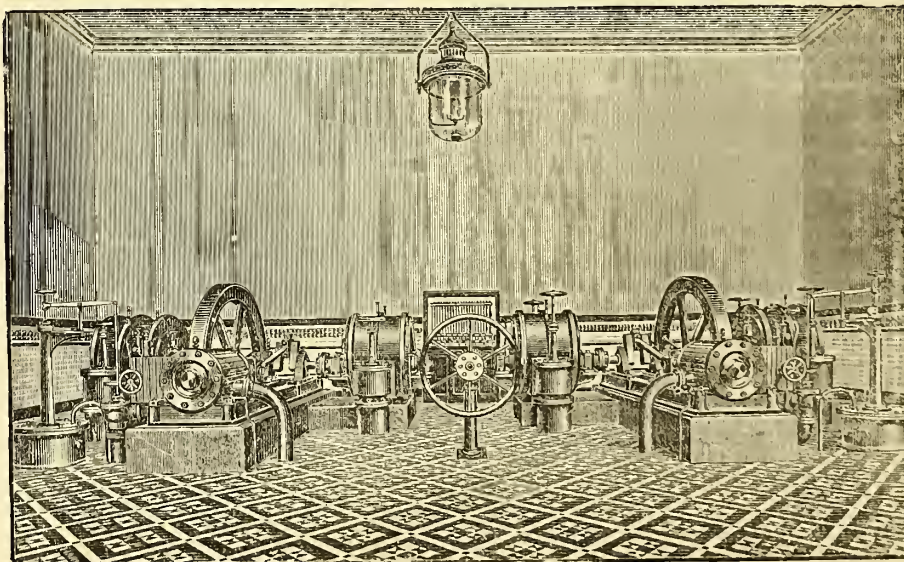
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Only Medal at the Liverpool International Exhibition, 1886, for Centrifugal Pumping Engines.

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The result is that in every instance their work is giving the fullest satisfaction.

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ONLY 75 REVOLUTIONS PER MINUTE.

The above Engraving shows Two Engines driving Four GWYNNE & CO.'S PATENT NON-FLUCTUATING EXHAUSTERS, to pass 200,000 cubic feet per hour (without the slightest oscillation), at the EFFINGHAM STREET GAS-WORKS, SHEFFIELD.

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THE Gas Purification and Chemical Company, Limited, advise their friends that their only representatives for the Sale of Oxide are Mr. Andrew Stephenson and such Sub-Agents as may be accredited from the Head Office. They further state that the royalties possessed by them extend over an area of more than 350,000 acres, and are held for a long term of years. They employ their own overseers and labourers, and there are no intermediate profits between them and the consumer.

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* See Advertisement on Page 111. of the Wrapper of last week's issue.

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AND 80, CANNON STREET, LONDON. Contractors for Gas-Works complete, Makers of Gas-holders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. A so for Collingwood's Regenerative Retort-Settings.

* See Advertisement p. 538 of this week's issue. Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

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be different; and then the Local Authority concerned would find themselves under the burden of serious responsibility.

THE IMPORTANCE OF LITTLE INVENTIONS.

THE publication in our columns last week of a description of a patented device for the speedy and economical extraction of cast-iron main-pipes from the lines in which they lie in the ground, reminds one of the multiplicity of small inventions whereby the work of making and distributing gas has been improved and facilitated of late years. This is a subject that might very well be worked up into a paper for a District Association of Gas Managers, by anybody who would take the trouble to compare the tools and processes in use now with those available (say) twenty years ago. We deliberately exclude from this review all changes in manufacturing processes which ordinarily form subjects for papers and memoirs, and confine our attention to the small details that nobody would think of bringing into notice alone. How many and various are the novelties of this kind that distinguish a well-equipped gas-works of to-day from the same establishment as conducted by the worthy men of the past generation! We published an article some time ago upon the importance of saving the "drop of solder" in manufacture; showing that all industrial progress is due to these intrinsically insignificant advances. A neat method of fastening a retort-lid, a device for taking up the wear of a hinge or a bearing, a trifling alteration of a governor valve—all these things mean progress of the most substantial kind. If one goes into a warehouse and looks over an assortment of fittings, how often does it happen that the attention is caught by something which is an evident improvement upon a well-known pattern; and we are told that it is a little invention just introduced by someone who knows the requirements of the trade! There is nothing theatrical about these small advances; they do not revolutionize anything; and the benefit derivable from any individual one of the class may be very slight. In the mass, however, they tell upon the art or industry in which they are used. It is often said—so often that the saying is sadly threadbare—that he is a benefactor of his species who makes two blades of grass grow where one grew before. If this time-worn old saw is used to illustrate the value of what Sir Frederick Bramwell has recently called the "next-to nothing," it fails; because to double the production of forage for a given area is not a small thing, but a great feat. To drive home our meaning, we should say that the man who can increase the length of a blade of grass by one-sixteenth of an inch is a benefactor to the world. He has thereby laid the foundation for a possible new variety of grass, more productive than the old, which may make all the difference between wealth and ruin to the future agriculturist. So in machinery, the inventor of a new and improved piece of detail, however small, so that it serves its purpose better than that which went before, is a true leader in industrial art.

Water and Sanitary Affairs.

As a rule, *ex parte* statements are to be distrusted; and probably it would be rash to make an exception in favour of the vituperative remarks of the gentleman who a day or two ago attacked the Chelsea Water Company at the Westminster Police Court. The applicant worked himself up to a high pitch of indignation not only against the Chelsea Company, but against the Metropolitan Water Companies in general. He complained of "a most iniquitous and high-handed proceeding" in the particular case referred to; declared that he had been treated with scant courtesy at the Company's office; and inveighed in general terms against "these great 'monopolist Companies,' who, it was suggested, did what they pleased with the down-trodden and oppressed consumer. Such is the formidable indictment which was preferred before Mr. Biron, Q.C., last week. It is not the first time the London Water Companies have been violently scolded in a Metropolitan Police Court; and we doubt not that the same thing will at intervals occur again. When some irate landlord or consumer airs his exaggerated grievances in the presence of a Police Magistrate, the reporters eagerly jot down his florid sentences; and in due course the dailies have recourse to the familiar head-line of "The Water Companies and the 'Public.'" Doubtless, now and again, the Companies are to blame. It is not given to mortals, or to companies, to be invariably in the right; but experience undoubtedly shows

that, in nine cases out of ten, the *ex parte* statements of the grievance-mongers will not bear the test of full and impartial investigation. There are two sides to every question, even where a Water Company are concerned; and we should be by no means surprised if a very different light could be thrown upon the particular facts, if facts they were, which were stated at the Westminster Police Court in the absence of the Chelsea Company's officials. In the meantime all this noisy flourish is calculated to deceive the public and to unfairly prejudice the Company whose conduct was complained of; the more so as the applicant, after pouring out the vials of his wrath, coolly stated that he could not attend again, as he was about to go to Scotland. This certainly looked as if he were not labouring under any abiding sense of injustice, although he gladly availed himself of an opportunity of blowing off the steam engendered by his dispute with the officials of the Water Company. What the applicant wanted indeed, if he could get it, was a peremptory order, based on his own version of what had taken place, for the Company to reinstate the pipe which they had disconnected. Of course, Mr. Biron had no power to comply with such an application, though apparently, and perhaps naturally, his sympathies were with the applicant. The learned Magistrate, whose somewhat hasty exposition of the Married Women's Property Act called forth some criticism on a recent occasion, paused before expressing any definite opinion as to the rights of the Company on the one hand and of the consumer on the other. Discretion prevailed; and Mr. Biron declined in this instance to undertake off-hand the interpretation of the law in regard to the matter before him. We think his Worship's reticence was commendable, for our Metropolitan Magistrates are sometimes hurried into rash statements, and are too generally expected to act as the "guide, philosopher, 'and friend'" of all sorts of applicants on every conceivable subject. Nevertheless, the law, so far as it is to be found in the Water-Works Clauses Act, 1847 (which some of our indignant contemporaries convert into the Water Companies Consolidation Act), is tolerably plain and intelligible. Section 74 of the Act provides that if the person supplied with water, and liable to pay for it, neglect to pay the rate at any of the prescribed times of payment, the flow of water into the premises in respect of which the rate is payable may be stopped by cutting off the pipe to such premises, or by such means as "the undertakers" may think fit. Section 70 enacts that the rates shall be paid quarterly; and that the first payment shall be made "at the time when the pipe by which the 'water is supplied is made to communicate with the pipes of 'the undertakers, or at the time when the agreement to take 'the water from the undertakers is made.'" These provisions are simple enough, and are necessary in the general interests of the public as well as of the Companies. Of the special powers possessed by the Chelsea Company under their own Act, we will not undertake to speak. We are not expressing any opinion on the particular case which was brought to Mr. Biron's notice, though, as we have indicated, we should expect to find that the powers of the Company have not in reality been exceeded.

The report of the Gas and Water Committee of the Corporation on the question of the constant supply, to which we made reference some weeks ago, came before the Court of Common Council on Thursday, and gave rise to a discussion of which a full account is given in another part of our columns. The Corporation have seen fit to adopt this somewhat remarkable report, whereby the City is made to plead that a constant supply of water is a luxury in which it cannot afford to indulge. Perhaps it may be suggested that water is not a popular beverage with the City magnates, who are familiar with something of a more exalted character than *aqua pura* at their civic banquets. A constant supply of champagne or turtle soup would perhaps be more keenly appreciated. But there are people, nevertheless, within the City boundary, who have a desire for something which they deem more convenient and satisfactory than an intermittent supply of water. It happens, however, that what may be termed an active demand is small. Out of fourteen parishes which have spoken their minds on the subject, ten are in favour of the constant supply, and four are against it. There remain 98 who say nothing. So far as we can remember, the spread of the constant supply, comprehending now more than one-half the houses in the districts of the Metropolitan Water Companies, has been brought about by the Companies and the consumers irrespective of the Local Authorities. Also in regard to the hydrants, excepting the City proper, the extent to which

these have been introduced is mainly due to the initiative of the Water Companies. In their efforts to extend the constant service, the Companies have frequently to encounter obstacles where they might rather have looked for assistance. Some of the Authorities, in days that are now happily gone by, were accustomed to argue that hydrants would be superfluous unless they rendered fire-engines unnecessary. So an idea now prevails in many quarters that, where there is a constant supply, there ought not to be any need for storage cisterns. The East London Company, in the interests of the consumer, and, as we believe, in accordance with the law, require that there shall be a storage cistern as well as a waste-preventer. This is looked upon by some misguided people as a gross piece of tyranny, and the notion is shared by Mr. Lushington, the Magistrate at the Thames Police Court, who has just decided that a waste-preventer holding two gallons of water is all that the law requires. Certainly it is not all that the consumer needs, as recent events have proved in the East London district. But the decision of the Magistrate goes against the Company, who will now have to carry the case to a Superior Court, where it is to be hoped a little common sense will prevail.

The sewage scheme of the Manchester Corporation forms the subject of an inquiry which is being conducted in the Town Hall, Manchester, by Mr. S. J. Smith, C.E., one of the Inspectors of the Local Government Board. The opposition presents a formidable front, if we may estimate its strength by the array of Counsel who appear on behalf of the objecting parties. The opponents consist of numerous local authorities outside the city area; and a large number of persons owning or occupying property in the neighbourhood of the proposed outfall works. The application to the Local Government Board is for power to borrow £450,000 for a scheme of sewerage and sewage disposal, and £40,000 for the purchase of land. The sewage of the city is to be gathered up in two intercepting sewers, converging into one at the city boundary, and proceeding thence to a point four miles distant, where the sewage is to be treated chemically, so as to throw down the matters in suspension. The liquid is then to be filtered through 60 acres of land, on the plan of intermittent downward filtration; the effluent passing into the River Irwell, and thence into the Manchester Ship Canal. The effluent must be of a character to satisfy the Canal Company; and an agreement has been entered into for the purpose. The area of the City of Manchester is nearly 6000 acres; and the population, 378,000. The present daily water supply is thirteen gallons per head for domestic, and seven gallons for trade purposes. There are 18,800 water-closets, 66,000 dry-earth closets, and no cesspools. The sewerage plan is devised for a population of 500,000; and a daily water supply of 44 gallons per head. The rainfall is 35 inches per annum, and the proposed sewers are estimated to carry off a maximum of 100,254,000 gallons per day. At the outfall works, the sewage will pass through a series of tanks; precipitation being effected by means of lime and sulphate of alumina, or "the best known precipitant." There is to be an overflow, by means of which, if necessary, the whole of the effluent could be passed direct into the Ship Canal. Mr. Allison, the City Surveyor, says he has designed the sewers of such dimensions that they would suffice for the requirements of Manchester, even if the present pail system were to be done away with and superseded by water-closets. The daily volume of wet sludge produced by the precipitation process is reckoned at 120 tons, to be dried down in four days to 25 tons. Such are the leading features of a plan which appears to possess considerable dimensions, though it has to encounter the objection of being too restricted, as it ignores certain outlying localities contiguous to the route of the outfall sewer. There is a "Greater Manchester" which pleads to be included. There is also a demur on the customary plea of nuisance, and it is urged as a hard matter that people who go out of Manchester in pursuit of health should afterwards have the sewage brought to their doors. Another objection has reference to the filtering area, which is declared to be too small. This part of the question is obviously affected by the efficiency of the chemical process which precedes the action of the filter-beds. The City Surveyor does not believe that any more land is, or will be, necessary. He rather expects that four or five years hence "chemical science will be so far advanced" that the Corporation will have no use even for the 60 acres. Dr. Frankland has also given evidence in support of the scheme, and believes the area for the filter-beds to be ample. Concerning the effluent, he says it

would not be pure enough to drink, or so pure as he should prescribe for an effluent that would be turned into a river from which towns took their water; but it would be sufficiently purified for the purpose for which it was to be used. We observe that Dr. Frankland speaks as if the whole 95 acres of land at the works would be available for filter-beds. According to the Coventry ratio, to which he makes reference, 60 acres would about suffice for the present population of Manchester, leaving no margin for increase. In cross-examination, Dr. Frankland seems to have the 60 acres in view, and says it would, of course, be better if the Corporation had a larger area at their disposal. With respect to irrigation, it is said that no such scheme is practicable for Manchester. The issue of the inquiry will be awaited with much interest. It is a great "sewage fight." Dr. Pankhurst, who is one of the opposing Counsel, declares himself ready to prove that, while the drainage scheme of the Corporation is "an admirable one," the plan proposed for the disposal of the sewage involves "a terrible mistake." Officials, medical and otherwise, from Bradford, Coventry, Leeds, and Bolton, have given evidence in defence of the plan for the treatment of the sewage, founded on their local experience. Mr. James Mansergh, C.E., approves of the entire project—the sewers, the outfall, and the sewage works. The line of cross-examination with regard to these witnesses suggests that the sludge would be likely to prove offensive to the neighbourhood, Dr. Charles Meymott Tidy appeared on behalf of the Corporation, and declared that the plan they were seeking to adopt would be "of enormous public benefit." The case for the Corporation closed on Saturday, and the examination of local witnesses in opposition has now commenced.

MR. HELPS' SYSTEM OF PIPE EXTRACTION.—In the article in the JOURNAL last week (p. 508) describing the appliance invented by Mr. J. W. Helps, Engineer of the Croydon Gas Company, for extracting cast-iron gas and water mains from the lines in which they lie in the trenches, it was by inadvertence omitted to be stated that the system has been patented, and therefore cannot be used without Mr. Helps's authority.

THE MANAGEMENT OF THE LEEDS GAS-WORKS.—At a meeting of the Gas Committee of the Leeds Corporation last Thursday, the resignation of Mr. E. J. Lloyd, Resident Engineer at the York Street Gas-Works, who, as announced last week, has been appointed Engineer and Manager of the Avon Street works of the Bristol Gas Company, was accepted. Mr. Townsley, of the Meadow Lane works, has been appointed to the position vacated by Mr. Lloyd.

PRESENTATION TO MR. G. GARNETT, M. INST. C.E.—On Monday afternoon last week, the Mayor of Ryde (Mr. R. Colenutt), accompanied by the Town Clerk (Mr. J. W. Fardell) and several members of the municipal body, waited on Mr. George Garnett, M. Inst. C.E., Engineer and Secretary of the Ryde Gas Company, at his residence, for the purpose of presenting him with an illuminated address on behalf of the Corporation. The Mayor, in making the presentation, referred to the many good works with which Mr. Garnett had been associated in connection with the town, and especially to his generosity in giving the Corporation a handsome mace—a gift which he was sure the whole town very much appreciated. He expressed the hope that Mr. and Mrs. Garnett might live for many years to look upon the testimonial which it was his pleasure to present. Mr. Garnett thanked the Mayor and the representatives of the Corporation, and expressed his high appreciation of their gift, which he said he should show to his friends with great pleasure. He hoped that when looking thereon, others might be induced to follow his example. If they did so, they would find the truth of the Scriptural adage that it was more blessed to give than to receive. The address, which is a beautiful work of art, was engrossed by one of the staff in the Borough Surveyor's office. Its presentation was in virtue of a resolution passed by the Council on the 10th of July last, just after the gift of the mace by Mr. Garnett. It sets forth that it is a testimony of the appreciation by the Corporation of the public spirit with which Mr. Garnett had helped every movement "having for its object the dignity and prosperity of the borough." The address, which is sealed with the borough seal, and signed by the Mayor and Town Clerk, is surmounted by the borough arms, and has a capital representation of the mace introduced amongst the other artistic embellishments. Referring to the presentation, the *Isle of Wight County Press* last Saturday said: "Very few citizens can show so good a record of public service as Mr. George Garnett. He was one of the originators of the Municipality of Ryde; and now he has been the means, directly and indirectly, of equipping its Corporation with a chain of office, a mace, and a loving cup. . . . As Chairman of the Ryde School Board, too, he has done a splendid work. Generous in all public matters, he has privately done much good. The whole town will cordially re-echo the words of the Mayor of Ryde in presenting the richly-deserved testimonial from the Corporation, and will wish him many a year of life in which to look back with satisfaction upon his work in Ryde, and to be the centre from which other beneficent deeds may arise."

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(FOR STOCK AND SHARE LIST, see p. 562.)

BUSINESS on the Stock Exchange during the past week has been active; although the happening of Jewish holidays in the course of it made things quieter for a time. The general tendency, after a little hesitation at first, has been good; and most descriptions have moved upwards except the Funds, which have been affected by dearer money. Money has been in demand, and the market is firm. A further rise in the rate would not come altogether as a surprise; but it will depend on the course of financial affairs between now and next Thursday. The Gas market has been rather quieter. But few changes have occurred in the quotations; and these are somewhat irregular. The tendency of the Metropolitan Companies has been easier. Gaslight "A" opened steady on Monday, but gradually fell away, and closed at its worst on Saturday; the final mark being 252. In South Metropolitan, the "A" and "C" have not been dealt in at all; but there have been a few transactions in "B." Prices have varied very little; but the quotation is 2 lower. A couple of transactions in Commercial old were all; and the quotation is unchanged. In the Suburban and Provincial Companies, business has been very quiet—except Alliance and Dublin, which has met with more attention, and changed hands at good figures; the time for payment of the dividend being near. A transaction in Crystal Palace 7 per cents., which is a rarity, was marked at 152. This would be equivalent to about 217 for the 10 per cents., or rather better than the nominal quotation. Of the foreign undertakings, Imperial Continental is quoted 1 higher; but the transactions marked were at no better prices than the week before. Continental Union preference is also 1 better, and both Bombay issues have risen $\frac{1}{4}$. The Ottoman Company meet to-day to declare a dividend at the old rate of 7 per cent. There has been more animation in Water; and several further improvements have been made in the quotations. The advance in Lambeth is most noticeable. The 10 per cent. shares are now almost treading on the heels of New River, which used to lead the rest by a considerable distance. Why Kent should be left so far behind the others is a mystery, as it is by no means the worst or the worst-managed Company.

The daily operations were: Quiet business in Gas on Monday; but the prices were extremely good. Water was pretty active, with a rise of 2 in New River, and 1 each in Kent and Lambeth. On Tuesday, Imperial Continental was the busiest of the Gas issues; little else being touched. Continental Union preference rose 1. Water was quieter, but very firm; and West Middlesex rose 1. Wednesday's Gas business was only moderate, and offered nothing to remark but a fall of 2 in South Metropolitan "B." Water was dull and unchanged. On Thursday, business in Gas was again limited. Imperial Continental advanced 1. Water as before. On Friday, there was business done in several Gas issues; but very little in any one. Bombays rose $\frac{1}{4}$. Water was more active, and good prices were marked. Southwark ordinary improved 1. Gas was quiet on Saturday, with a weak tendency—especially in Gaslight "A," which receded 1. Nothing at all was done in Water.

ELECTRIC LIGHTING MEMORANDA.

PROFESSOR FORBES UPON THE WESTINGHOUSE SYSTEM—THE ELECTRIC LIGHT IN ITS PLACE—THE PROPOSED ELECTRIC LIGHTING SCHEME FOR BIRMINGHAM.

THE communication from Professor George Forbes, F.R.S., to the Mechanical Section of the British Association, upon "Electric Lighting in America," was looked forward to with considerable interest. This was fully understood by Professor Forbes himself; and in introducing his subject, he assumed the duty of a scientific reporter upon the progress of central-station lighting in the United States during the past four years, since the Association visited America. He went on to remark that, the moment one lands in the States, one is struck by the popularity of electric lighting; and he says that this impression is maintained after leaving the great cities, and making the acquaintance of out-of-the-way towns. Of late years, however, the greatest progress that has been made in central-station lighting in America is the work of Mr. Westinghouse, who has made the Gaulard and Gibbs system a commercial success. As an illustration of the extent to which Mr. Westinghouse's electric lighting business has expanded, Professor Forbes states that he has at the present moment set up 110 complete central stations, with 191,000 lamps. Professor Forbes declares that he is no blind worshipper of American enterprise in general, or of Mr. Westinghouse's methods in particular. He admits that much of the best electrical plant and machinery are English; and does not think that the Electric Lighting Act, although he calls it iniquitous, is altogether to blame for the stagnation of the electric lighting business in this country. He is rather inclined to think that the cause of the progress of electric lighting with inferior appliances in the States is to be found in the spread of "technical instruction among the moneyed classes." This is a high-flying explanation indeed. People more awake to small considerations than Professor Forbes appears to be, might be inclined to add to this explanation a reference to prices of gas in America, and to the forbearance of the public with regard to the quality of the lighting. Capitalists have helped electric lighting speculators in this country, to their cost; but with little of the encouragement they appear in some instances to have received in

the States. However, to return to Professor Forbes's story. He gives due praise to the American electricians, and especially to the Westinghouse Company, for their forethought in manufacturing all their plant and machinery according to predetermined types in regular sizes; so that every part is interchangeable, and nothing has to be specially designed for filling orders as they come in. It is claimed for the Westinghouse system that it shows in the lamps 70 per cent. of the power given to the driving belts by the engine—a very good return for converters and alternating dynamos. Altogether Professor Forbes's paper is interesting and fairly instructive, notwithstanding the reserve with which the author treats the question of capital and working expenses in connection with central-station lighting, and his evident disinclination to recommend the Westinghouse system for England.

Among the papers contributed to the Mechanical Science Section of the British Association, was one by Mr. R. Percy Sellon upon the use of the electric light in the night navigation of the Suez Canal, which we refer to here in order to show that we are always prepared to recognize what there is good and useful in any description of electric lighting. Experience has abundantly proved that electric lamps for ship use, and for a variety of marine purposes, are as conspicuously in their place as they are out of it in the case of ordinary street lighting, and for other applications over which speculators persist in wasting money which, in general, does not belong to them. An example in point is supplied by the history of the opening up of the Suez Canal for night transit, which has practically increased the carrying capacity of the Canal by 50 per cent.—although it would not be correct to ascribe all the credit for this to the electric lamps borne by the ships, seeing that the Canal Company have co-operated in the matter by putting down a number of light buoys in the Bitter Lakes, and erecting guiding lights along the banks, supplied with gas from extensive works at Ismailia. The saving of time passing through the Canal for steamers carrying electric lights for night navigation is about 24 hours, which is worth £70 to £80 to first-class passenger steamers.

After a long period of quiescence, during which it may be supposed that plans have been perfected and negotiations completed, there is again a sound of the proposed electric lighting scheme for Birmingham which Messrs. Chamberlain and Hookham took in hand some months ago. According to a statement appearing in a local newspaper, the promoters are at last quite ready to make their formal applications to the Board of Trade and the Corporation, and are sanguine of success in a commercial sense. It is further stated that the supply of electricity is to be by meter at the rate of 8d. per unit; which is equivalent to gas at 6s. 8d. per 1000 cubic feet. At this rate, the average cost of an 18-candle power incandescent lamp would be a little under $\frac{1}{4}$ d. per hour, and of an ordinary arc lamp 4d. per hour. There is to be no restriction as to wiring houses, which consumers will be graciously permitted to get done (at their own expense) by any electrical fitting firm they may select; or the Company will undertake the work if desired. The average cost of the internal wiring is estimated at about £1 per lamp, plus an initial charge of £2 10s., which appears to be contemplated as a sort of entrance fee. The necessary electroliers and glass shades are estimated to cost 7s. 6d. each, and the lamps, which are to be charged for at 4s. each and are estimated to last 1200 hours, are also to be provided by the consumer. Thus it is evident that Messrs. Chamberlain and Hookham's customers will have a good deal to pay, in one way or another, for the blessings of electric lighting, if they ever rejoice in them. It is to be noticed that—probably by way of compliment to the Corporation gas—the normal incandescent lamps are estimated to afford an average illuminating power of 18 candles, instead of the 16-candle power usually assigned to these lamps in places where the gas is not quite so brilliant. Taking this statement of the contemplated rates of charge for electric lighting in Birmingham as authoritative, however, can any reasonable man require further information as to the causes why the system has not become more popular in this country? We would direct Professor Forbes's attention to this point. Here is a case of one of the chief towns of the Kingdom, which is at the present moment nearly, if not quite, destitute of the blessing of electric light. Is this due to the Electric Lighting Act, or to some other cause? It is proposed to supply the deficiency, however; and the first fact that stares one in the face from this project is that the electric light is to cost at least three times as much as gas in the town. In addition to this, the consumer is to do everything, and is expected to commit himself to heavy outlay for fittings, in spite of the consideration that of all the town electric lighting schemes that have been started in different parts of the country during the past five or six years, those still in operation may almost be counted upon the fingers of one hand. It is worse than useless for electricians and their unreasoning friends to hurl abuse at the Electric Lighting Act until they are prepared to explain considerations such as the above, which are more significant with respect to the real position of electric lighting in this country than all the glozing lectures and papers that were ever written to bolster up the new system of lighting.

THE PETROLEUM TRADE.—Captain J. J. Vandergrift, President of the United Oil and Gas Trust, in an interview with a reporter of the *Pittsburg Commercial Gazette*, furnished some highly interesting information as to the condition of the oil trade in Western Pennsylvania and also the future of the Ohio petroleum trade. He claims that by next year there will not be enough oil produced in this State to supply the demand of consumers; and for this reason the world will have to go elsewhere to obtain its full supply.

NEW GASHOLDER PATENTS.

FROM information that has reached us from various quarters, we are able to state that several applications have been and are to be made to the Patent Office for devices for guiding gasholders without lofty guide-framing; so that in a short time gasholder builders who may be inclined to make a speciality of economical construction upon this principle will have a considerable range of choice of methods. This is a matter that illustrates, in a very striking way, the force of example, and it may also be read as a lesson upon the canon of patent law which forbids the patenting of a principle. The idea of dispensing with what we have called superior guide-framing for gasholders is so clear that it strikes one as almost amounting to an invention of itself; but when properly considered, this idea will be found, upon inquiry, to be only properly definable as a discovery. Thus it enables us to show the essential difference between a discovery and an invention; seeing that the establishment of the principle that lofty guide-framing is not necessary for gasholders is a discovery, while the devising of the means whereby this principle can be carried into effect is invention. This consideration leads on to another reflection, upon the question which so grievously afflicts inventors—the respective rights and claims of the original inventor and the later improver. This is a matter that interests the world at large, which is often more indebted to the improver than to the first inventor; but it is something upon which opinions and interests are, and will always remain, hopelessly divided. Yet it is possible to do justice between the first inventor and the crowd of improvers whom he is apt to stigmatize indiscriminately as copyists and infringers, by keeping in view the distinguishing qualities of a discovery and an invention. It frequently occurs that the two ideas are confounded in one example; so that it is difficult to say off-hand which is discovery and which invention—which is the principle, and which the application of it. Such confusion commonly happens when the publication of an invention is the first intimation to the majority of the community that a new discovery has been made in the arts. Take, for example, the matter of incandescent electric lamps. Here was a case in which the discovery that fine filaments or wires of carbon (rendered vividly incandescent by the internal friction of a strong current of electricity, and preserved from combustion by being enclosed in a vacuum glass) could be made use of for lighting purposes, was almost inextricably mixed up with the invention of means whereby such lamps could be made. The man who first described these lamps and gave them the form and general character which they afterwards retained, but which were previously unknown, naturally regards himself as the rightful owner of the whole thing—discovery as well as invention; and he can hardly be brought to see that the man who comes after him, and merely improves upon the manner in which his discovery can be carried into effect, has any rights at all. Take, again, the case of the discovery of the effect of heating air and gas upon their luminosity attending the combination in combustion. It is not many years ago that the idea that any good whatever could be effected by such means was generally scouted. A British Association Committee reported that heating air and gas up to the melting point of the materials composing the burners with which they experimented, had no appreciable effect upon the illuminating power of the flame. Yet, at the time when this authoritative declaration was published, the beginnings of the modern regenerative lamp were actually in course of development. We all know to what a pitch this development has been brought by the successive improvements upon the original embodiments of the discovery. In these two cases, however—of the incandescent electric-lamp and the regenerative gas-lamp—it is possible to say that the original inventor of the means was also the discoverer of the principle; or if he was not strictly entitled to this distinction, that at least was to him due the bringing into prominence and favour of the idea carried out in his invention. It is not so in the case of the attempts now being made to dispense with superior gasholder-framing. Mr. W. Gadd, in the specification which we published last week, is perhaps the first patentee in the field. But he does not lay claim to any credit for the general idea to carry out which his invention is designed; and he will not, therefore, be aggrieved if a score of other patentees with similar objects to his own, but holding different views as to the most hopeful way of securing them, should besiege the Patent Office during the next few months. We have reason to believe that some inventors have now plucked up heart for patenting notions of this kind that they have cherished more or less hopefully for years; while more than one perfectly futile scheme will see the light that has been talked over and dismissed as impracticable by half-a-hundred engineers. In brief, the abolition of gasholder guide-framing is a question of the day that will not escape in some of its developments the reproach of being a "fad" of the hour.

It is in connection with this subject that we desire to utter a word of warning. We believe thoroughly, for reasons that need not be repeated, that with due precautions a gasholder can be guided from the base; but we are not yet prepared to state what these precautions are to be. It is necessary to remark that nobody has yet demonstrated to general satisfaction what is the amount of stress that would be thrown upon the bottom rollers of a holder, supposing that there was nothing else to keep the holder stable. To take Mr. Gadd's case first, as being most immediate, and to frame the inquiry in its simplest terms, we pose the following question: A single-lift gasholder is 100 feet in diameter, and 24 feet high, and weighs 66 tons—What is the strain upon the bottom

rollers according to Mr. Gadd's plan? So far as we can see, there do not exist the elements required to furnish the solution to this question. This opinion may be wrong; but we should like to see the problem worked out. Or again, as the solution which we look for as of the first importance does not depend upon the acceptability of Mr. Gadd's device, let it be sought for on the lines of the Rotherhithe experiment: If it is not necessary to carry up external guide-framing to the full height of the holder, in order to ensure its stability, how high should it go? And what will be the method for determining the stresses passing through the rollers that are retained? No attempt has been made to deal with such questions as these; but answers should be found for them if the new departure in gasholder design is to be credited with other than an empirical character. It may be possible to erect gasholders up to say 80 feet diameter, with a system of guiding utterly wrong in principle, but made serviceable by a lavish use of material. It is when holders become large that the question of combining efficiency with economy in construction grows pressing, and any deviation from true principle becomes dangerous as well as costly. After regarding the subject from all sides, therefore, and having regard to the magnitude of the interests involved, we repeat the desire already expressed in these columns for something like a crucial experiment in connection with a gasholder required to be demolished, the conditions of stability of which could be ascertained at a comparatively small expense. It is impossible to lay down in advance the conditions under which such an experiment should be conducted; but any gas engineer in a position to initiate such an investigation would deserve the thanks of his fellows by setting himself to solve one or two questions of gasholder stability in a practical fashion. As one of our correspondents has pointed out, however, experiments are apt to mislead, unless intelligently conceived and properly interpreted. It would therefore be a study to propound the conditions of an acceptable experiment. In the meanwhile, we desire to impress upon all inventors of means for dispensing with gasholder framing, the potent fact that they have not yet made good their ground, lest they should be carried away by the prevailing fashion, and, with a bound over all intervening obstacles, regard that system of construction as easy which only a short time since would have been dismissed as impossible.

It may be interesting to state that the Rotherhithe gasholder has continued in regular work ever since it was first inflated with the additional lift. The guide-framing is considered to be actually stronger than it would have been if it had been raised to the full height, because it is composed of cast-iron columns; and there is a limit to the height to which a framing of this kind can be usefully carried. A cantilever may be disguised as a column up to a certain point; but beyond that the deception becomes impossible. This consideration is of the kind which we had in view when we stated that small holders could be constructed after erroneous principles which would not hold good with larger examples. Columns may be used in the old-fashioned way for holders up to what a few years ago would have been regarded as a large size—that is, up to double-lift holders of 200 feet diameter. To depend upon cast-iron columns for holders of three or four lifts in height, and exceeding 200 feet diameter, would evidently be to spend a great deal of money upon a method of construction which, even if it could be made passably secure, would illustrate the devotion of the maximum of material to the minimum of strength.

FINDING WATER BY DIVINATION.

THE subject of this article is of a class that rarely finds admission into the necessarily severe columns of a technical journal; and that we should propose to devote any of our space to a discussion of it is an example of the truism that "extremes meet." For whatever may be said about engineering in general, by critics occupying all the range from the position just filled by Sir Frederick Bramwell to that taken up by Mr. Ruskin—that is to say, from a perfunctory admirer who can see no evil in the Engineer, to the scorner who does not find anything good in him—it cannot be remarked with truth that civil engineering is a mystic craft, or that it demands occult powers in its practitioners. Yet there is a point, which it is our present purpose to exhibit, at which the matter-of-fact practice of the civil engineer comes into contact with something as utterly inexplicable as any of the mysterious powers professed by the ancient Magi, or narrated in Rider Haggard's most thrilling romance. We mean the use of the so-called "divining rod" for finding underground springs or streams of water. It is possible that some of our readers, having reached thus far, may be disposed to turn from this article in disgust at the mere idea of our proposing to discuss seriously such a piece of "downright humbug," as the use of this method of discovering springs of water has been called in our hearing, by men who have never seen it. It is possible, however, for a witness to testify faithfully respecting something which he has seen, even though he cannot explain it. Scientific research would lose all its charm if there were no mysteries to be first noted and then cleared up; and a fact which appears altogether unaccountable when first seen by itself, may in due course fall into its proper place in a chain of phenomena completed at a later time by the discovery of a last link which makes harmony and reason out of what was previously a bewildering jumble of disconnected observations. This argument is all very good, it may be objected, so long as it applies to facts; but it is open to a critic to contend that we have not yet made good the first premises, and shown that the divining rod is a fact and not a means whereby wide-awake charlatans occasionally succeed in deluding the credulous. It will therefore be as well to mention that in

what we shall have to state in the following account of the divining rod, we explain nothing and guarantee nothing beyond the plain narration of what was witnessed by a party of visitors to Lisburn on the occasion of the recent meeting of the North of Ireland Gas Managers' Association in that prosaic town.

It will be more convenient, however, to recount by way of preface what is generally reported of the nature and use of the divining rod for finding water. Sufficient information for the purpose may be found collected in two articles which appeared in *Chambers's Journal* for Feb. 18 and July 21 of the current year. The first quotes an account of a remarkable experiment in Suffolk, published in the *East Anglian Daily Times*, conducted by a Mr. Lawrence, from Bristol, with the object—which appears to have been obtained—of determining the best site for a public well for the village of Wattisham. The account runs as follows:—

The articles used for the purpose of indicating the presence of water underground were a piece of steel spring about a foot in length, and a v-shaped hazel stick. The yard behind Wattisham Hall was first selected for the trials. With the piece of spring held in a bowed shape in front of him, and firmly grasped with both hands, the operator slowly stepped about the yard. In a very short time, and at one particular spot not far from the house, the spring began to twist and curve about in the most uncontrollable manner. With the hazel stick tightly held apex downwards, he again stepped towards the same spot, when the upward movements and twists of the stick were so violent as to break it. Mr. Lawrence predicted that at this spot a plentiful supply of water would be found.*

This description of the method of divination is corroborated by the writer in *Chambers's Journal*, by reference to another experiment witnessed by him near Bath, with the exception that in this case only the hazel rod was used. The statement continues: "It is certainly most interesting to observe the sudden and apparently uncontrollable movement of the wand, as held by the diviner, in certain spots, whilst it remains perfectly inert in others, and again, perhaps, moves very slightly. . . . In the case indicated . . . water was found." This account sufficiently describes the divining rod itself, and the method of using it; while, of course, it leaves the explanation of its action wholly in the dark. The appearance of this article attracted other communications upon the same subject which, as already stated, were published five months later. One of these names John Mullens* and Lawrence as the chief "diviners by the rod" of the age—how queer this sounds!—and claims virtual infallibility for the first, who is described as "a working mason on a gentleman's estate, and an unpretending honest man, who, if desired, sinks and builds his own wells and charges nothing if the water is not found." Mullens convinced the Vicar of the parish—naturally, an incredulous person—by tracing out the running sewer from the vicarage house for a long distance through the garden; not a hint of it being discernible above ground, and its position being known only to the Vicar himself. "He discovered our water-mains and branches here, wherever he crossed them in the course of his journeys, greatly to the surprise of an engineer from Sheffield who constructed our reservoirs." Another correspondent describes the use of the rod, consisting of "a small branch of white-thorn about 18 inches long in the shape of the letter Y. When the man—who was a mason—tried to find water, he walked slowly over the ground clasping the rod firmly with both hands near to the forked branches; and when the branches moved upwards, he said there was a spring of water below, and gave his opinion as to the depth of it from the surface. I was sceptical about the rod, and thought he moved it by some sleight-of-hand; but in the course of the day I was convinced it was not so." There is more to the same effect; but enough has been cited to show that practitioners with the rod have in different places convinced capable, and, in the beginning, sceptical observers, of their trustworthiness.

Now for our own piece of evidence. At Lisburn, upon the occasion of the meeting of the North of Ireland Association of Gas Managers, we met Mr. John Stears, of Hull, who claimed to be peculiarly gifted with the power, whatever it may be, of discovering not only water but also iron underground, by virtue of the rod. It was about eleven o'clock in the morning, when Mr. Stears volunteered to exhibit his remarkable powers—first privately, and

afterwards to a number of gas managers attending the meeting. A forked hawthorn twig, about 14 inches long, and V-shaped, was cut from a hedge and roughly trimmed of its leaves. Mr. Stears, holding a limb of the fork in each hand, with the apex to the front, slightly inclined downward from the horizontal, walked at an ordinary pace across the roadway. Very soon after quitting the curb the twig bent violently in his hands, which were quite rigid, "Here is the gas-main," he remarked. The revelation was so startling that other tests were demanded, which the operator continued to give for a space of nearly an hour in different parts of the roadway before an interested crowd of witnesses, many evidently "convinced against their will." Mr. Stears found in this way gas and water mains, underground drains, and springs; the indications in the cases of the two kinds of mains being substantiated by reference to competent authorities. It should be stated that Mr. Stears was comparatively a stranger in the town, and that the movements of the twig, however caused, were not such as he could have made by his own hands, which were, moreover, held several times by sceptical witnesses, who could neither stop the agitation of the twig nor detect any movement in the muscles of the operator. A hooked fish does not cause springing of the tip of a fishing-rod more apparently independently of the volition of the fisherman, than did this mysterious influence, whatever it was, of the end of the twig held firmly by Mr. Stears. The same action was afterwards repeated with a piece of soft copper wire. The movement of the twig was so curious, however, that one of the witnesses carried it off for examination, but without result. Without attempting to explain anything, therefore, we are able to declare, on the faith of many more eye-witnesses than would be required to hang a man, that on this particular morning in Lisburn Mr. John Stears did hold in his hands a freshly-cut twig, which did show very remarkable jerkings and bendings up and down. So much is positive. Then it was stated upon competent authority that gas and water mains underlay the roadways at the points where these manifestations occurred. Not one of many interested and incredulous spectators who were allowed to approach and watch the operator, and even to hold his hands, could detect any movement upon his part which would account for the movement of the twig; and nothing of the sort could be discovered by any of the tests which, upon the spur of the moment, were applied for this purpose. Further than this our testimony does not go. It is only fair to Mr. Stears, however, to state that he has since expressed perfect willingness to prove his powers in this line to anyone, and to submit to any reasonable test conditions. He does not profess to explain his powers in any way. He says that he discovered his own possession of it accidentally, and has for some years tried to find it in other people with whom he has been brought into contact. Some—a very small percentage—have something of the power, but he has never met with anybody who possesses it in as high a degree as himself, seeing that he can find both water and iron.

Mr. Stears informs us that while in Lisburn he traced all the drains and pipes [at a school, and was informed by the superintendent that he was correct in every case. He has also, as he states, found a spring in a gas-works, which was used to fill the gasholder tanks. The tank was sunk in a rather dry site, so that although there was a little drainage water, the sump-hole pump could not be kept in regular work. Water being urgently required, the divining rod was called into requisition; and the well-sinker was instructed to go to work at a spot indicated, although he protested that it would be useless. However, at a depth of 15 feet water was found; and when the well was deepened to 21 ft. 6 in. a spring was tapped which kept the pump supplied day and night until the tank was filled. Mr. Stears has furnished us with full details of the operation, and a plan of the site.

This is the whole of the story, of which our readers may make what they please. We only vouch for so much as we have seen. If there is trickery in the practice, it should be discoverable; if not, it is a truly remarkable phenomenon, which we are not bound to reject because we cannot account for it by any reference to known laws of Nature. The more experience man gains, the less hasty is he in recording opinions respecting matters which cannot be understood. Anybody who will take this subject in hand, however, and investigate and report upon it in a scientific spirit, will confer a benefit upon science. It is unendurable that amid all our colleges and technical institutes and high schools, men should go at large professing occult powers with reference to such a common matter as that of the discovery of underground springs and water-courses, and should deceive the public, if there is deception in the practice. If, on the other hand, it is a true power of Nature—which it is extremely hard to believe—why, let it be recognized as such, and let it receive its due acknowledgment.

* Since this article was in type, the following paragraph has appeared in several of the London newspapers:—An extraordinary series of experiments have been conducted on the site of the Hastings new workhouse. A point which has been warmly disputed in connection with the ground has been as to whether or not water was to be found there. It was at last decided to employ a "diviner," named Mullins, to test, by the phenomenon of a divining-rod, the capacity of the site in the matter of water supply. Mullins sent exceptional testimonials; having found abundance of water by divining for Lord Winchelsea, Lord Stanhope of Sevenoaks, Lord Lee, the Earl of Dysart, the Bradford-on-Avon Corporation, &c. From the fear of drawing together an inconveniently large crowd upon the grounds, the experiments were kept very private; but the matter became known to the local press representatives, of whom several were present, in addition to the Chairman of the Board (Mr. Winter, J.P.), the Building Committee, and the Board officials. Mr. Mullins was apparently highly successful. His plan was to walk with a hazel-twig suspended between the fingers; and when nearing certain points in the ground, the twig would become agitated, and twist right round in the "diviner's" hand. In order to prevent imposition, several sceptical persons held the ends of the twig very tightly in their hands whilst Mr. Mullins was experimenting; but even then it moved as usual, and in some instances snapped asunder in evading the attempts at resistance. According to the "diviner," there is an ample supply of water; and he calculates that at the highest points of the field there will be no necessity to dig more than 60 or 80 feet, whilst at some other points it might be found at 30 or 40 feet. The Committee of Guardians expressed themselves highly satisfied with the present stage of the experiments; but the well-sinking trials will be awaited with great interest.

THE Burlington (Iowa) City Council have decided that hereafter plumbers and gas-fitters, and all others whose calling obliges them to open the public streets for the purpose of tapping any gas or water main, sewer, drain, &c., shall take out a licence, to last one year, and to cost the recipient \$25. Having received the licence, the holder, prior to opening any street for the purpose of making a pipe, drain, or sewer connection, is required to furnish a bond, the sum of which is to be determined by the nature of the situation and surroundings, in regard to the possible amount of damage that might be caused by any neglect on the part of the contractor or licensee. A permit for each opening has to be obtained, the fee for which is to be \$1. The ordinance contains many other provisions, some of which are of a very stringent character.

Notes.

THE PRODUCTION OF CREOSOTE FROM PINE WOOD.

The extension of railroads to the Southern States of America having created a large demand for creosote for the preservation of timber, works have been established especially for its production from pine wood; and in a recent number of *Invention*, some particulars were given of the process employed. It differs from the ordinary method of charcoal burning, inasmuch as air is entirely excluded, external heat is applied, and a larger quantity of oily products are obtained, which in the ordinary way are lost in supporting combustion. The first condensable products are water and acetic and other acids; afterwards alcohol and phenoloid bodies; and, lastly, the heavy hydrocarbons used in creosoting. Gases are evolved in the following order:—Carbon dioxide, carbon monoxide, methane, ethane, ethine, and (at high temperature) hydrogen, due to the decomposition of hydrocarbons. The retorts are made of cast or wrought iron or steel; the two latter materials being especially used for large retorts, and the former preferably for small ones. They are generally made cylindrical, between 3 and 7 feet in diameter, and from 5 to 30 feet or more in length. The furnace gases are passed under a protecting brick arch below the retort (which is consequently first heated by radiation), and are then brought back over the retort. The most resinous pines, preferably those with a deep-red section, are chosen for giving the largest yield of oily products; the old trees which have been previously tapped for turpentine being especially prolific. The fuel for carrying on the process is the gas from the distillation as soon as it will burn, either direct or preferably drawn through scrubbers, and, if necessary, stored in a gasholder, although at the commencement wood or charcoal is used. The temperature for the first 12 hours is kept at about 290° C., afterwards gradually increasing, and finishing off at about 450° C.; there being left behind a poor charcoal, having the following percentage composition:—Moisture, 3·41; ash, 0·54; carbon, 63·80; volatile matter, 32·24. The following figures are the averages of 16 charges, and represent the yields in ordinary working:—Weight of wood, 4573 lbs.; light oil, '875 to '950 sp. gr., 13·8 galls.; pine oil, '950 to 1·040 sp. gr., 73·5 galls.; pyroligneous acid, 1·020 sp. gr., 185 galls.; charcoal, 1511 lbs. The distillates are allowed to settle, when the oil floats on the acid. It has a specific gravity from '97 to 1·03, retains a little acid, and contains also some volatile oil. The flashing point is 50° C. Its main application is for creosoting; and for this it is partly fractionated till the lighter and deleterious bodies, amounting to about 15 to 20 per cent. of the whole, are removed.

ELECTRO-CALORIMETRY.

At the recent meeting of the British Association at Bath, Messrs. W. Stroud and W. W. Haldane presented a paper on the above subject, in which they stated that further experiments had been made with the electrical method of measuring the specific heats of liquids described at the meeting of the Association at Manchester last year. The apparatus they have now adopted consists of two calorimeters—cylindrical vessels composed of thin hard-rolled sheet brass. In each vessel is a resistance coil of insulated platinum wire, fitted by means of a screw-plug of ebonite. One calorimeter, called the standard (the left-hand one), contains a thermometer; whilst the other is the working vessel, provided with a screw-plug for the admission of a pipette, used in changing the quantity of liquid. Connecting the two vessels is a thermopile, made of iron and German-silver wire. All the fittings are by screws, with leather washers, or by india-rubber tubing; so that leakage and evaporation are entirely avoided. Instead of the complicated methods formerly adopted for agitating the contents of the calorimeters, the very simple and exceedingly effective one of shaking the vessels themselves has been employed. For this purpose the calorimeters are enclosed within a suitable box, so as to be easily rocked or shaken. The authors discussed fully the ways of adjusting the rates of rise of temperature when electrically heated, so that these rates might be made as nearly as possible equal. This may be effected by shunting one of the coils, or by adjusting the amount of liquids in the calorimeters; the latter method being found to be the best. For the elimination of small errors, methods analogous to those adopted in accurate weighing may be employed.

REAPPEARANCE OF OLD GAS-MAKING PROCESSES.

The tendency displayed by the natural gas companies of Western Pennsylvania and the Ohio Valley to raise their rates for gas supplied to manufacturers, has caused attention to be directed to oil-gas processes, a great variety of which are now seeking public favour. A recent issue of the *American Manufacturer* contains descriptions of two so-called new processes of this order. One of these is being introduced by the Naysmith Fuel Gas Company, of Pittsburgh. It comprises a system of iron retorts, set after the fashion of ordinary coal-gas retorts. Two horizontal tiers of these retorts, each having over it in the arch a cast-iron superheater in shape like a V-pipe, constitute a bench. One superheater is for steam, and the other for air, which are brought to the front of the bench, and there admitted into one leg of the superheating pipe, passing through it to the other leg, where the currents of hot air and steam each encounter a small stream of crude petroleum. Thus carburetted, the vapours pass through the retorts, which are maintained at a temperature of about 900° Fahr., where the gas is fixed. From a condensation-box attached to the last retorts, the gas is led straight to the holder. A portion of the gas is used as fuel for

heating the retorts and raising steam. The process is reported to make gas at half the cost of natural gas, using Lima crude oil as the raw material; but the particulars published are very meagre. The other system is that owned by the Brooks Gas Process Company. In this case the bench contains six sets of retorts; each "set" consisting (as well as may be understood from an exceedingly poor description) of four horizontal branches subject to the heat of the furnace. A boiler supplies steam for conversion into gas, and to drive an air-blower. There is also a cooler for condensing the gas before it passes into the holder; but there are no washers or purifiers. Crude petroleum is pumped into overhead tanks, and thence flows through pipes into the front end of the retorts. Here it meets with steam; and the oil and steam become mechanically mixed. "It then passes into the next section; and meets the disintegrators, where chemical action begins to take place, and is forced through one disintegrator after another, with constant impinging against the inside of the retorts, until it has passed through all the disintegrators and sections into the regenerative chamber, where the chemical union becomes complete, and is then fixed or non-condensable gas. It now passes, with the right manipulation, through coolers into the holder, and is ready to be sent through the mains a 24-candle power gas of exceeding brilliancy." Mixed with tenfold its bulk of air, this gas is stated to resemble natural gas. From all this it will be seen that old processes under new names are being tried once more, with a view to compete with natural gas.

WAVERLEY ASSOCIATION OF GAS MANAGERS.—The fifty-fifth half-yearly meeting of this Association was held in the Tower Hotel, Hawick, on Thursday, the 13th inst.—Mr. J. Smith, Manager of the Hawick Gas-Works, presiding. There was a fair attendance of members. The Secretary (Mr. G. Taylor) read the minutes of the previous meeting, which were approved of, and showed that the funds were in a healthy condition. After a short address by the Chairman, in the course of which he mentioned that, through the use of gas cooking-stoves, the consumption of gas in Hawick during the summer had been increased by about 3 million cubic feet, various subjects connected with the manufacture and use of gas were discussed. Mr. Taylor was then presented by the Chairman, in the name of the Association, with a valuable gold medal, of artistic design, for his past services as Secretary to the Association. The medal was in the form of a wet gas-meter. A shield on one side bore the following inscription:—"Presented to George Taylor, Esq., by the Waverley Association of Gas Managers, as a mark of esteem for his services, 1888;" and on the other side was a shield bearing a monogram formed of the letters "G. T.," encircled by the name of the Association. After the business, the members, joined by a number of friends, dined together; the positions of Chairman and Croupier being ably filled by Mr. Smith, of Hawick, and Mr. W. Robson, of Selkirk. During the day the members of the Association visited the Hawick Gas-Works, under the guidance of Mr. Smith, and congratulated him on their very efficient condition. It was arranged to meet at Portobello in April, and at Melrose in September next.

THE HALIFAX GAS SCANDAL.—Our correspondent at Halifax (writing yesterday) says: "The position of affairs at Halifax in respect to the so-called gas scandal is almost unaltered from last week. The only item worth mentioning is that both parties—that is, the Mayor and Town Clerk, on one side, and Mr. T. K. Fox and his Solicitor, on the other—are agreed upon the terms of the indemnity; and the document now only awaits signature. It was expected that the Mayor would have appended his signature on Thursday, as an interview took place on that day between Mr. Rhodes (Mr. Fox's Solicitor) and the Mayor and Town Clerk; but, after a consultation, it was decided to defer the signing until the monthly meeting of the Town Council to be held on Wednesday of next week. It is to all appearance thoroughly understood by the members of the Town Council that the matter shall be proceeded with, and the allegations sifted to the bottom. Alderman Riley, the Chairman of the Gas Committee, declares that he knows nothing of any malpractices or irregularities, and strongly disapproves of the manner in which the subject was discussed by the Council in public during his absence from home. On the other hand, the general feeling among the ratepayers is something like this: The Mayor having publicly stated at the Council meeting that three persons would be implicated in the allegations to be made when the indemnity is signed, they ask, Why should Mr. Carr—who has carried out his duties as Gas Manager with signal ability—be singled out to bear the brunt of the battle, and the other two escape? The Mayor's answer to this is that Mr. Carr alone amongst the three is a servant of the Corporation; and they could compel him only to take proceedings after the indemnity was signed. The course taken with respect to Mr. Carr has undoubtedly strengthened the determination of the ratepayers, and of a great portion of the Town Council, that the indemnity shall be given, and the allegations (whatever they are) stated in open Council meeting, and thereby given to the public. I hear, however, on good authority, that the Mayor is inclined to the course of signing the indemnity forthwith. He is just now at Scarborough; but, as he is known to have had a long interview with Mr. Fox and Mr. Ellis Lever, when a large number of documents were brought under his notice, and certain information of a private nature given to him, he may, acting upon such information as he possesses, decide to precipitate matters, and bring the subject to a crisis in time for the Council meeting. Mr. Carr terminates his engagement with the Corporation at the end of the present week."

Communicated Articles.

THE GUIDE-FRAMING OF GASHOLDERS.

[The introductory lines to the letter by "Theory and Practice" in the JOURNAL for Aug. 21 would probably have recalled our readers' minds to the series of articles on the above subject commenced in our pages towards the close of last year, and the publication of which has been unavoidably interrupted. We are now, however, in a position to complete the articles; and we give to-day the notes to the third of the series, which appeared on the 31st of January last, together with the corrections of a few errors which have inadvertently crept in, reserving for an early issue the concluding instalment of this interesting communication.—Ed. J. G. L.]

NOTE I.

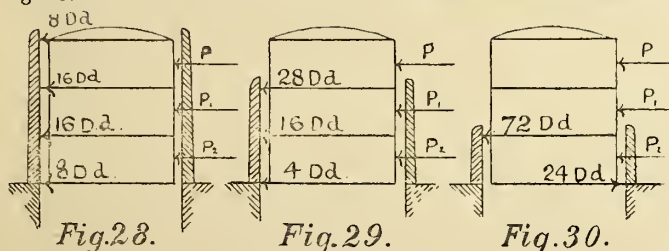
Iron shortens or lengthens about $\frac{1}{12000}$ th part of its length, for every ton per square inch strain upon it. This property of the elasticity of iron is very apparent in a large gasholder. For example, we will take the shortening of the top curb of a gasholder 200 feet diameter. The circumference in inches would be 7540, one-twelve-thousandth of which is 0.628 of an inch. Therefore the curb would shorten 0.628 of an inch for every ton strain; and as top curbs are frequently strained up to 4 tons per square inch (sometimes a very great deal more), the total shortening would be at least $2\frac{1}{2}$ inches, which means a reduction in the diameter of more than $\frac{1}{4}$ inch. It follows, therefore, that the top rollers are off the guide face by $\frac{1}{4}$ inch all round, when the holder is right up, and the curb is fully strained. The strain on the top curb is, of course, due to the pull of the top sheets; and this varies according to the pressure of gas within. When the holder is "down," there is practically no strain on the curb; and it is therefore at its full diameter. The roller carriages may be adjusted so that the rollers are absolutely tight against the guides when in this position; but immediately the holder rises, the pull of the sheeting compresses the ring, and so draws off the top rollers—making "play"—and each time the holder picks up weight (that is, cups), the curb shortens and the rollers leave the guides still more. This cannot be allowed for by adjusting the rollers when the holder is at its full height, because when the holder descends and the curb swells in diameter, the strains on the rollers would be enormous, besides over straining the framing.

Of course, this property of shortening under compression and lengthening under tension is applicable to the whole structure; the above has been chosen merely as an illustration. Therefore we see at once that there is no such thing as absolute and perfect fit in a huge structure like a gasholder; and, consequently, it would be very unwise to construct holders with only a few feet of guide-framing, as they depend upon perfect fit and absolute rigidity in all their parts. It is this same principle that makes it necessary to have the lifts of the gasholder at least one-fifth of the diameter in depth, to prevent tilting, and to economize material.

Again, the difference in temperature between winter and summer will cause the lengths of the various parts to vary. They may be $\frac{1}{10000}$ th part of their length shorter in winter than in summer.* These variations, due to elasticity and temperature, modify to a certain extent the cantilever treatment of the guide-framing, because of the impossibility of getting each part to perfectly do the duty and fill the office expected of it.

NOTE J.

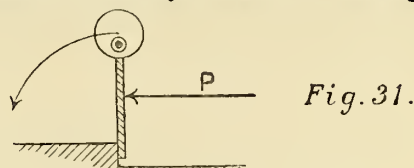
The pressure of the bottom rollers against the tank guides varies according to the height of the guide-framing. If the guide-framing be carried to the full height, the pressure of the gasholder against it is shown in fig. 28; the wind being uniformly distributed throughout the whole height of the holder, and acting in a horizontal direction. The pressure is distributed amongst the rollers on the three lifts approximately as shown. We say approximately because, should the rollers on the middle lift be too weak, or yield a little to the strain, it would throw more pressure on the rollers above and below. If the guide-framing be carried to the height of two lifts only, the pressure may be taken as in fig. 29. If the framing stop short at the outer lift, the pressures are indicated in fig. 30.



In all cases D represents the diameter of the holder; and d the depth of one lift—both in feet. The pressure is the resultant pressure in pounds distributed on the one circle—not the pressure on each roller. The arrows indicate the direction. The pressures given are those due to the wind only. The effect due to the weight of snow, can easily be added, if desired.

It has been suggested that the gasholder has a tendency to fall

against the wind, because its centre of gravity is above the centre of pressure of the wind. This can never happen as long as the base is restricted from advancing. It is impossible to cause the heavy headed stick shown in fig. 31 to fall backwards when struck in the direction indicated by the arrow P, although its centre



of gravity is above the point struck. It is bound to fall forwards, owing to the restricted base. A gasholder is an analogous case. When subject to a sudden gust of wind, it has a momentary tendency to fall backwards, or, more correctly, to thrust the bottom curb suddenly forward, hard against the guides. But as it meets with resistance, the top, of course, goes forward; and, if the wind is a steady, constant push, the pressures given out will be approximately as indicated in the foregoing diagrams.

NOTE K.

Even in the case of a simple plate girder, the exact calculation of the buckling tendency is practically impossible—the extent of stiffening necessary for the web has been determined by experience, and is quite foreign to all ordinary formulæ relating to the strength of girders, which formulæ only provide for the strength of flanges and web to resist the load, omitting the buckling tendency altogether. Speaking on this subject, Weyrauch states that "experiments have long shown that the plate-girder fails first by side buckling; the forces thus arising elude any systematic investigation."* If this be true for a simple plate-girder, how much more so for a complicated structure like a gasholder. In a single column or strut, subject to direct load, the determination of the buckling tendency is very difficult. How much more so, then, for a column built up of a group of columns, latticed together, and subjected to forces acting indirectly upon them and in various planes and directions. The formulæ given in the article, therefore, are to be preferred to a deep mathematical investigation based on merely theoretical conditions, and which is likely to be very much wider from the truth.

NOTE L.

The general formula for the strength of a cylindrical cantilever is $\frac{I C}{r L} = W$.

Where I = the moment of inertia of the section.
 C = the ultimate (tensile) resistance of the material per square inch (say, wrought iron, 20 tons; cast iron, 10 tons; and steel, 30 tons).
 r = radius (external).
 r_1 = radius (internal).
 L = length of cantilever.
 W = breaking weight in tons.

Or, filling in the value of I for a circle,

$$W = \frac{r^4 - r_1^4 \times .7854 C}{r \cdot L}$$

All other rules found in text-books are based upon this, though the way in which they are expressed may vary. Humber, Molesworth, and others, give rules which can be proved to agree with the above.

For very thin cylinders, however, it is not thought necessary to burden the formula with the two radii, as the difference is so slight Rankine, Clark, Fairbairn, Trautwine, and others therefore substitute the following approximation,

$$\frac{A D C}{4 L}, \text{ or } \frac{.7854 D^2 t C}{L}$$

Where A = the sectional area in square inches,
 D = the diameter of the cylinder,
 t = the thickness.

As regards the constant C , Fairbairn found, from several experiments, that it was about 13 tons per square inch for wrought iron (Trautwine gives 21 tons).

Experiments have been made with thin wrought-iron tubes, varying from 12 inches to 24 inches diameter, and from $\frac{1}{4}$ inch thick; and it was found that, as the thickness is reduced, the strength decreases at a greater ratio, and that the strength does not advance exactly as the diameter, but at a somewhat less ratio.

The general formula when applied to the experimental 24-inch diameter beam gives a breaking weight about double of that at which the tube actually broke; and the experiments go to prove that, as the diameter increases, the formula becomes more and more unreliable—the divergence accelerating rapidly; this being due to the fact that the formula does not provide for buckling or lateral stiffness. Mr. B. Baker, Mr. D. Kinnear Clark, and others, draw attention to this omission in the general formula.†

In the case of an iron ship, the skin is more than strong enough to take the direct strain upon it; but over and above this, it is stiffened by stays. According to Rankine, the space between the stays should not exceed (say) 40 times the thickness of the skin;

* See Barlow's "Strength of Materials," p. 280.

* See "Strength and Determination of the Dimensions of Structures of Iron and Steel," by Dr. J. J. Weyrauch; also Box, on "Strength of Materials," gives numerous examples proving this.

† See "Rules and Tables for Mechanical Engineers," p. 512.

otherwise the skin would yield by buckling.* The same applies to very hollow beams. They must be stiffened up, or they will yield by buckling; and for this the ordinary formula makes no provision. We, therefore, see its inapplicability to the gasholder for determining the strains. Something more is wanted to go hand in hand with it, and that is an allowance for buckling, distortion, or, as it is sometimes called, *wrinkling*, which allowance has been made in these articles.

NOTE M.

The columns on the lifting or tensile half of the cantilever are, of course, aided by their own weight, and the weight of the allied framing. The columns near the axis have very little lifting force upon them. Consequently their own weight more than balances it; but as the columns recede farther from the axis, the lifting strain increases until it exceeds the weight of the column. The actual upward lift on the outermost column is, of course, the difference between the calculated lift, and its own weight; assuming the structure to be a perfect cantilever. The columns on the crushing side of the cantilever guide-framing are, of course, further strained by the addition of their own weight. As the wind may blow from any quarter, all the columns must be of equal strength, as each in turn may be the most severely strained one.

The strength of a column is, of course, increased to a much greater extent by adding to the sectional area than it is impaired by the additional weight. Again, the heavier the structure, the greater is the dead weight to set in motion by the capsizing forces. It is to this, added to their individual transverse strength, that the columns in the old style of guide-framing mainly owe their stability.

ERRATA.

First Article (Vol. L.).

Page 792, Conclusion 4 read as follows:—*That a telescope gasholder is even worse, unless the guide-framing exceeds one-seventh of the diameter in height, owing to lever tower.*

Page 793, line 16 (first column), for "inner lifts" read "inner lift."

In the same column, line 57, for "moments round X" read "moments round O."

Page 793, line 44 (second column), for "the eight of the outer lift" read "the height of the outer lift."

Second Article (Vol. L.).

Page 963. In figs. 7 and 8 the arrows representing wind pressure are shown of equal length, they should vary in length; being greatest in the centre, and falling off on either side gradually.

Page 964, line 14 from bottom (second column), for " $= 14\frac{1}{2}$ tons" read "28,286 lbs., say $12\frac{1}{2}$ tons." The rule following to be altered thus: "Or approximately, three times the diameter, multiplied by the depth of one lift = the compression on the bottom curbs (in pounds) due to the racking effect of wind pressure, when the inner lift only is above the guide-framing in a treble-lift holder; leaving therefore in this case about 32 tons for snow effect."

Page 965, line 36 (first column), substitute, for "amounts to" the following:—"Is approximately 25 times the diameter, multiplied by the depth of one lift, in a three-lift holder with two lifts towering above the guide-framing, which, in this case, is $25 \times 200 \times 45 = 225,000$ lbs., or fully 100 tons."

Line 5 from bottom, substitute for "this" "which."

Third Article (Vol. LI.).

Page 189, fig. 23, substitute " $\frac{1}{2}$ d." for $\frac{1}{2}$ D. on the right-hand side.

Page 190, line 38 from the top of second column, for "movement" read "moment." In the formulae 23 lines from bottom for " d^2 " put " d_1^2 " in both cases. Page 191, line 29 from foot (first column), read "columns" for "column." Page 192, line 15 from foot (first column), for "fig. 25" read "fig. 26."

MODIFICATION OF HARCOURT'S COLOUR TEST.

By H. LEICESTER GREVILLE, F.I.C., &c.

Chemist to the Commercial Gas Company.

An article on this subject, by Mr. William G. Hicks, appeared in the JOURNAL for the 11th inst.; and as I have had some ten years' practical experience in the use of the Harcourt tests, and have myself introduced some modifications of the original apparatus, I should like to contribute a few remarks on the subject.

In the first place, I cannot see in what possible way the method of determining the various impurities in coal gas described by Mr. Hicks are modifications of, or, indeed, in any way connected with the Harcourt colour tests. The only connecting link, as far as I can judge, is the lamp for the determination of sulphur compounds. The term "colour test" speaks for itself, and is essentially a correct title for Mr. Harcourt's tests. Carbon disulphide, sulphuretted hydrogen, and carbonic acid are all determined by the use of colour standards, with the result of placing in the hands of comparatively unskilled people a method of testing which, although not strictly accurate, is sufficiently correct for guidance in practical gas purification, and is indeed for this purpose invaluable. Mr. Hicks does not propose to use these colour standards in his so-called modification of the tests; and his methods are simply those already well known to chemists. The determination of ammonia by means of passing a known quantity of gas through test acid, and subsequently titrating by test alkali, is that in daily use as the Referees' test; and the direct passage of the gas through a known quantity of test acid in a tube, using an aspirator to draw the gas through the liquid and measure, is a method I have employed as a rough test for many years past. It is only practically available where the proportion of ammonia in the gas is comparatively large. The estimation of carbonic acid by means of barium hydrate is a well-known method which has been frequently described. The process recommended for the estimation of sulphuretted hydrogen is open to very grave objection, owing to the well-known solubility of the gas in aqueous solutions. I gather

from Mr. Hicks's description, that the amount of sulphuretted hydrogen present in a certain volume of gas is inferred from the saturation of a known volume of an aqueous solution of lead acetate of definite strength, calculated on the basis of the known reaction between lead and sulphuretted hydrogen. Before, however, sulphuretted hydrogen passed through the solution so as to be indicated on the lead paper can be taken as a guide to the completion of the reaction, not only would the lead in the solution have to be converted into sulphide, but the water present would have to be charged with sulphuretted hydrogen, and the effect of this would be to considerably under-estimate the true amount of sulphuretted hydrogen present. The error from this source would also be a variable one with variations of temperature and pressure; the absorption of sulphuretted hydrogen by water increasing largely as the temperature decreases. The objection to the method of sulphuretted hydrogen determination recommended by Mr. Hicks applies with still greater force to his determination of carbon disulphide, as the volume of liquid employed would probably be as large, while the amount of sulphuretted hydrogen originally present would be smaller, and the percentage error would thus be proportionally increased.

With regard to temperature and pressure corrections in determinations of this character, I must confess to have, as a rule, ignored them, as the methods of operation are not, in my opinion, sufficiently correct to necessitate such refinement. Mr. Hicks, it is true, obtained as much as $6\frac{1}{2}$ inches of exhaust in his aspirator; but this could only have arisen from the employment of two tubes of solution, which is really unnecessary if the precautions are taken of pressing the capillary tube down to the bottom of the liquid, so as to divide the gas into minute bubbles, and of aspirating the current of gas at a sufficiently slow rate.

My own modifications of the Harcourt test were fully described in the JOURNAL for Oct. 12, 1886 (p. 652); but since the publication of the details, some useful improvements have been effected. The apparatus as now manufactured by Messrs. A. Wright and Co., of Westminster, is complete in a box, which can be carried about from place to place, and used as required. The box is so arranged that all the separate details of lamp, test-tubes, and measure aspirator are in their proper places. When in use, the front of the box slides out, exposing the apparatus, but at the same time protecting the lamp from draught; while a small hinge flap at the back allows the passage of light to the sight-box with its two tubes—viz., the colour standard, and that containing the lead solution. A test completed, the whole apparatus can be removed to another spot; and a fresh test taken without the delay of moving the apparatus piece by piece, and with the additional advantage of not requiring any special arrangements for shielding the lamp from draught or rain.

AN ARTESIAN BORING AT EALING.—Adjoining the new reservoir recently completed by the Grand Junction Water Company at Ealing, which was described in the JOURNAL for the 7th ult. (p. 241), artesian boring operations are being carried out by Messrs. Le Grand and Sutcliffe, and the chalk formation has just been struck at a depth of 321 feet from the surface. The base of the London clay was reached at 249 feet, below which came 72 feet of the Woolwich and Reading beds.

ELECTRIC LIGHTING IN BERLIN.—Experiments are now being made in Berlin with the electric light for street illumination; the first thoroughfare in which it has been introduced being the well-known avenue Unter den Linden. This is lighted by 108 arc lamps, suspended from chains running between cast-iron poles 24 feet in height. The latter are round, and ornamented with heads of lions and the Imperial arms at the base, and an eagle at the top. In the central avenue the distance between the lamps is about 100 feet; but in other parts, except at the crossing of the Friedrichstrasse, more. The motive power is supplied by four dynamos stationed in the adjacent Mauerstrasse; and the strength of each lamp is 2000-candle power.

THE MANUFACTURE OF COMPRESSED FUEL.—An addition to the various machines which have of late years been devised for converting into an article of commerce the dust or slack of coal, has just been made by the introduction of an appliance invented by Messrs. Mowll and Messenger, of Dover. The new machine is of comparatively small size; the briquettes made by it measuring only $4\frac{1}{2}$ inches long by $2\frac{1}{2}$ inches wide and $2\frac{1}{2}$ inches deep, and weighing $1\frac{1}{2}$ lbs. each. In making these briquettes, the coal dust is first mixed with 10 per cent. of crushed pitch; and the mixture is fed into a vertical mill, in which the ingredients are thoroughly incorporated by stirrers. At the bottom of the mill the ingredients encounter a jet of steam, which melts the pitch, and brings the mixture into a plastic condition. The mixture is then fed into a revolving mould; and the charge receives its initial pressure, from a horizontal plunger. The mould then makes a slight turn, and the partially compressed charge encounters another plunger, which gives it the final pressure. Another slight turn brings the compressed charge to an ejector, which pushes it out of the mould into a trough, from which the briquettes are removed by a boy on to a tray to be taken away for stacking. They are ready for use in about an hour from the time they have been delivered from the press. The action of the machine is continuous; and the rate of ordinary working is about 14 briquettes per minute, or five tons per day of 12 hours, which can be increased to six tons if necessary by working at a higher speed. The machine can be operated by unskilled labour, or be driven by horse or steam power.

* See Rankine on "Shipbuilding."

Technical Record.

SOUTH-WEST OF ENGLAND DISTRICT ASSOCIATION OF GAS MANAGERS.

HALF-YEARLY MEETING AT WESTON-SUPER-MARE.

The Twenty-second Half-Yearly Meeting of this Association was held on Tuesday, the 11th inst., at Weston-super-Mare. The PRESIDENT (Mr. H. Sainsbury, of Trowbridge) occupied the chair; and there were present a large number of members and friends.

The formal business, as reported in the JOURNAL last week, having been disposed of,

The PRESIDENT delivered a brief address, as follows:—

PRESIDENT'S ADDRESS.

Gentlemen,—It is to me a source of great satisfaction to find on the *agenda* paper of this meeting that “opening remarks” only are expected from the President, and not the formidable “inaugural address.” In looking over the proceedings of our past meetings, I was also pleased to observe that the remarks made by former occupants of this chair had been brief, and purely introductory to the business of the meeting.

It is a pleasure to all who take an interest in these Associations to hear of their increasing number and rapid growth of membership; showing as it does the willingness of our brethren to work no longer in isolation and self-sufficiency, but to carry out the great and divine law of “bearing one another’s burdens,” and impart to others the wisdom which has been bestowed upon us. In the JOURNAL OF GAS LIGHTING for Aug. 21 last, I notice there is a report of the first annual meeting of the North of Ireland Association of Gas Managers; and in the succeeding number a paragraph announcing the proposed formation of a similar Association for the Eastern Counties of England. We wish these new Associations, as well as those of older growth, much success and increasing usefulness. We have had the pleasure of admitting to our ranks a larger number of new members this year than in any previous year since the formation of the Association; three having been admitted at the March meeting held at Trowbridge, and seven to-day. On reading the report of our first half-yearly meeting held at Sherborne ten years ago, I find our number of members was then only 31. Now we stand at 74; or rather more than double the membership we had then. We are glad to know that death has not entered our ranks since we last met; but we have lost two valued members by removal to foreign parts. Mr. W. W. Monk, of Bournemouth, has gone to Melbourne, Australia; and Mr. Walter Thomas (who was with his father at West Cowes, Isle of Wight), to British Columbia. May they both prosper in their new undertakings. The latter gentleman has forwarded to our Honorary Secretary a few interesting particulars of his new surroundings, which will presently be read to the meeting.

A few months ago the theory of a new departure in the guide-framing of gasholders was ably discussed in the columns of our trade journals. The last few weeks have witnessed the successful, if only partial, accomplishment of this scheme. Mr. Livesey, with his accustomed energy and pluck, has made the experiment; and at the Rotherhithe station of the South Metropolitan Gas Company, a three-lift gasholder may be seen without the usual guide-framing beyond the second lift. May we not look upon this, and also the somewhat different plan invented by Mr. Gadd, and described by Mr. Newbigging in his paper read before the Manchester District Institution of Gas Engineers, as a type of what will in the future be the method of constructing and guiding our holders.

We have before us to-day three important subjects for consideration. Mr. Jervis has again kindly stepped forward to give us a few remarks upon “The Hydraulic Main, and Retort-Bench Bracing”—two points which have often tried the patience and ingenuity of many gas managers. Brickwork will expand with heat, and it is with difficulty that the hydraulic main, when placed on the beds, can be kept level, and so ensure an even dip in all the pipes; while the obstacles in the way of so bracing the retort-benches without exposing some portion of the tie-rods to a great heat are known to most of us. We hope Mr. Jervis will give us the true solution of this problem. Our old, but troublesome friend, naphthalene, will be alluded to by Mr. Davis, of Poole; and as he is going to tell us what he found to be a remedy for it, may all who are similarly perplexed try his plan, and obtain the same relief. Mr. Thomas, of West Cowes, has the happy knack of inventing new or improved appliances to meet the varying difficulties which are found in our works. A year or two since, he brought out a very capital “regulator” for tar-fires; while to-day he will describe “A Pressure-Gauge having no Joints.” Many of the pressure-gauges at present made, when used with foul gas, often clog in the small passages with tarry matter. Mr. Thomas has doubtless experienced this obstruction; and has improved upon the gauges already in use to remove this and other defects. I feel assured that the foregoing subjects, together with the usual business of the Association, will occupy all the time at our disposal; but should the opportunity occur, we shall be glad to hear remarks on any other subject calculated to advance the interests of the Association, that members may bring forward; a free interchange of opinions being essential to our well-being.

We cannot assemble at these autumn meetings without looking forward with hope, yet anxiety, to the coming winter. In the spring we are full of plans for improving our apparatus during the summer; but in the autumn these are largely completed, and waiting for the test of increased make and increased consumption.

All are hoping to sell more gas, and to manufacture, if possible, at a less cost. Trade seems to be somewhat improving throughout the country; and, if this is so, we trust it will mean a larger consumption of gas. Residuals, too, are looking up in every department; and we may hope to realize more from them than during the last winter. Some of you have ere this had your summer holiday, and are now braced up, and better fitted for the work lying before you. Others who have not will do well, if possible, to spend a few days in this popular watering-place of the west, and inhale the breezes from off the Atlantic Ocean. As the winter comes on, the conscientious gas manager has little time for recreation and change. All his powers of body and mind need to be concentrated on his work; for he must more or less unite in himself the various duties of engineer, chemist, and accountant, as well as take the general supervision of his workmen. Much wisdom and self-control are needed to carry on our different works successfully; and to those who, like myself, feel their insufficiency for these things, I would say in this, as well as in higher and more sacred matters, let us apply to the Fountain of all Wisdom, “who giveth to all men liberally and upbraideth not.”

Mr. J. J. JERVIS (New Swindon) read a paper entitled

THE HYDRAULIC MAIN, AND RETORT-BENCH BRACING.

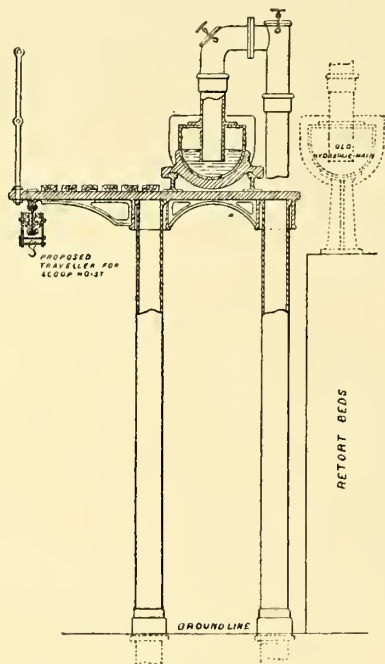
In the short paper I am about to read, I do not propose to enter into any matters relative to the sizes or shapes of the hydraulic main; or whether it should be of wrought or cast iron, or dispensed with altogether, and give place to a whole family of automatic valves, anti-dips, &c. I purpose only to speak of its position, or where it should be fixed by those who choose to retain it. Nearly all anti-dip disciples make use of the hydraulic; so that any discussion this question may raise will be of interest to them, and my sole object in reading a paper to-day is to form a text for some discussion.

The position of the hydraulic main is almost universally over the retort-benches—in a splendid place for all possible dirt, smoke, heat, and the general discomfort of the workman who have to attend to anything in connection with it—more especially in the pleasing duty of “pipe-jumping,” should chokes occur. Of course, the retort-bench offers a ready and inexpensive foundation for the hydraulic standards or crutches; but it may be open to question whether such a base as is offered by the retort-stack is the best for a reservoir which we desire to keep as level and rigid as possible. Some engineers contend that it is not objectionable for the hydraulic to be close over the retort-bench, and that the thick solid tar found in the vessel is not caused by the heat of the retorts. In “King’s Treatise on Coal Gas,” it is stated that: “Various means have been tried to prevent or clear out this accumulation of thick tar; one being an enlargement of the hydraulic itself, till, in one case that I [Mr. G. Livesey] have seen, each length would make a small Cornish boiler. Then the elevation of the hydraulic from two to four or five feet above the brickwork with the object of removing it beyond the reach of heat; it being considered that the heat from the setting converted the tar into pitch. A stream of gas liquor has in some cases been caused to flow through the main; and for a long time I had a quantity of hot water from the steam-boiler put into the main once or twice a week. But this did very little permanent good. The making the main deeper, and square at the bottom, has been suggested. Means for drawing off the tar from the bottom, instead of the top, have been devised and used with varying success; but by no plan, so far as I am aware, has the prevention of this accumulation been certainly or completely obtained. The causes of its production are twofold—first, the retention of the tar in the main; and, second, the heat of the gas from the retort in passing through this comparatively stationary tar evaporating its volatile constituents; for it is the hot gas, and not the radiated heat from the setting, that does the mischief.” And further on, after describing how, by making the hydraulic shallower, and only allowing about 2 inches of tar below the bottom of the dip-pipe, it states that the tar kept “perfectly fluid;” there was “no pitch or thick tar, and no crystals of ammonia; . . . not a stopped dip-pipe all the winter, and stopped ascension pipes were of much more rare occurrence.” Perhaps, then, it may be a fair argument to say that the choking of ascension and dip-pipes is not due to the close proximity of the hydraulic to the retort-bench; and that, therefore, on that account there is nothing to be gained by shifting it. Still I think the top of the retort-bench a most undesirable place.

Again, “King’s Treatise” says that the saddles or standards supporting the hydraulic should have a substantial bearing on the bench, and their position is over the piers separating the ovens. But is a substantial bearing obtained on those walls that are part and parcel of the beds, and shift accordingly with their expansion and contraction? These party walls need renewal at certain periods, and then there is anxiety and risk. Strutting, slinging, and other means are resorted to, to maintain the hydraulic in safety, which might be avoided were the main supported on girders or columns independent of the brickwork. This was chiefly the cause of my placing the hydraulic at our works on girders and columns in front and absolutely free of the retort-bench; so that any alterations or renewals of the brickwork could be carried out with perfect freedom from anxiety as to the safety of the hydraulic. The drawings I have here show how I have placed the main. It was done in a simple and cheap manner; the whole alteration, extending over seven beds of fives, costing under £40.

The idea of supporting the hydraulic other than on the brick work is not a new one; in fact, it is an old and condemned plan

In "King's Treatise" we find it stated: "The hydraulic main is usually supported by cast-iron stands or crutches . . . mounted on short brick piers, placed over the piers of the ovens, so that the main is at a short distance away from the front of the settings, and beyond the influence of the excessive heat. In the early period of gas lighting, the hydraulic main was cylindrical, and supported on cast-iron pillars, placed in front of the settings; but, owing to the prejudicial heat rising from the front of the bench when drawing the retorts, and the inconvenience of the projecting columns, this system is generally abandoned. From six years' experience, I demur to the indictment, both as to the prejudicial heat and the inconvenience of the projecting columns. The heat arising when drawing and charging is felt less on the platform than in the orthodox position of the hydraulic. The platform shown in the drawing is very handy for the workmen, and was much better for them than walking about on hot bricks. Anyway, whether the hydraulic is fixed over the brickwork or on girders, it is but due to the men that some provision should be made for as cool a platform as possible. The wooden battens of my platform are pretty dry by this time I expect, but they have not fired once during the six years they have been in use with the "excessive heat," although the platform is only 3 feet above the highest mouthpiece.

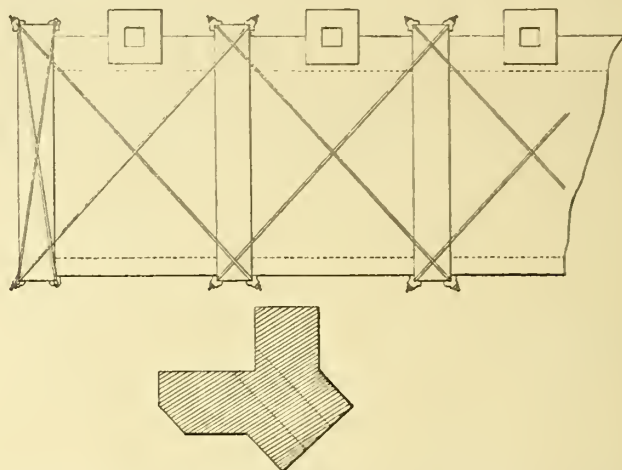


Having shifted the hydraulic main off the brickwork, I fancied there was not so much need to tie the piers between the beds by buckstaves back and front. The separate chimney system to each bed (which is now being tried, I believe, at Bath, and which we have followed for the past 14 years) interfered with bracing from end to end by angle-bars at the corners of the entire stack; and I could not, by placing buckstaves against the end walls of the bench, tie over the beds, as they were of different heights. Under the circumstances, I resolved to do without bracing at all; but whether or not the proceeding was wise remains to be determined. There is some consolation, however, in noting that in this matter as in others, there are divers opinions, and that there are some gas engineers who still do without bracing. Even in "King's Treatise" it is said that some "engineers contend that transverse tie-bars and buckstaves are unnecessary, because at times the bars are burnt away at the centre and the heat causes them to expand. But if the tie-bars are fixed in the proper position, either above the brickwork of the bench, or carefully embedded in it out of the reach of the heat of the flues, there is no danger of these burning away. Unless well bound together transversely as well as longitudinally, a bench will not endure the wear and tear of many seasons' working; the piers between the arches will inevitably bulge, and openings and crevices will appear between the ovens, admitting air and injuring the draught." Such is the text; and the matter of bracing seems to be so simple that there need be no fools.

There are one or two questions, however, that might be asked. Does not a long tie-bar—that is, from end to end of bench—allow of a good bit of expansion of brickwork? Except on account of the hydraulic main, do the middle or inside beds of retorts require longitudinal aid, inasmuch as they have the support of their neighbours one against the other? Is it sufficient therefore to buttress or otherwise stay the end beds only? And when an arch is taken down, is the temporary strutting on account of the hydraulic, or purely on account of expansion? Is the matter of checking the expansion by tie-bars a question only of how much? The heated brickwork *must* go somewhere; and the only consideration, I take it, must be which way? If the arches cannot spread, they must rise; and if the front walls cannot come forward, the rear ones will go backwards.

The point I wanted to decide was whether after all, when I had relieved myself of care in regard to the hydraulic, I need trouble

anything about bracing the retort-bench. I found from four years' experience without any bracing that the inside piers remained plumb; and the end one only went over about 2 inches in a height of 9 feet. The face ends of the pier walls had come forward about 3 inches, which would have been a bad thing for the hydraulic had it stood on crutches there. The expansion of the retorts, back and front, was not more than previously; but, altogether, I was convinced that some bracing is better than none at all, even though it be only from end to end over all. There will be more or less expansion with the best bracing; but there will not be the excessive expansion there is possible where no ties are made use of. The retorts "go" with the brickwork; and the cracks in them are not so readily repaired as in the walls, &c. I therefore determined to again brace up; but brace over all I could not. Mouthpieces at different levels in front, separate chimneys to each bed behind, and unequal heights on the top, precluded the use of long ties.



As in retort renewals I generally clear the arch right out, I wished to avoid all necessity of strutting, and have as clear and cool a working space as possible. I meditated some accommodating bracing. "Necessity is the mother, &c.;" and the drawing herewith shows my "invention." It may be thought complex and unnecessary; but, of course, I deem it just the thing. Anyway it has been satisfactory so far. Each bed is independent of its neighbour; and any bed may be cleared right away without occasioning any alteration of the tie-rod, &c. The short tie-rods will not allow of so much expansion as longer ones; and the placing back of the face of the bed 2 inches to form a corner for the angle-bar, does not interfere with the setting of the retorts. The "go" of the expansion of the retorts is directed by the angle-bars to the back wall rather than to the front; and the mouthpieces and ascension pipes consequently keep plumb. The cost of bracing the seven beds in this manner was under £45.

Discussion.

The PRESIDENT thought that the meeting had just heard a very practical paper. Mr. Jervis had given good reasons for removing the hydraulic to beyond the front of the retort-bench; and it seemed to have answered well in his case. At the same time, some managers were not much troubled with thick tar. At Trowbridge he had not cleaned out his hydraulic for several years; and yet had not found that thick tar accumulated to any considerable extent. He had personally inspected the arrangement described by Mr. Jervis, and could testify that the woodwork did not burr away.

Mr. W. FIDDES (Bristol) said he had tried to do without bracing with through settings, 20 feet in length; but they split and separated from the piers, at about 3 feet from the front of the setting. It was therefore necessary to put up buckstaves and tie-bars. He also found considerable improvement by putting on the top of the pier before turning the arch, a sort of "bond timber" made of very large fire-clay lumps, each about 2 feet in length, splayed to take the springing of the arches. The plan served to tie in the brickwork to a considerable extent; but not sufficiently so to dispense with the buckstaves and tie-rods. It was difficult to get buckstaves that would hold. The cast-iron ones would snap suddenly, without warning; and those made of wrought iron buckled and gave way gradually. Of course, as soon as a buckstave failed, it was necessary to renew it, or damage to the setting would speedily follow. When a setting was lit up, it expanded about 3 inches in the direction of the length, and 2 inches in height. So whenever the heat of the retorts was increased, the rule should be to slack the nuts of the tie-rods, and *vice versa*. In order to meet this variation, he had tried bell-cranks and a system of counter-weights to take the leverage. But this failed. Then he substituted lead, or lead and tin washers, thinking they might squeeze together gently. This, however, was not so successful as careful attention to the nuts, letting out half a thread or so each morning and night until the maximum expansion was obtained when lighting up. In cooling down, the furnace was filled with fuel, the damper shut, and the ash-pit and door carefully covered up, so that no cold air could enter. The retort-lids were all carefully screwed up; and when this plan was followed, two or three weeks elapsed before the setting got cool. The retorts lasted from 1200 to 1400 actual working days. When letting down, it was a good plan to seal up the mouths of

the retorts with 4½-inch brickwork, to prevent loss of heat; and the same might be done with new settings adjacent to those in use. For about 40 years he had worked with separate chimneys to each bed, very short, not more than 2 or 3 feet above the top of the stack. By this means, he secured better heats with less fuel; and therefore always adopted that plan.

Mr. J. LOWE (Weymouth) remarked that, having had great trouble with cast-iron buckstaves, even when "bellied" so as to be stronger in the centre, he hit upon a cheap and effective wrought-iron buckstave. It was made of two second-hand railway irons, strongly clamped together. The cost of these discarded rails was only about 80s. per ton for small quantities, and somewhat less for large; so that a 10-foot buckstave cost him about a guinea. Made in this manner they were about 5 inches square; so that with 14-inch partition walls, and retorts close to the side wall of the setting, it might be necessary to keep the ascension-pipes out a little, in order to clear them.

Mr. S. W. DURKIN (Southampton) said he had long been of opinion that some simple plan for bringing the hydraulic out from above the top of the stack was advisable. As at present fixed, it seemed altogether in the wrong place, particularly where there were long rows of beds. When letting some of the beds down, it was necessary to have the hydraulic main levelled; and the same when re-lighting, when working with the shallowest possible seal, as he was now doing, as the hydraulic should be perfectly level. Mr. Jervis's plan would enable the hydraulic to be kept level. Formerly he was much troubled with thick tar; but a few years since he adopted a plan, which he had already described to the Association, for taking off the tar from the bottom of the hydraulic. It was a simple arrangement, with no weir overflows. He used through retorts 20 feet in length, with a hydraulic at each end; and in both the tar was taken off at two points. He also made a connection between the hydraulic mains and the liquor-pump outside; and every day he pumped some liquor through the mains and overflows, and this washed away any accumulations of thick tar. By this means, also, the dips were sealed in liquor, and not in tar; the gas was washed by passing through the hot liquor; and the whole kept clear. Recently he had overhauled a hydraulic which had not been opened for two years; and found very little thick tar in it. Temperature had something to do with the formation of thick tar in the main, as there was a tendency in the direction in cold localities, when the main was over beds that were out of use. He was therefore pleased with the success of his arrangement, as saving the great trouble and labour involved in getting deposits of pitch out of the hydraulic. Referring to retort-bracing, he said that he remembered using nothing in years gone by but iron retorts; and these never strained the benches so much as clay retorts, which were brought more immediately in contact with the arches. In some settings of iron retorts, the tie-bars had actually been built into the brickwork; and when taken down for re-building, it was found that the tie-bars were quite carbonated and rotted away—being merely kept in position by the brickwork. He had used a rather ingenious form of buckstave. It was made of cast iron, with a groove in which a fish-plate of wrought iron was fitted. These were displaced by cast-iron T-shaped buckstaves, "fish-bellied" in section, which did not answer, as they were liable to snap suddenly with a loud report. Even when made thicker, and therefore stronger in section, this objection still obtained. Wrought-iron buckstaves were then introduced; and he had some that had been in use for 20 years. They were still perfectly sound, except at the lower end, where they were corroded by the water used in extinguishing coke. He had arranged a cast-iron channel to keep the water away and protect this part of the buckstaves. The tie-bars were nearly all on the outside of the brickwork—transverse as well as longitudinal; and he condemned the plan of burying tie-bars in brickwork. They should all be in sight. He quite agreed with Mr. Jervis that brickwork would "go" somewhere. If tied at the top, it would go at the centre; and if the transverse tie-bars held on, the walls would expand, and the bars would bend, but they would not break. He need scarcely add that if they did break, it would be a serious matter, and would destroy the draught and injure the retorts. Mr. Jervis's system of tying was interesting; but whether it could be adopted to through retorts, he was not prepared to say.

The PRESIDENT remarked that it was a pleasure to all to hear Mr. Lowe's voice again and to see him present again after his long illness and consequent absence from the last two meetings. In regard to the paper, tar at Trowbridge was taken off from the bottom of the hydraulic, and perhaps that was the reason why he had very little trouble with thick tar. He quite agreed that the bars should be outside the brickwork; and he had tried protecting them by enclosing them in drain-pipes, but still they would break off at the point of fiercest heat.

Mr. W. DAVIS (Poole) next submitted the following paper:—

A REMEDY FOR NAPHTHALENE.

Having been requested by our respected President to give a short extract from my experience as a manager, and as I consider it is the duty of every member of this Association to promote the interests of our profession by promulgating all the information he can, it has occurred to me that, by briefly stating my experience with that great pest to many gas managers—viz., naphthalene—I may interest, even if I cannot much instruct my brethren in the profession.

Some years ago I had the management of a works where there

were four purifiers 10 feet square; and they were fixed in such a position that the inlet-pipes from the hydraulic centre-valve had a fall into the purifiers. Consequently, when these were emptied, it was frequently necessary to clear the condensed matter from the bottom; and what made matters worse, the scrubber was a very small one—about 18 feet high by 6 feet diameter—through which ammoniacal liquor was continually being passed in the usual way. The distance between the scrubber and the centre-valve was only about 25 feet. Therefore, it was only natural that a large quantity of condensable moisture would be carried forward, and deposited in the bottom of the purifiers. In order to obviate this, as I happened to have four 16-inch pipes (12 feet long) in stock, I put them up in the form of a condenser. These pipes were fitted from bottom to top with 9-inch by ½-inch boards, cut in lengths of the diameter of the pipe, and placed cross-ways; thus giving a large rubbing surface for the gas in its passage to deposit the moisture carried forward from the scrubber. This, I was pleased to find, had the desired effect. It also produced an effect that I had not anticipated. I had previously been very much troubled with naphthalene; the inlet and outlet of the station meter having been frequently choked up with it, and also the pipes leading to the holders. The inlet and outlet pipes of the holders were likewise a constant source of trouble. After the introduction of these pipes (which I have since termed "depositors") I was not troubled with naphthalene. This led me to investigate the cause of the naphthalene formation. As many crystals contain what is termed the "water of crystallization," I at first came to the conclusion that I had made a discovery; but after consulting a very clever chemist, I found that these crystals do not contain that water. We then came to the conclusion that the crystals were produced by synthesis, and that the presence of moisture caused its production. Whether or not this is really the secret of its formation, it is a fact that, by carrying out this arrangement in works that I have since erected, I have not been troubled with naphthalene.

Discussion.

The PRESIDENT said that, speaking generally, naphthalene was not now so troublesome as in former years. He had known the inlet and outlet of the station meter to be choked in about a month, at a time when a part of the condenser had been out of use. But, by working the condenser regularly, and keeping the whole of it at work, he had not seen a stoppage with naphthalene for more than 20 years, although he had continued to use the same kind of coal and to work under similar circumstances. As to the effect on the public lamps, he remembered that once, after a continuance of hard frost and bright sunshine, on a certain Sunday night, the lamplighters could not light a single lamp in the main street. This was not due to naphthalene, but to moisture frozen in the pipes, and melted by the sunshine alternately; so that it gradually found its way to the bend at the bottom of the lamp-post.

Mr. J. H. CORNISH (Bridgwater) observed that some years ago he had much trouble with naphthalene; both the inlet and the outlet of the holder being choked. He employed steam to remove the deposit, and this caused the pipes to expand and occasioned a leakage into them from the inside of the tank, which could not be remedied without emptying it. A plunger was then used instead of steam, to clear the pipes; and this proved effective, at the same time dispensing with the disadvantage just named. He could recall instances when more than half the public lamps were out. But by adopting a large foul main, three times the length of the retort-house, and by more gradually condensing the gas, he completely got rid of trouble from naphthalene.

Mr. N. H. HUMPHREYS (Salisbury) remarked that there was no doubt as to the fact that naphthalene deposits were caused by improper or too rapid condensation of the gas; but he thought there were instances on record—some had been cited before the Association—of naphthalene being formed from gas that had been properly condensed and purified in accordance with the latest state of knowledge on these subjects. This seemed to support the view expressed by Mr. Davis, that under certain circumstances naphthalene might be formed by synthesis; and it would be interesting to have further information on the point.

Mr. R. BEYNON (Torquay) said he had not succeeded in completely overcoming the naphthalene difficulty, and was going to erect a larger foul main. In 1885 he was only troubled in the winter—from December to February. He had an ordinary annular condenser; and a friend advised him to cover it up during the next winter. In 1886, he covered it with sulphate-bags. This was effective to the extent that, whereas he formerly had a dozen complaints per day, they came down to one or two. But now he suffered mostly in the autumn between August and November, and most seriously in the mains and services. This he ascribed to the greater ranges of temperature prevailing at that period of the year. He read in the JOURNAL OF GAS LIGHTING, that Mr. Duxbury, of Darwen, had experienced much the same thing. He considered that it was to the regulation of the condenser that they must look for a cure.

Mr. H. G. CROWE (Wellington) remarked that he had a friend who was troubled with naphthalene. In this case the hydraulic main was carried down the centre of the retort-house; and there was a bench of retorts on each side—the one hydraulic serving for both sets of benches. His friend attributed the naphthalene to the position of the hydraulic. He inquired whether Mr. Jervis had found the alteration he had described in his hydraulic had any effect as to naphthalene?

Mr. JERVIS: I do not know what naphthalene is.

Mr. A. THOMAS (West Cowes) said that some little trouble from this source had fallen to his lot in times gone by. In the case of one particular length of main about half a mile from the works, every winter it would gradually fill up until the supply was entirely stopped. The first year he cut out a long length of the pipe, and found, to his surprise, that it was quite clear. The jarring had caused its dispersion. Afterwards he tried drilling a hole and pouring hot water down the main, which proved a cure. He also found that the application of a force-pump would remove it. But after he had started new works with a foul main and good condenser, he lost sight of the naphthalene. He therefore concluded that the foul main and the condenser furnished the cure; and that previously his gas had not been properly condensed.

Mr. S. W. DURKIN (Southampton) said that naphthalene was an old friend of his. The farmers complained of the present season, but more equable temperatures had prevailed, which were favourable to those who were troubled in this way. He was generally harassed by naphthalene in the autumn, or whenever great differences of temperature prevailed, such as alternations of bright sunshine and cold nights. Yet for nearly twelve months he had hardly known what it was. He had a set of men whose duty it was to attend to complaints of this sort, and he scarcely knew what to give them to do. Last winter he went on very well till after Christmas; and then he had a 16-inch pipe choked on the works, and this sorely perplexed him. This particular piece of main happened to be laid deeply in the ground; and he imagined there was some tidal influence which kept its surroundings cold and damp, and so caused the formation. He had a great belief in the foul main, and thought it possible that his present provisions in this respect were not large enough; and when a larger foul main was fixed, he hoped to see the naphthalene disappear altogether. As a proof of the fact that temperature had a great deal to do with the formation of the naphthalene, he might add that he never knew any to form near the station meter, which was kept at an equable temperature. Attention to this point, he believed, would avoid trouble at the meter.

Mr. W. FIDDES (Bristol) remembered that on one occasion several years since, he was with the late Mr. George Lowe in London when they were opening the ground to discover the cause of a stoppage in the gas-mains that supplied the Houses of Parliament. There was an 18-inch branch main, from which two 4-inch mains were taken off, and ran parallel to each other for some distance. One of these parallel mains was continually having to be stripped in order to clear away naphthalene, but not a particle was ever found in the other. He had had a great deal to do with naphthalene deposits himself, and was inclined to think that large main-pipes greatly reduced this pest. Some years ago they had smaller connecting-pipes about the works; but now it was the custom to use larger ones; and 24-inch pipes had been laid down in place of 9 or 10 inch. At one station it was the rule to clean out the inlet and outlet pipes of the holders every Sunday. He had known 7-inch holder connections completely choked, and 12-inch ones not much better; but now he used pipes not less than 24 inches in diameter for holder connections, and had not been troubled with naphthalene for a considerable time. In one particular case, a holder outlet-pipe remained perfectly clear for six years, and then choked suddenly; so that the gas could not get out of the holder. To remove it he used a small boiler, and a 1½-inch pipe carried down to the syphons inside. Some naphtha was heated in the boiler; and the vapour dissolved the naphthalene, and brought it down in a liquid state, so that it could be readily pumped out of the syphons. By this means the pipes could be readily cleared in two hours. He thought that the naphthalene formed over the top of the pipe something in the form of a mushroom; and after a time broke up and fell down the pipe—thus causing the sudden stoppage. The average temperature of the water in the holder tanks would be something like 56°; and he had observed that if the temperature fell much below this, they were sure to be troubled with naphthalene, if not in the holder connections, in the mains or services. The lights in the street lamps would be reduced to the size of rushlights; and the stoppage would, strange to say, follow regular lines in the direction of the points of the compass—running north-west one time, and in another direction at another time. Wherever the main was situated in low, damp, and therefore cold ground, he found the deposit take place. He also discovered that the deposit favoured points of junction of dissimilar metals—such as a lead service joined to a cast-iron main. It might therefore be questioned whether the magnetic influence of the earth, or electrical influences, had anything to do with the deposit. This, of course, was merely a suggestion. There was no naphthalene where canal gas was supplied; in that case it appeared to go into the tar rather than the gas. But where Somersetshire coal was used, it seemed to go into the gas. The subject was most complicated; and it was only by careful observation that a sure remedy could be discovered.

Mr. DAVIS, in reply, said he had often heard it remarked that a very short paper would bring about a good discussion; and it was a pleasure to him to see that the few remarks he had hastily thrown together, had elicited so much information. He thought his argument, that moisture was somehow concerned in the deposit, was fully borne out by the various speakers. Twenty years ago the theory was first propounded, that the tar and gas should be kept together in the foul main for a time, in order either to fix the naphthalene in the gas, or to take it out in the tar. He adopted this plan at the works where he was then engaged; but he left there before

the effect could be ascertained. He heard, however, that it was not altogether a success. At his next works the condensing and purifying plant was small in proportion to the quantity of gas made. He tried to reduce the moisture; and in so doing, decreased the naphthalene to such an extent that it did not give trouble anywhere except at the holder connections. Singular to say, the inlet choked in the spring, and the outlet in the autumn; but they never choked together. These were the facts; but he could not explain them. Perhaps in the autumn the heat of the sun had more power, and the temperature was higher; so that the naphthalene was vapourized and carried to the outlet. At this season of the year, too, it had been remarked that naphthalene was liable to form in the mains. Perhaps the heat of the sun vapourized the water in the holder tanks, which, being carried forward with the gas, aided or stimulated the formation of naphthalene. He did not know whether electricity had anything to do with it. It might have, as water would tend to convey electricity. But he had come to this conclusion: If the gas met with moisture anywhere between the retort and the burner, and was afterwards exposed to cold or damp, then naphthalene was formed. It would be remembered that M. Bremond had proposed to desiccate the gas by means of lime—a plan that was found effectual in preventing naphthalene.

(To be continued.)

THE "INDUSTRIAL" HIGH-POWER BURNER.

At the last Meeting of the Société Technique du Gaz en France, M. Potier introduced to the notice of the members a new high-power burner suitable for public lighting. It bears the name of the "Industrial" burner; and two forms of it are shown in the accompanying illustrations, which are taken from those which were given with the description of the appliance contained in a recent number of the *Journal des Usines à Gaz*. Fig. 1 is a type of burner constructed for a consumption of 15 cubic feet of gas per hour; fig. 2 is a larger one, consuming about 26 cubic feet per hour, and is shown fitted in a street lantern. The illuminating power of the former is 10 Carcels, or 95 candles; that of the latter, 22 Carcels, or about 210 candles. The special feature of the appliance is the covered chimney surrounding the gas-supply pipe, which starts from the bottom of the burner and issues above the

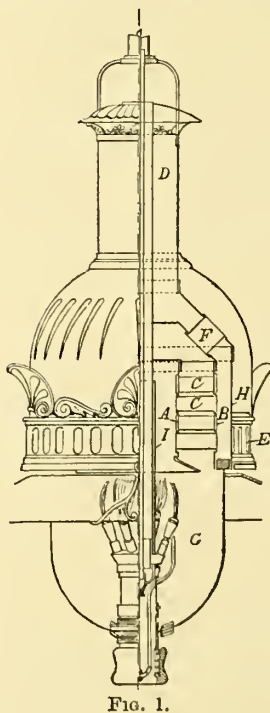


FIG. 1.

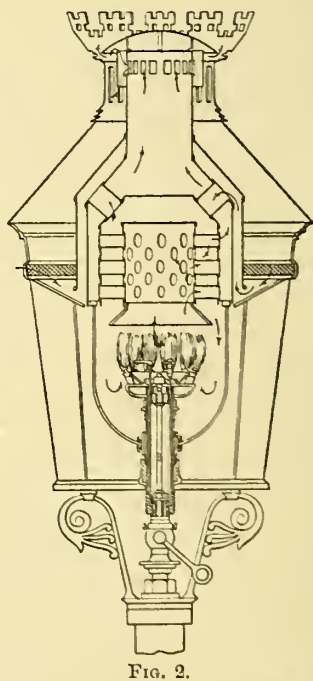


FIG. 2.

recuperator, or rather at the upper part of the chimney. Within the chimney there is set up a current of air, which keeps the gas inlet-pipe sufficiently cool to prevent any decomposition of the gas or obstruction of the tube and burners by soot. The recuperator, which consists of two concentric cylinders, A and B, connected by means of horizontal tubes C, is composed of nickel. The products of combustion meet in the cylinder A, whence they pass by the tubes C into the chimney D. The necessary supply of air is admitted by the openings E, and makes its way into the recuperator through a number of tubes F placed upon the two cones. The air, already partially heated by contact with the casing H, as well as by its passage through the tubes F, finally becomes superheated in passing to the exterior of the tubes C, which are arranged zigzag fashion, on its course to the lower portion or cup of the lamp G, where the burners are placed. The central pipe is protected from the action of the gas-flames by means of a porcelain tube I. To light the lamp, all that is necessary is to turn the tap into a certain position, and apply a taper to the lower end of the small bent tube shown in fig. 1, when the gas will burn at the top. By continuing to turn the tap, the group of burners becomes ignited, and the flash-jet is extinguished. The glass of the lamp may be easily removed for cleaning; and no shadow is projected by the lower portion.

THE LIGHT-GIVING POWER OF DIFFERENT GAS-BURNERS.

In the concluding notice of the papers read at the congress of the Société Technique du Gaz en France (held at Boulogne-sur-Mer in June last) which appeared in the JOURNAL for July 24, mention was made of a communication presented by M. Bouvier on the subject of the light-giving capacity of various kinds of gas-burners. The paper has since been published in full in *Le Gaz*; and from it we take the following particulars. The author's experiments were made with the burners generally in use; their lighting power being compared with the Bengel burner—the Paris standard. Each one was tested, by means of a Dumas and Regnault photometer, at a variable distance from the screen illuminated by a Carcel lamp, and under the conditions most favourable for each type of burner. The tests were made in the winter time, in a dark chamber of about 2100 cubic feet capacity, provided with a ventilating hood above the photometer; and there were never more than two operators present at one time. The consumption of 105 litres (3·7 cubic feet) of gas being that of the Paris standard burner, yielding the light of 1 Carcel (9·6 candles), the capacity of each burner is stated on this basis. Some of the principal results arrived at are given in the following table:—

Description of Burner.	Consumption per Hour in Litres.	Illum. Power in Carcels.	
		Actual.	Per 105 Litres.
<i>Open-Flame Burners.</i>			
Hollow-top steatite batwing, No. 7 of the large series used by the City of Paris, with regulator .	125·00	1·020	0·857
Larger burner (No. 8) of the same series.	200·00	1·740	0·912
<i>Argand Burners with Chimney.</i>			
Porcelain 20-hole burner (No. 4) .	189·00	1·980	1·100
London steatite Argand, 24 holes .	184·00	2·010	1·160
Porcelain 40-hole burner	171·90	2·100	1·233
Flat-top steatite 40-hole burner .	186·31	2·417	1·362
42-hole burner, with central disc .	286·40	4·000	1·466

By way of comparison, the author quotes some of the published results of tests of two gas-burners of the regenerative type—the Cromartie and the Wenham; and they show conclusively the superiority of this class of burners as lighting appliances.

Summing up his observations, the author states that the open-flame burners employed for the purpose of public lighting are capable, if they are judiciously selected and used, of yielding results within about 10 per cent. of those obtained with the Paris standard burner; while the enclosed burners of the ordinary and *quasi*-intensive types exceed the standard by from 10 to 45 per cent. One result of a test of the latest form of Clamond burner is given. This appliance gave a light equal to 4 Carcels with a consumption of 180 litres of gas, or 2·33 Carcels with the ordinary consumption of the standard burner.

Some trials of petroleum lamps were also made by the author. He selected two kinds of the "Lampe Belge;" each having circular wicks with flame-spreaders, and marked to give the light of 30 candles with a consumption of 90 grammes (1388 grains) of refined petroleum per hour. In one case "Solar" oil, at 80c. per litre retail, was used; and with a consumption of 70 grammes per hour, costing 5·63c., the light of 1·69 Carcels was produced. In the other, refined petroleum, costing 55c. per litre, was employed, as against an ordinary Carcel lamp burning purified colza oil at the rate of 10 grammes an hour, with the following results:—First hour: Consumption of oil, 87·7 grammes; light yielded, 3·01 Carcels. Second hour: Consumption of oil, 89·5 grammes; light yielded, 2·97 Carcels. Average consumption of oil, 88·6 grammes, valued at 4·87c.; light yielded, 2·99 Carcels. Of course, the price of the oil is subject to variation according to locality.

The result of the author's experiments shows that suppliers of gas may easily obtain the light of the Carcel with a consumption of 115 to 120 litres of gas by batwing burners (notably those used for public lighting) consuming from 125 to 200 litres of gas per hour; and an equal quantity of light with an expenditure of 80 litres of gas in the case of enclosed burners consuming from 200 to 250 litres per hour. The luminous intensity of the usual high-power burners is, as already shown, very great—the Carcel being produced with a consumption of only 40 litres of gas. Looking at this matter in the light of the competition of electricity and petroleum, the author points out the advisability of suppliers of gas making a judicious selection of the best burners for the use of consumers; this being one of the simplest and least expensive methods of retaining their patronage. If they can demonstrate that, by the employment of proper burners, the same quantity of light as is afforded by an ordinary incandescent electric lamp can be obtained with the consumption of 150 instead of 200 litres of gas—and the author's experiments prove that this can be accomplished—they will not have much cause to fear the competition of the newer system of illumination.

LIGHTHOUSE ILLUMINATION BY ELECTRICITY.

A correspondent has recently sent to *The Times* an interesting account of the electric lighting arrangements which have lately been completed and brought into operation in the magnificent lighthouse on St. Catherine's Point, in the Isle of Wight. It appears that prior to the 1st of May last the light exhibited at this station was described in the Admiralty list as a fixed dioptric light of the first order. In other words, it was a steady light pro-

duced by means of a six-wick concentric oil-burner and refracting lenses; the intensity of the naked flame being equal to about 730 candles. This, it may be mentioned, was a considerable improvement on the means of lighting employed when the lighthouse was first established in 1840, and when only a four-wick fountain lamp and inferior apparatus were in use; while before the last-named date there were only fires or lights on the downs above the Point—a kind of lighting which was both uncertain and unsatisfactory. At present an electric light is being shown, the full intensity of which was recently stated by Captain Sydney Webb, the Deputy-Master of the Trinity House, to be equal in illuminating power to rather more than 7,000,000 candles. Every half minute—for the light now revolves—a mighty flash of five seconds' duration, such as would have electrified the early navigators, sweeps around the sea, and is visible at distances that seem incredible. To effect this improvement, there has been added to the establishment a commodious engine-room containing three steam-engines of 12-horse power each, and two magneto-electric machines of the De Meritens type. Two of the engines are intended to work for lighting purposes, although only one is used in connection with one of the machines in clear weather. The third engine is meant to work the fog-signal, which, coincidently with the change in the light, has been greatly increased in power. In the lantern, carbons of very large sectional area (not circular, but fluted) are used; and the optical apparatus is of 16 sides or panels. As a precaution against breakdown, everything is in duplicate at least, with an oil-light in reserve as well.

In connection with the foregoing particulars, the writer gives a short sketch of the progress of coast illumination from the earliest attempts made to ensure the safety of the mariners by means of beacon fires. First, there was the wood pile on the lonely hill-top, possibly maintained at the instance of some humanely disposed individual; then the coal fire in the watch-tower, in a cradle of a peculiar disposition, closed at the top and towards the land, and open towards the sea, with iron bars in the nature of network, but without glass; then the tallow candles, three to the pound, as at Winstanley's Eddystone; then the flat-wick lamp supplied with sperm oil—the latter too great a luxury in these times—and aided by rude reflectors; then the cylindrical wick Argand lamp, supplemented by paraboloidal reflectors; then the concentric-wick lamps and lenses of Fresnel; and, finally, with optical apparatus improved both in design and manufacture, the Trinity lamps of Sir James Douglass, and the high-power gas-burners of Mr. Wigham—vegetable oil, mineral oil, and gas in the meantime coming into general use. It will be remembered that as the result of the exhaustive experiments in connection with the investigations into the relative merits of electricity, gas, and oil as lighthouse illuminants, conducted at the South Foreland a few years ago, and a full account of which, by Mr. Harold B. Dixon, M.A. (who was appointed to carry out the photometrical observations), will be found in the volume of the JOURNAL for the second half of 1885, the conclusion was arrived at "that, for the ordinary necessities of lighthouse illumination, mineral oil is the most suitable and economical illuminant, and that for salient headlands, important landfalls, and places where a very powerful light is required, electricity offers the greatest advantages." The most southerly point of the Isle of Wight, and, as such, one of the most important positions for a lighthouse on the shore of the English Channel, has been, it would seem, very properly selected for an electric light station. The only other lighthouses on the coast of England itself at which the light is produced by means of electricity are Souter Point, on the coast of Durham, between the mouths of the Tyne and the Wear, where the traffic by sea is thick and the smoke from the collieries and factories an element in the matter; the South Foreland, where the two lights, so well known to passengers across the Straits of Dover, were established as far back as 1634 for the then threefold purpose of leading clear of the Goodwin Sands, through the Downs, and up and down the English Channel; and at the Lizard, on the Cornish coast, where two more lights mark the southernmost headland of that part of the Channel—a locality which was earning an unenviable notoriety for wrecks during fogs. All these are powerful lights, allowing often a glare in the sky to be seen from far beyond the extreme range of the lights themselves. But, powerful as they are, they may be almost said to pale before the present St. Catherine's light; for it has ten times the intensity of the best of them—the one on Souter Point. In fact, it is one of, if not, as is believed, actually the most intensely brilliant light in existence.

DEATH OF MR. C. COPLAND, OF HULL.—We regret to have to record the death, on the morning of the 16th inst., in his 59th year, of Mr. Charles Copland, whose name was at one time closely associated with the gas supply of Hull. Mr. Copland was by profession a civil engineer; and some years ago he held an appointment in connection with the Phoenix Gas Company. In 1854 he relinquished this in order to become Engineer of the British Gas-light Company, of the whole of whose stations he had charge; and he then took up his abode in Hull. In 1870 he left the service of the Company with numerous testimonials, and joined Dr. Longstaff and his son in the management of the well-known firm of Messrs. Blundell, Spence, and Co. (Mr. Copland having married one of Mr. Henry Blundell's daughters). This firm was shortly afterwards converted into a limited liability company; Mr. Copland being one of the original Directors—a position which he resigned about five years ago on account of failing health.

Register of Patents.

TREATING NAPHTHALENE FOR USE IN CARBURETTING APPLIANCES.—Fenner, H. J., and G. H., of Blackheath. No. 14,085; Oct. 17, 1887. [11d.]

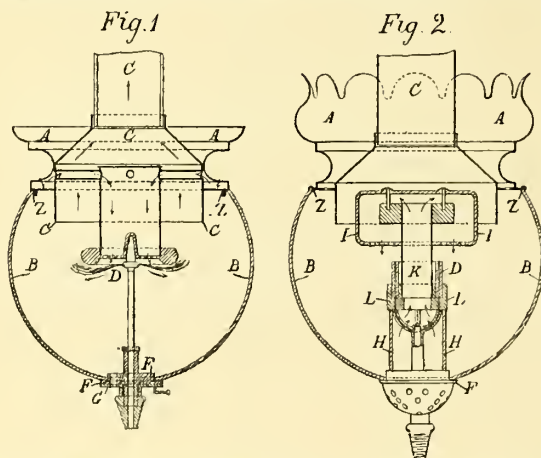
This invention relates to the arrangement of apparatus designed for use in the manufacture of naphthalene into convenient shape for filling into apparatus employed in carburetting gas for illumination; the intention being to mould it when in a molten state into "marbles, balls, or forms substantially round." The apparatus employed for the purpose consists of plates arranged in series (capable of assemblage and separation), in order to receive, form, and release the naphthalene supplied in a molten state thereto, in combination with means for applying pressure, guidance, and refrigeration.

REGENERATIVE GAS-LAMPS.—Walker, C. M., of Dulwich, S.E. No. 14,118; Oct. 18, 1887. [8d.]

This is an improvement on the lamps described in patents Nos. 7660 and 12,952 of 1887; the object of the inventor being to make a generator in the form of a single tube—preferably of a single casting of metal or other substance. Inside the generator is formed a collar to receive the chimney or flue, the bottom of which is solid, and pierced with a hole, through which the gas-supply pipe passes downwards. It also has lateral holes, connected to similar holes in the wall of the generator, for the passage of the products of combustion; the spaces between these connections being used as air passages. The outer casing of the lamp is fixed; leaving sufficient room for the passage of the products of combustion to the flue. Inside this is fixed a circular deflector extending somewhat below the seating of the glass door; and upon the end of the gas-pipe is attached a ring-burner having a double socket, as described in the earlier patent No. 12,952. In one form of the lamp, the air-tube of the burner is used to hold the glass door in its position by means of an under screw, which keeps the glass tight up against the rim of the outside case of the lamp.

GAS-LAMPS.—Boult, A. J.; communicated from G. Lebrun, and P. Fougeron, of Paris. No. 16,933; Dec. 8, 1887. [8d.]

The construction of these lamps will be understood from an inspection of the engravings—vertical sections of two forms of lamps.



The air necessary for the combustion of the gas in the lamp shown in fig. 1 is introduced into the globe B, and connected with a central vertical tube by horizontal tubes, the centre one of which is provided at the bottom with a perforated plate situated directly over the horizontal flame. The products of combustion are carried off by a chimney C surmounted preferably by a deflector. The burner D terminates in an elongated point or pin, which fits into a recess formed in the centre of the perforated plate through which the air passes to the flame. The burner proper consists of a ring of steatite or similar material, secured exactly in the centre of the apparatus, and concentric with the perforated plate. F is the plate on which the globe B rests, and into it is screwed the tube carrying the burner D; so that the height of it can be adjusted for the purpose of fitting the upper part of the lamp hermetically on to the globe at Z. The plate F is formed with two openings; one (in the centre) being screw-threaded for the reception of the burner tube, and the other for the purpose of lighting the lamp. This latter opening, when the lamp is burning, is closed by a moveable plate G formed with a similar opening. If it is desired to introduce the air necessary for the combustion of the gas from below the flame (as in fig. 2), the globe-carrying bracket F is perforated, and the air passes through the perforations and through a glass tube H into an upper chamber I, whence it descends to the flame through the perforated bottom of the chamber. To light the lamp, the bracket F is formed with an opening, closed either by a slide (as in fig. 1) or by a hinged door falling by its own weight. The centre of the parts of the lamp may be done by fitting the central tube K of the upper air chamber I into a corresponding recess formed in the metal part L of the burner.

ATMOSPHERIC GAS-BURNER.—Saul, D. H., of Shoreditch, London, E. No. 2324; Feb. 16, 1888. [6d.]

This invention relates to a form of atmospheric gas-burner (for heating asbestos or other fuel) especially applicable to slow-combustion grates. It consists of a bent air chamber or tube which passes under the bottom bar of the grate, and to which is affixed an oblong burner capable of being closed with a lid when required.

SUPPORTS FOR GAS-GLOBES.—Lake, W. R.; communicated from R. Jacobs, of New York. No. 10,355; July 17, 1888. [8d.]

This invention, relating to supports for globes and chimneys used in connection with gas or lamp burners, consists essentially (1) of a ring

sustained around the burner, and a series of spring slides adapted to move in guides on the ring, and having at their outer end suitable shoulders to catch the customary annular bead or flange around the globe or chimney; and (2) of the ring sustained around the burner, and made in two sections, adapted to be moved toward or from each other, and having shoulders to catch the bead at the lower edge of the globe, with suitable springs whereby the sections of the ring are given a spring tension toward each other and against the lower edge of the globe or chimney supported above or around the burner.

APPLICATIONS FOR LETTERS PATENT.

- 13,341.—SCHARF, P., "Improvements in gas-batteries." Sept. 15.
 13,345.—BROWN, M. J., "An improvement for increasing the illuminating power of Argand gas-burners and mineral-oil lamps." Sept. 15.
 13,355.—KNEEN, W., "Improvements in liquid-meters." Sept. 15.
 13,389.—SAUL, D. H., "An improved atmospheric gas-burner for burning coke, coal, or any inflammable fuel, or heating any substance to an incandescent heat, that may be used in gas-fires." Sept. 17.
 13,414.—BOULT, A. J., "Improvements in gas motors." A communication from MM. Larrivée and Aengenheyster. Sept. 17.
 13,425.—OECHELHAEUSER, W. VON, "Improvements relating to gas-engines." Sept. 17.
 13,431.—FAUSTMANN, C., and MATHIAS, N., "Improved means for lighting and extinguishing street gas-lamps." Sept. 17.
 13,477.—PORTER, G., "Improvements relating to lamps for burning enriched or carburetted gas." Sept. 18.
 13,499.—SUGGATE, F. C., "Gasholders." Sept. 19.
 13,567.—BRAITHWAITE, C. L., jun., and BRAITHWAITE, I., "Improvements in apparatus for controlling and regulating the discharge of water or other liquid at any required head or pressure below that of the initial pressure." Sept. 20.
 13,579.—STOKES, A., "Self-guiding gasholders." Sept. 20.
 13,610.—LAKE, H. H., "Improvements in and relating to apparatus for lighting and extinguishing gas-lamps." A communication from N. H. Shaw and Ai Bee Shaw. Sept. 20.

PATENTS WHICH HAVE BECOME VOID.

[AFTER THE FOURTH YEAR.]

- 8208.—CUTLER, E., "Gas-kilns."
 8211.—HOLT, H. P., "Gas motor engine."
 8232.—SOMBART, C. M., "Gas-engines."
 8344.—NEWTON, H. E. (Klönne), "Making coal gas."
 8565.—ROOERS, J. E., "Gas-engines."
 8579.—SHAW, J., "Gas motor engines."
 8637.—CROSSLEY, F. W., "Gas motor engines."
 8680.—KELLY, R. R., and another, "Sulphate of ammonia, &c."
 8755.—EDWARDS, T. E., and others, "Gas furnaces."
 8950.—GEORGE, R., "Gas-stoves."
 8960.—AINSWORTH, W., "Gas-engine cylinders."

THE PRICE OF GAS IN OLDBURY.—According to one of the Birmingham papers, the gas consumers in Oldbury are greatly dissatisfied at the increase made by the Local Board in the charge for gas, as well as at certain conditions which the Gas Committee seek to impose upon their customers. It is stated that the proprietor of the Gaiety Music Hall, in Birmingham Street, has had the whole of his establishment fitted up with oil-lamps, and recently invited the tradesmen of the town to witness the effect. A shopkeeper in Church Street some months ago also discontinued the use of gas. These experiments with oil are being watched with a great deal of interest by a large number of tradesmen; and if they prove to be successful, others are expected to follow their example.

THE STRIKE OF GAS STOKERS AT SALFORD.—The strike of gas stokers at Salford, to which reference was made in the JOURNAL last week, terminated on the 17th inst.; a basis of agreement being arrived at by employers and men. A meeting of the Gas Committee was held in the morning, at which a deputation from the men was received. The matter was discussed, and a proposal laid before the deputation, with a view to meeting the objections raised. This was afterwards submitted to the main body of the men by the deputation, who attended a meeting of the Committee held in the evening at the Town Hall to communicate the views of the men upon the Committee's proposition. The proceedings at this meeting lasted for upwards of four hours; the result being, as above stated, that an agreement was arrived at. It was arranged that the men should resume work at six o'clock last Tuesday evening; and this was accordingly done. Subsequently, however, they complained that the duties were too heavy to be borne for any lengthened period. On Saturday morning, therefore, they appointed a second deputation, who had an interview in the Mayor's parlour with the Mayor (Alderman Dickens), Mr. H. Lord (Chairman of the Gas Committee), and Mr. Shonbridge (Gas Engineer and Manager). The conference lasted about half an hour, and resulted in the Mayor promising that a special meeting of the Committee should be called for yesterday morning to decide whether any alteration should be made in the present arrangement, and whether any further concessions should be granted in the men's favour.

GAS MANAGERS AND "OUTSIDE" ENGAGEMENTS.—At the meeting of the Smethwick Local Board last Friday week, certain matters affecting the Manager (Mr. B. W. Smith), which had been under investigation by the Gas Committee, were reported upon. It appears that Mr. Smith had been acting as professional adviser to Messrs. Lloyd and Lloyd, at the Coombs Wood works; but in doing so he considered he was acting within the liberty usually allowed to gas engineers. As he had expressed regret for having done this without the permission of the Committee, and stated that in future he would take care to confine his services solely to the Local Board, the Committee recommended that his action be overlooked. They further recommended that the Manager be instructed to take steps to at once reorganize his staff, in order to carry on the gas-works on the most economical lines. Mr. Brooks moved the reception of the report. Mr. Carr remarked that Mr. Smith had been for something like two years a salaried officer of Messrs. Lloyd and Lloyd; laying down their gas plant, superintending its erection, and attending to the manufacture of gas. He contended that this would take him away to a great extent from the business of the Board, for which he received a most liberal salary. He thought the Manager should have had more sense than to accept the appointment; and he felt sure that if he had asked the Committee to allow him to do so, they would not have given him permission. He moved, as an amendment—"That Mr. Smith either be requested to resign his situation as Manager of the gas-works, or that notice be given to him to do so according to the terms of his engagement." After some discussion, the amendment was put and lost, and the report adopted.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

GAS ANALYSIS.

SIR,—A few of the minor points referred to in my criticisms of Mr. Hicks's apparatus have been satisfactorily explained, but they are really of little importance; and in order to secure the adoption of the method, he should be able clearly to show some advantages over the apparatus in general use. There should be some undoubted gain in time, simplicity, or accuracy; and it appears to me that it would have been better if, in his original description, the writer had compared his results point by point with those obtained by existing methods, in order to demonstrate such advantages, if any.

Mr. Hicks requests me to explain the meaning I intended to convey by "a slight underpressure." The term is very common; but I will endeavour to make my meaning quite clear. Where levelling tubes are used, it is customary to lower the water-level somewhat to facilitate the collection of the runnings of the confining liquid from the sides of the measuring vessel. Fully three minutes should be allowed for this collection before taking a reading; otherwise the error at each reading may amount to 0.5 per cent. or more. Such an error would evidently affect the calculations; for in one of the examples given, there is an assumed diminution of 0.3 per cent. by absorption in the ammonia test, and if time were not allowed for collection of runnings, instead of the operation resulting in a diminution, there would be an apparent augmentation of (say) 0.2 per cent. I hope I have now made my meaning sufficiently explicit.

I believe it would be found that hydrogen and marsh gas could not be determined by this apparatus. It is obvious that ammonia, sulphuretted hydrogen, and carbonic acid must not be tested for in apparatus that necessitates their confinement over water—that is to say, where anything like an approach to accuracy is required; for one volume of water at 15° C. absorbs an equal volume of carbonic acid, which is the least soluble of the three, the volume of sulphuretted hydrogen absorbed being 3.23, and that of ammonia 727.20. The estimation of ammonia in coal gas with the best apparatus is extremely liable to error. In the present case the gas is exposed to water during collection of the sample, when regulating the water-lines, and also when standing to equalize the temperature. It may be for only a short time, as Mr. Hicks remarks; but it is long enough to vitiate his tests. Sulphuretted hydrogen has more exposure than ammonia; and the operation, besides being practically valueless, if carried out as recommended, spoils the remainder of the sample. Carbonic acid must also suffer sufficiently during its exposure, which is still more prolonged, to render the result incorrect.

Where the results can be at the most only approximately accurate, it would appear useless to take elaborate precautions, and make infinitesimal corrections. In fact, I cannot really see that the apparatus has any single advantage over the better class of apparatus in use, unless it be in the lowness of cost price—a matter not of much consequence.

Commercial Gas-Works, Stepney,

E. W. WHELDON.

Sept. 21, 1888.

ARMIDALE GAS COMPANY, LIMITED.—In the report presented by the Directors of the Company to the shareholders, at their half-yearly meeting held on the 31st of July last, they expressed their intention of reducing the price of gas, as from the 1st of the following month, to 13s. 4d. and 11s. 8d. net per 1000 cubic feet for lighting and cooking purposes respectively. The working of the undertaking in the six months ending in June resulted in a balance of £473. A dividend of 8 per cent. was declared; and it was decided to add £150 to the reserve fund.

THE PUBLIC LIGHTING OF TUNSTALL.—At the last meeting of the Tunstall Local Board, the Clerk read a letter received from the Defries Safety Lamp and Oil Company, Limited, containing an offer for the lighting of the town by oil in place of gas. The lamps were to be lighted at sunset and extinguished at sunrise, or within an hour thereof, for a period of three years, and each lamp to give a light, including reflected light, of 30-candle power; the cost to be £2 12s. 6d. per lamp per annum. The Company quoted Erith as a place which they had successfully (?) lighted, and where the lighting by oil was a great improvement on that by gas. The matter was referred to the Highway Committee. Subsequently the tender of the British Gaslight Company, Limited, for supplying the public lamps with gas for one year from Aug. 1, 1888, was accepted on the following terms:—£3 for every lamp supplied with a batswing burner; £4 10s. for every lamp having three batswing burners; and as to 100-candle power lanterns, to which a meter is attached, on an average consumption, at the rate of 2s. 4½d. per 1000 cubic feet, with additional charges of 13s. per lamp for lighting and cleaning, and 4s. 4d. per lamp per annum for reducing the light at 11 p.m.

STRATFORD-ON-AVON WATER SUPPLY.—Last Tuesday Colonel Ducat, R.E., one of the Inspectors of the Local Government Board, held an inquiry at the Town Hall, Stratford-on-Avon, with reference to an application of the Town Council for leave to borrow a further sum of £1700—making altogether about £22,500—for the purpose of water supply. Among those present were the Mayor (Sir A. Hodgson), Messrs. Lunn and Thompson (Councillors), the Town Clerk (Mr. T. Hunt), and other officials. Replying to the Inspector, the Town Clerk said that up to Lady-day last the Corporation had spent on the water-works exactly £21,368 12s. 8d. The expenditure had, in fact, exceeded the amount of loans already sanctioned, to the extent of about £900; and the Corporation found that it would require about £1700 to pay off existing liabilities, and provide for sundry expenses and the cost of connections and meters. The water-works were opened about two years ago; and although no compulsion was used, the consumption of water was increasing satisfactorily. The Inspector pointed out that the interest on the money already borrowed was between £700 and £800 per annum, which was considerably more than was derived from the water charges. Mr. Lunn said the balance was made up out of the general district rate. The Inspector inquired the total amount of loans already granted for sanitary purposes, and the assessable value of the district. The Town Clerk replied that the outstanding loans under the Public Health Act amounted to £33,787 1s. 6d.; and the rateable value of the borough was £31,678 16s., of which amount £27,376 12s. 3d. was for sanitary purposes. Occupiers of land paid only one-fourth of the rate levied on houses. After making other inquiries, the Inspector intimated that he would report to the Local Government Board on the subject of the application.

Legal Intelligence.

WESTMINSTER POLICE COURT.—THURSDAY, SEPT. 20.
(Before Mr. BIRON.)

CUTTING OFF A SUPPLY OF WATER.

Mr. J. Blackbeard, of 119, Brompton Road, applied to his Worship for advice respecting the action of the Chelsea Water Company, who had cut off the water supply to one of his houses, No. 5, Worcester Street, Pimlico; the tenant at the time having left not quite a fortnight, after an occupation of twelve years, and the rate being paid up to Midsummer last. Applicant had been himself supplied by the Company for 27 years; and the lady who had just left his house, after such a long occupation, had removed to another in the district, and therefore, continued to be a customer of the Company. No demand had been made; and, despite the remonstrance of a neighbour, the supply was disconnected, and an application directly afterwards made for 25s. to put the water on again. It was a most iniquitous, high-handed proceeding; and when he complained at the office he was treated with scant courtesy, and told that the best thing he could do was to pay the money. He had freely expressed his opinion that it was only a trick to put the landlord to the expense of having a stopcock fixed in the road or under the pavement, so that the officials would be in a position to exercise more control when they thought proper. This was the real secret; and he asserted that the Company only wanted the merest subterfuge or excuse to cut off the supply, being dissatisfied with the existing connections, for which the landlords had had to pay.

Mr. BIRON looked into the Company's Act and also the Water-Works Clauses Act, 1847, and then remarked that the question might be dependent on the interpretation of Acts incorporated with the Company's Special Act of 1852. The powers acquired by the Company under that statute were very large indeed; but it hardly seemed to him that section 59, which provided for cutting off a water supply, was applicable to such a case as had been stated. He could not, however, undertake off-hand to express a very positive opinion.

Applicant: While I was at the office, other people came in, and were equally dissatisfied with their treatment. We are nothing more nor less than in the hands of these great monopolist Companies; and they seem to do as they like with us. Surely the time has arrived for fresh legislation in the interest of the public. Cannot you order the Company to put on the supply again without the monstrous charge of 25s.?

Mr. BIRON: I say that I am inclined to think they have no power to cut off the supply; but I should certainly look at the Acts more carefully than I can do now, in the course of a busy afternoon, before I will issue process. I will look carefully at the law, and you can renew your application when I sit again. If I find I have the power, I will certainly exercise it.

Applicant thanked his Worship, but said he could not attend again as he was going to Scotland.

Mr. BIRON said if that were the case the question must remain undecided. All he could do, under the circumstances, would be to let one of the warrant officers wait on the Secretary of the Company, and ask him to be good enough to explain the reason of their procedure, and the section of the Act under which they had acted.

THAMES POLICE COURT.—WEDNESDAY, SEPT. 19.

(Before Mr. LUSHINGTON.)

CONVICTION OF THE EAST LONDON WATER COMPANY FOR REFUSING TO SUPPLY WATER.

To-day Mr. I. A. Crookenden, the Secretary of the East London Water Company, was summoned at the instance of Mr. John Henry Johnson, of St. Ann's Wharf, Limehouse, for refusing to lay on a supply of water to two houses belonging to him.

The evidence of the complainant showed that he had recently erected two houses in Northey Street, Limehouse. He had laid on the pipes and fittings in the usual way, and such as the Company had allowed him to use in 64 other properties within the jurisdiction of the Court. On the 25th of July he applied to the East London Water Company to have the water laid on, and paid the necessary fees and the rate, for which he held the receipts. The Company's men came to his place, and then went away again, without having connected the service. He had since repeated his application several times, but without success; and he then took out the summons against the Company. The reason given by the Company was that he had declined to put in cisterns. As there were already cisterns to the houses in question, and there were waste-preventing cisterns over the closets, he objected to storage cisterns. He had 64 cases in which the same thing would apply, if he was wrong on this point.

Mr. G. KEBBELL, who appeared on behalf of the Company, argued that they were within their rights, and justified in not giving complainant a supply, as he had not conformed to the several sections of the Act of Parliament bearing on the matter. The Act provided that before a supply was put on, a cistern to store the water should be fitted up; and if this was not done, they had power to discontinue the supply. The waste preventer did not hold more than two gallons of water. He called attention to the sections of the Act, showing it to be the intention of the Legislature that there should be a cistern, properly affixed, where there was a constant supply. He maintained that the contrivance which the complainant had put in was not a cistern. The domestic supply in this case was drawn from the main; while the complainant's vessel or receptacle was only for the closets. It was in the interests of the community that there should be proper cisterns affixed to each house, in case of a water famine.

Mr. LUSHINGTON held that the complainant's apparatus was a cistern with a waste-preventer inside it. Therefore, it was a sufficient receptacle for water, and complainant had a right to a supply.

For refusing to supply water on the 28th of August the Company were fined £5, and 20s. for each of the nine following days that the water was not connected; together with £1 1s. costs.

His Worship remarked that Mr. Kebbell might, if he pleased, apply for a case, and that the application would have due consideration if made within the proper time.

Complainant remarked that this would entail a great hardship on him.

Mr. KEBBELL observed that complainant would be sorry he had won the case by the time they reached the House of Lords.

OTTOMAN GAS COMPANY, LIMITED.—The Directors of this Company report that the gas-rental for the half year ending June 30 last amounts to £7424 7s. 8d., and the net profit to £2682 10s. 9d., which, added to the balance brought forward, makes the sum of £3156 2s. 11d., out of which they recommend a dividend at the rate of 7 per cent. per annum on both classes of shares. This will absorb £2625; and leave a balance of £531 2s. 11d. to be carried forward.

Miscellaneous News.

THE ASSESSMENT OF THE STIRLING GAS COMPANY'S WORKS.

In our Edinburgh Correspondent's "Notes" last week, brief reference was made to the appeal by the Stirling Gas Company against the raising of the valuation of their works and plant from £1300 to £1600, without, as the appellants contended, any change in the conditions of the undertaking to justify the increase. The matter was argued before the Valuation Court for Stirlingshire on the 10th inst.—Provost YELLOWLEES presiding—with the result, as already stated, that the amount was fixed at £1500. This is £100 less than the Assessor (Mr. Currie) arrived at; but as it is understood that the decision of the Magistrates is to be appealed against by the Company, a more extended notice of the proceedings than that given by our correspondent may be of interest to our readers.

Mr. R. WHYTE appeared for the appellants; and Mr. BUCHANAN represented the Assessor.

After a preliminary objection had been disposed of, the legal gentlemen and the Assessor had a private conference, which, however, failed to result in an agreement being come to as to the amount of the valuation, and the discussion of the case was proceeded with.

Mr. BUCHANAN, on the suggestion of Mr. Whyte, explained the principle on which the Assessor had fixed £1600 as the valuation of the works. He said that, under the Valuation Act, the Assessor was instructed to value subjects, where they were occupied by the proprietors, in such a way as to ascertain what they would produce if let to a tenant. The Stirling Gas Company had intimated to the Assessor, through their Treasurer, their total income. From this the Assessor had deducted the whole of the expenses which a tenant would take into consideration making an offer for a lease of the gas-works. The Assessor and the Treasurer had agreed in regard to the whole of the items to be deducted, with the exception of the Secretary's salary, Auditors' fees, allowance for gas-meters, and insurance on hereditary property. The salary and the fees were disallowed by the Assessor in consequence of the decision of the Court of Session in the Dundee case. The allowance for meters was refused on the ground that the income derived from them was not included in the total revenue returned by the Treasurer of the Company, and because, as a matter of fact, a tenant in taking the works, would not consider the question of meters at all—the gas consumers paying as meter-rent a sum sufficient to cover the outlay which the tenant would have to make in purchasing the meters. The insurance was disallowed, because the proprietors of heritable subjects were in no case permitted to deduct from the rent paid by a tenant, the insurance paid for the subjects.

Mr. WHYTE said that Mr. Buchanan's explanation had very much cleared the way and simplified matters, because it prevented the necessity of going over the whole case. Evidently the only difference between them was; first, whether the Assessor should allow the Secretary's salary and the Auditors' fees, amounting to £14 2s., as being part of the expenses of management; secondly, whether insurance was a proper deduction; and, thirdly, whether any allowance should be made to the Company for the meters as forming part of the floating capital of the Company. He also found, from Mr. Buchanan's explanation that the Assessor had gone on the principle laid down in the Falkirk Gas Company's case, decided by Lords Lee and Fraser, in the Court of Session Valuation Appeal Court, in 1883. The "rubric" of the case was short, and was to the following effect:—A private Gas Company, who were proprietors of their works and pipes, were assessed on the principle of deducting from the income derived from their customers the necessary expenditure, tenants' profits (estimated at 15 per cent. on two-thirds of the expenditure), and 5 per cent. interest on their floating capital. It was decided that this method of valuation was wrong. Lord Fraser held that the proper manner in which to value such a subject was to deduct from the income of the Company the annual expenditure, and a sum for tenants' profits, which ought to be estimated at a percentage on the net profits, and a percentage on capital invested in moveable property; the remainder being the annual value for the purposes of assessment. Lord Lee held that a percentage on the capital value of such works forms a fit, though not an exclusive rule of assessment, and that in the particular case an allowance of 8 per cent. on the capital value of the works would have been a proper method of valuation. Regarding the first and second heads, Lord Fraser, in the Falkirk case, said that the tenant was entitled to the following deductions:—The expenses of making and distributing the gas, of repairing buildings, gasholders, and mains, and of collection; charges incurred by the Company for management; insurance; interest on tenants' capital; and rates and taxes. It would be observed, remarked Mr. Whyte, that Lord Fraser specially mentioned insurance as being a proper deduction; and under the head of "Expenses of collection and management," the Secretary's salary and Auditors' fees certainly fell. The view which Mr. Buchanan took of insurance was, he considered, a very limited one. The insurance was not simply to provide against destruction by fire of certain articles of wood or other combustibles about the works, but to provide against explosion, which might happen in a business of the character of gas making. It had been found extremely difficult—in fact, almost impossible—to get an insurance company to take such risks without the payment of an enormous premium; and the Stirling Gas Company had established a fund for the purpose. If insurance was a proper deduction, as Lord Fraser said it was, it should be allowed, whether the premium was paid to an outsider or effected by a special fund. In the report of the Falkirk case, 1 per cent. was spoken of as a fair rate of insurance; and, considering the risks, it certainly was. On a capital of £15,000, 1 per cent. would come to £150; and this sum ought to be deducted for insurance. Lord Fraser specially mentioned meters as being part of the floating capital. He said: "A tenant, in order to carry on a works, must invest a considerable sum in moveable capital belonging to himself, upon which he was entitled to a percentage, which must be considerable, because of the perishable nature of the articles. For example, meters, which were in the possession of the Company, were moveables, without which they could not carry on their trade. The return from them could not be included in the annual value, because they were not heritage, as was decided in the former case of the Falkirk Gas Company; but these, though not included in the annual value, represent floating capital which an intending tenant must possess." In giving effect to his mode of deductions, Lord Fraser allowed 5 per cent. on the floating capital. The Assessor in this case only made an allowance upon £4000, which did not include the cost of meters, in which a capital of £6000 was invested. Apart altogether from the clear statement contained in Lord Fraser's decision, it was perfectly apparent that the business of a gas company could not be conducted without meters. They were moveable and not heritable; and hence were not liable to be taxed. He (Mr. Whyte) had prepared two statements—one according to Lord Fraser's opinion on the subject, and one based on the dictum of Lord Lee. According to the views of Lord Fraser, the assessable value of the gas-works would be £1235 1s. 5d.; by Lord Lee's method, it would be £1275.

Mr. BUCHANAN, in reply, pointed out that Lord Fraser gave his opinion that a Gas Company ought to be assessed very much on the principle laid down by the Judges in the Dundee case. Lord Lee, on the other hand, decided that the proper way to arrive at the valuation of gas-works—although it had not been done in any previous case—was that there should be a certain percentage on the capital value of the concern. Curiously enough, the result arrived at by both Judges was very much the same; but while it settled the assessment in the Falkirk case, it did not decide any principle, and the Falkirk case could not be quoted as an authority in the assessment of gas companies. On the other hand, the Dundee case was decided after a very elaborate proof and debate; and the Judges, knowing that their decision was to form the basis for valuing gas-works in future, considered the case, and issued a written decision, which was quoted at length in the decisions he had read.

Mr. WHYTE made a short reply, in the course of which he pointed out that the Dundee case, upon which the Assessor seemed to rely, was decided in 1881; and that in the Falkirk case, decided in 1883, the Judges had fully in view the decision in the previous case, and had agreed in holding it to be wrong, although they were not at one themselves as to what the right principle was. Immediately after the decision in the Falkirk case, the Assessor readjusted the valuation of the Stirling Gas-Works, on the footing of the principle laid down by Lord Fraser; but he seemed now to wish to depart from this, and fix some principle of his own. On the basis laid down by both Lord Fraser and Lord Lee, the valuation was excessive; and it was not for that Court to say the Judges were wrong.

Provost YELLOWLEES remarked that he did not think it was for them to say whether one Judge was right or another wrong, but there was a way by which they might arrive at a fair valuation; £15,000 was looked upon by all parties as a proper amount. This at 10 per cent. would be £1500; he moved that the valuation be fixed at that figure.

After some conversation on the subject, the motion was agreed to; the Provost remarking that, in framing their valuation so as to make the £1500, the Court had not fixed any principle.

ARBROATH CORPORATION GAS SUPPLY.

PROPOSED EXTENSION OF THE WORKS.

At the Meeting of the Arbroath Gas Commission last Thursday—Provost ANDERSON presiding—the proposed extension of the gas-works formed the subject of a long discussion. It will be remembered that at the previous meeting of the Commission (see *ante*, p. 346) a resolution to proceed with the extension of the works, at a cost of about £7000, was carried by a majority, on an amendment moved by Provost Anderson to a motion for delay; and that the opposition, through Mr. Michie, thereupon gave notice of a motion to rescind this resolution.

Mr. MICHIE (who read his speech) said his first reason for the action he had taken was that the Manager, Mr. R. S. Carlow, had assured the Board only recently, when the last of a series of permanent improvements on the works, costing from £5000 to £7000, was effected, that no further expenditure would be required for many years. Mr. Carlow's words at that time were that the Corporation were in possession of one of the finest little gas-works in Scotland. Yet now he came forward and asked them to be removed to another site, as the present one was unsuitable. Were they not astonished at this, after being told only 18 months before that the works were complete, and would not require anything for many years to come? His second reason for opposing the extensions was that he did not consider the proposed increase of storage accommodation at all necessary, and that they had never heard a word about defective pressure in the lower districts of the town until last winter. In conclusion, he moved, in the terms of his notice, that the resolution passed at the last meeting be rescinded.

Mr. SANDEMAN seconded the motion. He said the longer he considered the proposed extensions, the more he became convinced that they were unnecessary. In regard to the principal reason urged for the extension of the works—the insufficiency of pressure in the lower parts of the town—he had consulted several householders residing in the neighbourhood of the Harbour, and they had informed him that there was quite sufficient pressure there. Even the officials in the lighthouse had stated that they had an abundant supply of gas. He had obtained figures (which he quoted) showing that Arbroath stood in a favourable position, as compared with other towns, in the matter of storage accommodation; and in view of this he considered it useless to try to frighten the community into an expensive extension scheme by holding before them the possibility of the town being suddenly thrown into darkness through failure in the gas supply. He reminded the Commission that the consumption of gas was falling off, and that the result of increasing the expenditure on the works would inevitably be an increase in the price of gas. Gentlemen who spoke as if it were absurd to entertain the fear that the manufacturers in Arbroath would adopt the electric light, were not well read in what was taking place around them; for only the other day he saw a report which showed that the Forfar Gas Corporation had lost £275 during the past year by the introduction of the electric light into the factories. He knew also that the light had been adopted in factories in Brechin, Montrose, and Bervie, not to speak of Dundee, where it was extensively used in mills, factories, and building-yards. In view of these facts, the Commissioners ought carefully to consider what they were doing.

Mr. KENNY, while sympathizing with Mr. Michie and Mr. Sandeman in their objections to spending £7000 or £8000, moved, as an amendment, the previous question, as a protest against the method which had been pursued in bringing about the discussion. At the same time, he hoped that when the matter was sent back to the Committee of Management, they would see their way to postponing action until the spring months.

Mr. MELVIN seconded the amendment, characterizing Mr. Michie's conduct as void of common sense, and contrary to all the rules of fairness which prevailed in the carrying on of public business.

Mr. WILSON said he understood, when he left the country about a year ago, that the gas-works were fully equipped for a number of years to come; and therefore he was surprised, when he returned, to hear an expenditure of about £8000 spoken of as being necessary. He had looked into the matter very carefully, and had come to the conclusion that the works were by no means complete for two or three years' service. He did not impute blame to anyone, but considered that a mistake had been made somewhere. He was convinced that the Corporation must proceed with the extensions. He held, however, that the Corporation ought to provide a large depreciation fund to meet such heavy expenditure. He had full confidence in the ability of their Manager to carry out the extensions; and the mere fact that Mr. Carlow had been able to lower the price of gas in the face of a rising price for coals, was quite sufficient to meet all that Mr. Sandeman had advanced.

Provost ANDERSON detailed the various steps which had been taken leading up to the meeting that day, in order to show why the majority considered it necessary to carry out the additions to the works. Incidentally he pointed out that an estimate by Mr. Carlow, showing that new gas-works could be erected on a low-level site for about £15,000, had proved, even to Mr. Carlow's own mind, utterly fallacious, and had been abandoned;

it having been found that a figure nearer £30,000 would be required. Proceeding, he said it had been contended that the Commissioners would not, in the event of their resolving to remove the works, require an Act of Parliament to authorize their doing so. He admitted that they might adopt the Burghs Gas Supply (Scotland) Act; but even in the event of their doing so, he contended that they would not be entitled to transfer the debt and annuities from the old to the new works. Independent of all this, however, he held that if they were to get on with any business at all, they were bound to make up their minds what course they would follow; and they ought not to delay longer in carrying out the resolution of the Board, unless some particularly good reasons for rescinding it were given.

Mr. DICKSON, while expressing his intention to support the amendment, argued that it would be more economical to erect new works on a fresh site than to lay out money on extensions of the old ones. He adduced figures in support of his contention. He said the Commission had an opportunity now of getting rid of their admittedly bad site, and it might never occur again. There were plenty of places to be had; and he calculated that they would receive as much for the ground now occupied by the works as would purchase a new and more suitable site.

Provost ANDERSON pointed out that Mr. Dickson had not shown how he proposed dealing with the sinking fund in connection with the new works.

Mr. DICKSON held that it was not necessary for him to do so, as he did not propose that the old works should be abandoned all at once, but should be gradually absorbed in the new works.

Provost ANDERSON replied that this proposal was utterly unworkable, inasmuch as they could not, for example, have the retorts at the old site and the purifiers and other plant at the new one.

Mr. CLUNIE said the Sub-Committee of which he had been a member were thoroughly in favour of new works, on condition that Mr. Carlow's estimate of £15,000 was not exceeded, and that a suitable site could be obtained. The estimate, however, had been proved to be far under the mark; and the Sub-Committee had failed to obtain a satisfactory site.

Mr. MICHIE having replied, A vote was taken, with the following result:—For the motion, 5; for the amendment, 11. The resolution previously come to, to proceed with the works, therefore stands.

GLASGOW CORPORATION GAS SUPPLY.

OFFICIAL INSPECTION OF THE WORKS.

The official inspection of the Glasgow Corporation Gas-Works took place last Thursday; and the event proved to be of such considerable interest to the members of the Gas Trust generally, that it is not unlikely to become an annual one. In the early part of the day, Bailie M'Laren, who is at present the Acting Convener of the Gas Committee, together with a number of his immediate colleagues (Bailie M'Farlane, ex-Bailie Crawford, and others), visited the Dalmarnock works, over which they were conducted by Mr. W. Foulis, M. Inst. C. E., the General Manager of the Gas Trust, and Mr. Manwell, the Works Manager. Everything was found to be in a highly satisfactory condition there. The matter which received most attention from the Committee was the enclosing of a large additional piece of ground lately acquired by the Trust in the immediate vicinity of the works, for their subsequent extension. The party next visited the Tradeston works, which are about to undergo entire reconstruction, in accordance with the provisions of the Act of Parliament passed last session. Under the guidance of Mr. Foulis, the members inspected the arrangements involved in the reconstructural operations, including the new bridge which is to be built over the Caledonian Railway at Maxwell Road.

Later in the day the other members of the Trust, accompanied by various leading Corporation officials, left the Queen Street station by special train to join their colleagues of the Gas Committee at the Dawsholm works, which were to be inspected by the whole party and with some detail. Mr. Foulis was again the chief conductor; being assisted in receiving the visitors by Mr. David Terrace, the Manager of the works. Before proceeding with the inspection proper, the party partook of luncheon—Bailie M'Laren presiding, and Bailie M'Farlane occupying the vice-chair. The Chairman apologized for the absence of the Lord Provost (Sir J. King, Bart.) and ex-Bailie Ure, the Convener of the Gas Committee. The former, he said, was enjoying a well-earned holiday on the Continent; and the latter was suffering from illness. Referring to the official duties which the Committee and the other members of the Gas Trust were that day discharging, he remarked that the Committee had already inspected the works at Dalmarnock and Tradeston, and that the Dawsholm establishment, where they were assembled, was the largest and most complete of the gas-works belonging to the Corporation. In speaking of the magnitude of the operations carried on in connection with the Glasgow gas undertaking he stated that they carbonized 270,000 tons of coal per annum, and employed upwards of 2000 workmen in the height of the season; while the works as they stood were capable of producing 16 million cubic feet of gas per day. It was at present intended to expend about £160,000 in the erection of almost entirely new works at Tradeston; and, when completed, they were expected to be capable of making 10 million cubic feet of gas per day. In order to manufacture this enormous quantity of gas, 1000 tons of coal per day would be required. Obviously, it was a great advantage to have railway sidings at the works, together with all the appliances necessary for bringing forward and dealing with this large quantity of coal. The present producing power of the works at Dawsholm involved a daily consumption of 800 tons of coal. The works there were capable of being extended to double their capacity; and this showed that the Committee had great views in regard to the increase of the gas supply to that city. During the past summer there had been the most extraordinary increase that they had had for many years. He might safely say that it was 12 per cent. above the consumption last year; so that they had not taken steps too soon to provide for a larger supply than that of the present time. Subsequently the party, under the guidance of Mr. Foulis and Mr. Terrace, made a complete tour of the works; beginning with the gasholders, three in number, each 160 feet in diameter and 60 feet high, in two lifts, and having a total combined capacity of close upon 4 million cubic feet. The retort-house was next visited; and the Siemens system of regenerative firing was fully explained. The condensing, washing and scrubbing, and purifying departments were then inspected; and numerous points of interest were explained to the visitors as they passed along. The thorough removal of the ammonia in the scrubbers, and the perfect extraction of the carbonic acid, sulphuretted hydrogen, &c., in the purifying tanks, excited much curiosity in the minds of those Gas Commissioners who had not been previously initiated into the mysteries of gas making and purifying. The station meters, governors, exhausters, photometers, &c., afterwards received a due share of attention; and every one of the visitors was much gratified with the explanations given. Other portions of the works were visited; and then the party passed through the adjoining chemical works, which belong to the Gas Trust, but are leased to Messrs. Arrol and Co., for dealing with the residual products. With this the pleasant round of inspection terminated.

BRISTOL UNITED GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Wednesday, at the Offices, Canons' Marsh, Bristol—Mr. J. COLTHURST in the chair.

The notice convening the meeting having been read, the report of the Directors, the principal portions of which were given in the JOURNAL last week, was presented.

The CHAIRMAN, in moving the adoption of the report, said the Directors were pleased to be able to give the shareholders a favourable one at that meeting. The profit for the six months covered by it had been £30,628 15s. 3d., as against £21,140 in the corresponding period of last year. He desired to call their attention to the changes that had taken place since the year 1884, when a considerable reduction was made in the price of gas. Two alterations in price followed closely on one another; and it was found that the figures, which stood in June, 1884, at £30,645, fell to £14,951 in June, 1886. The shareholders would probably remember that their late Chairman, Mr. W. Spark, called attention to these facts, and pointed out that they had to draw upon their reserve fund to make up the dividend to the usual figure. Mr. Spark, however, expressed the belief that the figures would right themselves in time, that the Company would recoup itself, and that they would soon have a similar profit to that to which they had been accustomed. This prediction had been realized; for whilst in 1884 their profit for the half year was £30,645, in the past six months the sum stood at £30,628. So they would see that the figures were nearly similar. These figures were made up by the increased quantity of gas used and by the sale of residual products, which in 1886 were at their very lowest. The price of tar had improved somewhat; and with regard to ammoniacal liquor, while the price had not materially improved, the quantity had increased and made up the difference. The attention of the shareholders was also called in the report to the great economy that had been effected in the expenditure. He found that although they had used more coal during the past six months, yet, through the changes that had taken place in regard to freights, they had effected a considerable saving. Less material had been used in the works, less money had been spent on the mains, and less in wages; and all these economies had helped to make up the substantial difference shown in the report. The Board also, feeling the desirability of increasing the use of gas for other purposes than lighting, held a public exhibition of gas cooking and heating apparatus at the Drill Hall, Clifton. The show was an excellent one; and as the result of the exhibition, their supply of cooking-stoves had risen to upwards of 700. This had naturally increased the supply of gas. The Directors had to record the retirement of Mr. Walter Fiddes, who for 44 years was in their service as Engineer; and they had voted him a retiring allowance of £500 per annum. They had found it necessary to considerably alter their arrangements in regard to the duties at their several stations; and, as a necessity, it was thought desirable to make a change in regard to the Chief Engineer. It was felt that, as Mr. Fiddes had served them so long and so well, upon his leaving them he should be awarded a retiring allowance, as was done in the case of their former Engineer; and the sum fixed upon was £500. In the report they saw that it was proposed to rescind a resolution of 1853, which fixed their meetings for March and September, in order that they might be held in February and August. He explained that formerly their collections were made half-yearly. But recently they had altered their system, and had the collections made quarterly; and the change enabled the Directors to declare the dividend at an earlier period than usual. It was proposed now to hold their meetings about a month earlier than they had been accustomed to do.

Mr. S. JONES seconded the motion, which was carried unanimously.

On the proposition of the CHAIRMAN, seconded by Mr. JONES, a dividend at the rate of 10 per cent. per annum was declared.

The CHAIRMAN next moved—"That the resolution passed at the half-yearly meeting of proprietors on Aug. 5, 1853, by which it was decided that the half-yearly meetings of the proprietors should be held in March and September, be now rescinded."

Mr. R. W. GILES seconded the motion, and it was adopted.

Mr. J. C. WITHERS asked whether there was a prospect of the price of gas being further reduced.

Dr. TUCKETT moved a vote of thanks to the Chairman and Directors for their attention to the affairs of the Company. The balance-sheet was, he said, the best the Directors had issued for a long time.

Mr. H. J. ALLIS, in seconding the motion, spoke of the very satisfactory profit made during the past half year.

The motion having been agreed to,

The CHAIRMAN replied, saying that his colleagues and himself appreciated the kind expressions used towards them, and that it would stimulate them to increase their efforts on behalf of the shareholders. With regard to the question as to further reducing the price of gas, he would point out that the Directors were in the position of trustees between the shareholders and the public; and although it was their duty to secure for the former the 10 per cent. dividend, they also felt that, in whatever way they could possibly improve the quality of the light and lower the price, it would always conduce to the interests of the undertaking to do so. Without giving any specific answer to the question, they might be assured the Board would not lose sight of the matter.

The proceedings then terminated.

WATER SUPPLY IN THE FEN DISTRICT.—At the meeting of the Holbeach Board of Guardians last Friday, a resolution was passed approving of the South Lincolnshire Fen Water Act, passed last session, and expressing an opinion that the supply of water would be a great advantage to the inhabitants of the Union, and that the Rural Sanitary Authority would do all in their power to encourage the scheme.

SCHEME FOR THE SUPPLY OF WATER TO HOLYWELL.—Last Tuesday evening an important meeting was held at the Assembly Hall, Holywell, when the claims of a scheme for supplying the large and populous district embraced in Holywell, Greenfield, and Bagillt were advocated by several well-known gentlemen. A Company has been formed, with a capital of £20,000, to carry out the scheme; and assistance has been promised by the Duke of Westminster, the Earl of Denbigh, Lord Mostyn, Sir Piers Mostyn, and other prominent landlords. The source of the supply is Milwr, about 1½ miles from Holywell; and the water, after passing through filter beds, will be stored in two large reservoirs. The Engineer of the scheme is Mr. H. E. Taylor, C.E., of Chester, who was engaged in a similar capacity in connection with the Hawarden Water Company; and he considers it likely to be a very successful one. Alderman W. Brown, Mayor of Chester, presided; and among the addresses was one by Mr. C. E. Matthews, of Birmingham. He strongly urged the inhabitants to support the scheme. He pointed out that it was the last one likely to be brought forward; and if not accepted, the Board of Health would provide a proper supply of water and charge it on the rates, as the present supply had been condemned by them. A resolution was passed approving the scheme, and a number of shares were afterwards subscribed for by the tradesmen and inhabitants.

THE PRICE OF GAS AT ROCHDALE.

A Meeting of the ratepayers of Rochdale was held last Thursday, for the purpose of discussing the general rating of the borough, and protesting against the recent increase of the salaries of certain Corporation servants. The following resolution was moved and seconded:—"That this meeting is of opinion that the past expenditure of the borough is extravagant; that, in the interests of the ratepayers, a revision of the existing financial arrangements is urgently needed; and that the price of gas should be substantially reduced to local consumers." Attention was called to the fact that the price of gas is 3s. 2d. per 1000 cubic feet in Rochdale, and only 2s. in Bury; and it was contended the surplus was to a large extent illusory, and at all events ought not to be left to the Corporation to be used in some extravagant manner. Alderman Taylor, replying to the mover and seconder of the resolution, said the price of gas had been steadily reduced in the town. When he first began to consume gas, it was 14s. per 1000 cubic feet. Then it was reduced by degrees to 12s., 10s., 8s., and at last to 6s. It was also decided that whenever the profits should reach or exceed 5 per cent., another reduction should take place. This had been done whenever possible. What was the position? There were carbonized at the gas-works between 30,000 and 40,000 tons of coal every year, for which about 9s. per ton was paid. A year or two ago the price was 10s. If a rise of 1s. per ton in the price of coal—and it was quite possible that this might occur—took place, what would be the result? Suppose, for instance, 40,000 tons of coal were consumed, a rise of 1s. per ton would amount on the whole to £2000. In that case they would not have their 5 per cent. At present the supply of gas to the public lamps was not paid for; it was given. There was another benefit which the inhabitants of Rochdale possessed. When the gas-works were purchased, a great effort was made to ensure the poorest cottager being provided with gas. There were now in Rochdale nearly 20,000 meters at work; and leaving the factories out of the question, the population to be supplied was 80,000. There were more people in Rochdale supplied with gas than in almost any other town in Lancashire, or perhaps in England. Another advantage the town had had recently was in the treatment of residuals. The Council had not been extravagant at all in the matter of the gas undertaking; but had been very careful in the expenditure. He was anxious that the ratepayers should not at one coup reduce the price to anything like the charge at Bury. The Gas Committee had recommended the Council to reduce the price, and he believed a further reduction would take place. But if the town did get a reduction, and they had no profit whatever, would they willingly pay the £14,000 a year loss on the water undertaking? They had to do it. [A VOICE: "We must take it off the salaries," and loud cheers.] Why, the whole of the salaries would not amount to this sum, nor half of it. It was a poor way of economizing to pay one's servants a less sum than they were worth. Mr. E. Nuttall contended that the Corporation could reduce the price 7d. per 1000 cubic feet, and still make a fair profit. Mr. Allan Mills pointed out that this would mean an increase of the rates to a corresponding amount; but it was most desirable, in the interests of direct taxation. If any ratepayer wished to avoid paying the 1s. 3d. in the pound, the amount of which he was relieved by the gas profits, he had only to make use of some other sort of light. The owner of a large warehouse rated at £100 per annum would perhaps only expend £2 annually in gas. The effect of this would be that the large ratepayer would get out of paying 100 one-and-threepences in the pound, because his rates were reduced by the profits on the gas. And who were paying these rates? The cottage consumers. It was unfair that any man in the town should be able to avoid paying in this manner. Mr. H. Cunliffe held that the larger consumers really produced the profit. Mr. E. Evans stated, on the authority of a member of the Gas Committee, that the tenders for supplying the Rochdale Corporation with coal for making gas, when before the Committee, were not dealt with, or entered into, in a businesslike way. It was stated by his informant that the very same class of coals as those accepted were offered by another tenderer at 1s. per ton less. The resolution was passed with a few dissentients. The following resolution was also carried:—"That this meeting strongly condemns the action of the Town Council in their recent increase of official salaries, in defiance of the wishes of the ratepayers as expressed at the meeting held in the Town Hall, and pledges itself not to support any candidate at the forthcoming November elections who voted for those increases, and who thus set the ratepayers at defiance."

RIO DE JANEIRO GAS SUPPLY.

It will be in the recollection of our readers that about two years ago the gas supply of Rio de Janeiro was transferred by the Brazilian Government from the English Company who had for a number of years held the concession to a Belgian syndicate; the works being handed over to the latter body on the 1st of September, 1886. We have received some extracts from a report which has been presented to the Minister of Commerce, Public Works, &c., by the General Inspector of Gas Lighting, in regard to the lighting of the city during the past year; and we take therefrom the following particulars:—The Inspector states that the new conditions under which gas is supplied are advantageous both to the State and the private consumers, not only in the matter of price, but also in regard to the quality of the lighting, which has been improved. The consumption of gas in the street lamps, which was formerly 95.5 litres (about 2½ cubic feet) per hour, and for which the Municipality paid 6.8 centimes (0.068d.), is now 100 litres, which cost 6.4c. The Public Departments and private consumers paid respectively 70c. and 75c. per cubic metre of gas (15s. 9d. and 16s. 10d. per 1000 cubic feet) under the old arrangement; but under the new one they do not pay more than 60c., or 13s. 6d. Comparing the prices charged under the old contract with those of the new, as applied to the total consumption of gas last year, the economy effected is stated to amount to the sum of 204,927 frs., or about £8000. The increase in the consumption of gas during the year was 11.12 per cent.; being 2.5 per cent. for public, and 8.7 per cent. for private lighting. The additional private consumption was caused by 631 new customers, and was quite a natural result of the reduction in the price. Under the new arrangement, the intensity of the light has also been increased to the extent of more than a candle; and this higher illuminating power, it is stated, has always been kept up. Certain complaints have been made on the subject of this increased intensity, as not being that prescribed by the contract, and as necessitating the employment of twice the number of private burners to obtain the same quantity of light as that furnished by the English Company. These complaints, the Inspector states, have no foundation; and seeing that all the gas supplied is of the same quality, the light produced by the street lamps cannot be greater than that found in the private houses. For the outlay of all the consumers to be double, the Company would have to manufacture twice the quantity of gas which was actually distributed; whereas the meter at the works shows an increase of barely 8.27 per cent. upon that of the previous year. It must therefore be to other causes that the complaints must be attributed. In the first place, many leakages exist, due to the bad workmanship of the gas-fitters; then, secondly, burners are employed of inferior quality. In order to avoid complaints, however, and to enable the con-

sumers to obtain a good light with economy, the new Company supply and fix gratuitously burners of all sizes, selected with great care. The Inspector points out that most of the inhabitants fail to give sufficient attention to their daily consumption of gas; and some even compare the bill for a winter quarter with a preceding three months in the summer season. Finding the former higher than the latter, they at once make a complaint, without having noticed the difference in the length of the nights. A great number of these complaints against the new Company are of the same nature as those brought forward in the time of the English Company, and are quite familiar to the Government. Certain irregularities have, nevertheless, been discovered; and these have necessitated the intervention of the Lighting Inspector.

THE PRICE OF GAS IN LANCASHIRE.

The Borough Treasurer of Blackburn (Mr. J. H. Bailey) has lately published an important and comprehensive return relating to the finances of Lancashire towns, from which the following particulars are extracted:—

Name of Place.	Popula- tion.	Rateable Value.	Total Rates in the Pound.	Price of Gas.			Gas Profits.	
				Small Cons.	Large Cons.	Dis- count.	Total.	Equals a Rate per £.
		£	s. d.	s. d.	s. d.		£	d.
Accrington . . .	31,435	120,572	4 2	3 6	3 3	5d.	—	—
Ashton-u-Lyne . .	39,600	141,426	4 6	2 4	2 4	—	—	—
Bacup . . .	25,034	79,486	3 11	3 7	3 3	5 p. c.	—	—
Barrow . . .	52,000	223,210	3 10	8 6	3 6	—	4,170	4½
Blackpool . . .	20,000	155,117	4 2	2 6	2 6	—	3,800	6
Bolton . . .	110,000	407,086	4 10	3 0	3 0	6d.	11,500	7
Bootle . . .	53,000	242,445	3 9	2 8	2 8	—	—	—
Burnley . . .	78,000	224,965	3 11	2 6	2 6	3d.	3,554	3½
Bury . . .	55,000	222,025	4 10	2 1	2 1	1d.	52	—
Chorley . . .	21,000	66,588	5 0	3 9	3 6 3 3	3d.	2,885	10½
Clitheroe . . .	11,900	33,580	3 7	3 6	3 5 3 2	2½ p. c.	—	—
Darwen . . .	32,000	110,179	4 9	3 0	2 9 10	2½ p. c.	2,907	6½
Heywood . . .	24,000	95,000	4 0	4 0	4 0	5d.	—	—
Lancaster . . .	24,619	93,739	3 0	2 6	2 6	3d.	—	—
Manchester . . .	377,529	2,435,404	4 9	2 8	2 8	—	32,410	3 1-5
Oldham . . .	138,220	573,436	3 0½	2 10	2 9 2 7	6d.	13,809	5½
Preston . . .	103,234	334,174	5 2	3 2½	3 2½	10 to 20	—	—
Rochdale . . .	72,789	255,298	5 3	2 10	2 10	—	12,128	11½
St. Helens . . .	57,403	252,552	4 1	2 10	2 10	2½ to 10 p. c.	1,574	1½
Salford . . .	195,894	766,084	5 0	2 10	2 9	—	20,895	6½
Southport . . .	37,000	230,624	3 8	3 0	3 0	5 p. c.	7,207	7½
Stalybridge . . .	27,000	93,866	4 2	2 10	2 8 2 9	—	—	—
Stockport . . .	70,000	224,667	4 0	2 5	2 5	—	5,769	6 1-6
Warrington . . .	48,000	141,546	5 6	3 6 5	3 6 5	6d., 1s.	—	—
Wigan . . .	53,000	163,954	5 8	3 1	3 1	10 20	—	—
Blackburn . . .	120,000	408,834	4 8	3 1	2 10	5 p. c.	—	—

THE PUBLIC LIGHTING OF CHELSEA.—According to the report of the Chelsea Vestry for the year ending March 25 last, the total number of lamps in the whole district was 1346; the price of gas being 2s. 5d. per 1000 cubic feet. The new lamps erected during 1887-8 numbered 13, and 15 were discontinued. There were 1907 defective lights reported to The Gaslight and Coke Company, of which 825 were caused by deposits of naphthalene and 72 by water. The number of repairs to lamps and lanterns was 1566. In the Vestry's testing-room, 330 governors were tested during the year.

ANGLO-GREEK PETROLEUM WORKS AND WELLS COMPANY, LIMITED.—This Company was registered last week with a capital of £300,000, in £10 shares, with the objects of acquiring certain properties and concessions of petroleum wells situate in Greece; working, letting, selling, or otherwise dealing with the same, or any part thereof; carrying on the manufacture of all the products drawn from the wells, and the petroleum trade in all its branches; manufacturing gas, and carrying out gas-works of every description; making railways, tramways, roads, or other means of carriage or conveyance, piers, landing-places, and other works and buildings incidental to the Company's business.

THE NEW WATER SUPPLY AT BURNHAM (SOMERSET).—It is satisfactory to know that the inhabitants of Burnham, who agitated so long for an improved water supply (and apparently not without good reason), are showing their appreciation of the new works which the Local Board have just had constructed at considerable outlay. At the meeting of the Board held last Thursday, it was reported that the residents were applying so fast to have the water laid on to their houses that the Surveyor could scarcely keep up with the demand. Already 309 houses out of 499 have been connected. The people are now beginning to admit that there was no good well water in the neighbourhood; and they acknowledge that the source whence the Board derived their supply—the Winscombe Springs—is the best available.

METROPOLIS WATER SUPPLY.—In the course of their report to the Official Water Examiner for the Metropolis (General A. De Courcy Scott, R.A.) on the composition and quality of daily samples of water supplied to London last month, Messrs. Crookes, Odling, and Tidy say: "As might have been expected, the unusual and irregular meteorological conditions of the past few months have had a certain influence on the waters of the Thames and Lea. We shall have to comment on this circumstance hereafter. We content ourselves now with remarking that the water supplied to London during a very exceptional summer has been uniformly good and wholesome. Of the 182 samples examined by us during the month of August (excepting three samples of the East London Company's supply which were recorded as 'very slightly turbid'), the whole were found to be perfectly bright, and free from any trace of suspended matter."

CHELTENHAM GAS COMPANY.—At the half-yearly meeting of this Company held last Thursday, the Chairman (Mr. W. H. Gwinett), in moving the adoption of the Directors' report, said that the accounts for the past six months were very satisfactory; the profit realized admitting of the payment of the usual statutory dividend. The revenue had increased, and so had the profits, as compared with the corresponding period of last year. This was due partly to additional consumption, reduced working expenses, and the adoption of improved manufacturing processes. The new gas-holder in course of erection was practically finished, and was at present under test, previous to being brought into use during the coming winter. On behalf of the Directors, the Chairman expressed their indebtedness to Mr. R. O. Paterson, their excellent Engineer and Manager, under whose superintendence the holder had been constructed. A question was asked as to the proposed adoption of the electric light in a portion of the borough, and whether any communication on the subject had been received from the Town Council. The Chairman said there had been a communication, and the matter was receiving the attention of the Directors. The report was adopted; and the full statutory dividend having been declared, the meeting was brought to a close.

PROPOSED CONSTANT WATER SUPPLY IN THE CITY.

At the Meeting of the Court of Common Council of the City of London on Thursday last—the Lord Mayor (Alderman P. De Keyser) in the chair—a lengthy report was presented by the Gas and Water Committee upon the petition of St. Giles's Vestry, Cripplegate, and letters from three other parishes in the City, asking the Corporation to direct the issue of notices calling upon the Water Companies supplying the City to provide a constant supply of water. The report stated that the New River Company had expressed their willingness to confer with the Special Sub-Committee, and subsequently the Sub-Committee were informed that the Company were willing to give the constant supply if required, provided the regulations of the Metropolis Water Act, 1871, were previously complied with. It was ascertained that the average cost in St. Pancras in altering fittings, &c., was £5 for each owner; but that the cost in the City would probably be more. The number of fire hydrants would also have to be doubled. The Sub-Committee had reported further that they had received a letter from Mr. Archibald Dobbs, who stated that the citizens would regret it if the petition in favour of a constant supply were granted. Mr. Dobbs afterwards attended before the Sub-Committee, and gave additional information. The report stated that very few complaints reach the New River Company as to short supply—on an average, about two a day; and these were usually owing to a defect of some fitting or the stopcock being shut. Resolutions in favour of the constant service had been received from six parishes; four had sent resolutions against; and four had passed resolutions in favour, without communicating the fact to the Committee. Thus only 15, including Cripplegate, out of the 112 City parishes had expressed an opinion on the subject. The Committee believed it would be obviously unfair to apply the constant service to the City generally; and they suggested that, if it were decided to adopt it at all, it should be only to those parishes which had expressed a desire for such supply. The Committee recommended that it was not expedient, in the interests of the petitioners and the citizens generally, to take any steps in the direction indicated.

Mr. H. MEAD (Chairman of the Gas and Water Committee), in moving the adoption of the Committee's report, said that out of 14 of the 112 parishes of the City, ten were in favour of a constant water supply, and four against. The remainder of the parishes had expressed no opinion. The parishes in favour of a constant supply constituted a very small number of the ratepayers to set such large machinery at work, which would affect 35,000 inhabitants by putting them to great expense. The Committee had taken the matter into very careful consideration; and had had an interview with the Water Companies, who informed the Committee that they were quite willing to give a constant supply, provided all the requirements of the Act of Parliament authorizing it were complied with. The Companies also stated that, under certain circumstances within their power, they would supply individual firms with a constant supply for the purposes of trade or otherwise. The Committee had also considered the advantages and disadvantages of a constant water supply, and had come to the opinion that the disadvantages outweighed the advantages. The ratepayers would be put to considerable inconvenience and expense; the cost of the new fittings being estimated for the whole of the City to amount to something like £300,000 to £400,000. The report showed that the average cost of the fittings necessary for a constant water supply in St. Pancras was £5 for each house. This, he thought, perfectly justified the Committee in coming to the conclusion not to recommend the Court to agree to the application of the memorialists.

Mr. R. STAPLEY observed that the Committee had no document or letter from the Water Companies in which they agreed to give any individual firm a constant supply. The Committee, however, made a point of a promise to this effect from the Companies. Now he (Mr. Stapley) had made an application on the strength of the Committee's report to the Company that supplied his district; and they denied having made any such promise. Therefore one of the great arguments put forward by Mr. Mead fell to the ground. It also seemed to him (Mr. Stapley) that Mr. Mead was very much out in his estimate as to the expense of the fittings for a constant supply. The Vestries, he believed, would very soon report favourably on the constant supply system, because of the great convenience this would be to a large number of persons in the City. With a constant supply, they would be able to turn off their water at night with the certainty of being able to turn it on again early next morning, and not, as now, have to wait sometimes till 11 or 12 o'clock in the forenoon. He would be the last to urge the Corporation to put the City to a great expense for new fittings if the inhabitants decided against it; but the Companies should be made to understand that, if they would provide a constant service to individual firms who requested it, a good deal of the objection to the Companies would be removed. The Company he spoke of, however, distinctly denied making any such promise as the Chairman of the Committee had mentioned.

Mr. H. H. BRIDGMAN said the chief point in the Committee's report was the great expense for new fittings. It was not the Water Companies' business to inform people what the cost would be; and he was sure that, if any individual firm or parish desired a constant supply, the New River Company would give it, provided the requirements of the Act were complied with. Seeing that only a few of the Vestries had asked for it, he thought the Committee were quite right in their report not to recommend the Court to put the whole City to the expense of new fittings. The Corporation, under the circumstances, should not apply their powers to make the New River Company afford a constant supply, because, although it had been stated that £9 or £10 would be the cost of new fittings, he found in one instance the cost was £50.

Mr. H. GREENE observed that the parish of St. Giles had come before the Court of Common Council in 1885 and again in 1888, asking the Court to take the necessary steps to call upon the Water Companies to give a constant supply to the inhabitants of the City. Had they requested them to do this for their own particular parish, the Court would have dealt with it in a very different manner; but as they desired the Court to put their powers in motion for the purpose of a constant supply to the whole of the City, they had a very important question to consider. The Committee had come to the conclusion not to recommend it; and he was bound to say that, even in those parishes which wished a constant supply, there was a very considerable difference of opinion among the inhabitants. Looking at the matter all round, it might fairly be said the Committee had done its duty.

Mr. A. DOUBLE thought this was not the way to treat the Ward of Cripplegate or the City; and he was of opinion that the Committee should have ascertained the wishes of the water consumers of the City before presenting their report. He therefore moved that the consideration of the report should be adjourned, to enable the Committee to obtain the views of the water consumers of the City on the question. He ventured to think that, as London was the wealthiest city of the world, it was simply monstrous that it should be without a constant supply of water. As to the expense of fittings, he wished to point out that a large number of the buildings in the City were of modern construction; and the fittings were in fair condition. Therefore the expense of fittings would be comparatively small. With regard to the willingness of the New River

Company to grant a constant supply to individuals, a short time since he had some correspondence with the Company; and they said, in a letter to him, that, for various reasons, it would not be possible to comply with the wish of individual consumers for a constant service, but that the Company would give careful consideration to any suggestions for supplying a district. There was nothing in the Committee's report or that letter to guarantee a constant supply to any individuals—in fact, he doubted the willingness of the New River Company on this question.

Mr. A. BROOKMAN remarked that St. Giles's was a manufacturing district; and if a constant supply of water were provided, there might be breaks in the pipes and the whole place would be flooded. However, he indorsed Mr. Stapley's remarks that it was a great inconvenience not to have water in the morning. If the matter went before the Committee again, this question might well be considered; and a proposal made to the Water Companies.

Mr. H. CLARKE said the whole question was in a nut-shell. When the Vestries desiring a constant supply obtained a consensus of opinion of the inhabitants of their districts and arrived at the initial cost, then the Court would enable them to get a constant service.

Mr. R. W. SCOBELL asked how the estimate of £300,000 for fittings was arrived at?

Mr. MEAD replied that there were over 30,000 inhabited houses; and in St. Pancras the cost of fittings was £9 a house. Therefore it would be considerably more expensive to put in the new pipes in the City, because of the breaking up of pavements. He estimated that it would be at least £400,000.

Mr. G. N. JOHNSON thought a constant supply should not be forced on any locality.

The amendment to refer the report back found no seconder, and the motion was adopted.

EDINBURGH WATER SUPPLY.

PROPOSED UTILIZATION OF ADDITIONAL SOURCES OF WATER.

At the Meeting of the Edinburgh and District Water Trust held on the 3th inst.—Provost AITKEN presiding—the following memorandum was submitted by the Engineers (Messrs Leslie and Reid), on the subject of a proposal to utilize the Manor Water as a supplementary source of supply for the city and suburbs:—

In view of the probability of an additional supply of water being required at no distant date for Edinburgh, Leith, Portobello, and the districts adjacent, the Water Trustees visited the Manor Valley on the 21st of July last, for the purpose of inspecting the nature of the gathering-ground, and to satisfy themselves as to the suitability of that district for affording an additional supply; and we understand that the Trustees were well satisfied as to the excellence and purity of the water. We therefore think it would not be amiss were we now to present a statement, for the guidance of the Trustees, as to the different schemes which have already been proposed for utilizing the waters of the Manor Valley for the supply of Edinburgh and the surrounding district.

The Manor Water as a source of additional supply was first reported on by Mr. James Leslie in 1870, when he stated that the district "would give for town use and compensation 19,600,000 gallons a day, which, after allowing for compensation, would give 13,000,000 gallons a day for the use of the town. The water seems to be very pure and good; and there is a good site for a reservoir at Posso." The cost of the scheme was estimated at £290,120; and it was further pointed out in the report that the supply available for town use might possibly be increased by forming a reservoir further down the Manor Valley for supplying compensation water to the stream. In 1873 the Mid-Lothian Water Company obtained an Act for bringing in a supply of 5,000,000 gallons per day from the Manor Valley, for the purpose of supplying the county of Mid-Lothian generally, with the power to treat with the Edinburgh and District Water Trustees to supply them with a portion of the water. This Act contemplated the abstraction of the spring water only, and that at a sufficient elevation to avoid the necessity of tunnelling on the line of the pipe-track; and a reservoir was proposed for compensation, to be constructed on the site near Posso, selected by Mr. Leslie in 1870.

In 1874 the Water Trustees, along with the Corporation of Edinburgh, promoted a Bill to obtain additional supplies of water from the Moorfoots; but as the provisions of the Bill to some extent came into conflict with the powers conferred on the Mid-Lothian Water Company, it was considered expedient, in order to avoid their opposition in Parliament, to pay them a sum of £10,000, in consideration of which the Company's powers were allowed to lapse. The fact that Parliament had already granted powers to abstract water from the Manor Valley for the supply of Mid-Lothian, and of Edinburgh, Leith, and Portobello, will no doubt weigh in favour of any future scheme from this source, more especially when it is remembered that the Edinburgh Water Trustees have already supplied to a large extent the very districts which the Mid-Lothian Water Company, intended to provide for in their Act of 1873.

Numerous analyses have from time to time been obtained of the Manor Water; and they all agree as to its purity and suitability for domestic supply. Dr. E. Frankland, Professor of Chemistry in London, in his evidence before the Committees of Parliament in support of the Mid-Lothian Water Bill of 1873, said, as the result of chemical analyses, "I found both samples of the most excellent quality, fit for all domestic purposes, very pure and soft, and free from all suspicion of animal contamination. They were also colourless and palatable;" and, he added: "You could not get a better water supply for domestic use for the supply of a town if you searched the United Kingdom through." There are no manufacturing or other interests on the Manor Water which are likely to offer objections which cannot be met by water compensation in the usual way. It is right to mention that the town of Peebles recently obtained a small supply of water from the Manor by means of a 7-inch pipe; and that, in any scheme for supplying Edinburgh from this source, the interests of the town of Peebles would require to be protected.

For the information of the Trustees, we may mention that the Moorfoot scheme was resolved upon in 1873; and the sanction of Parliament obtained for it in 1874. The estimated available supply from that source is about 9 million gallons per day, which, along with the Pentland water, makes a total available quantity of 16 million gallons per day. The execution of the main portion of the works was completed in 1879; and the Moorfoot water was first introduced in March of that year. At that time the estimated population supplied was about 293,000; while it is now about 378,000. The supplies for trade purposes have also increased from 625,000 gallons to about 2 million gallons per day during that time. The total consumption has risen from 7 million gallons per day in 1879 to 15 millions at the present time; thus leaving a margin of only a million gallons per day to meet the wants of the district until an additional supply be introduced.

Experience has shown that in a district with such inequalities of level as that supplied by the Trustees, and having such large demands for shipping, sanitary, and trade purposes, a constant service cannot be maintained with a consumption of much less than 40 gallons per head per day.

Should the Trustees consider the Manor worthy of further consideration, we would suggest the expediency of having the estimates as to the quantity of water obtainable and the cost of executing the works carefully revised, so as to enable the Trustees, if considered advisable, to make a comparison between this and any other scheme.

Bailie ARCHIBALD, in moving that the memorandum be remitted to the Works Committee for consideration and report, said it appeared to him—and he believed the community were of the same opinion—that it was time the Trustees considered the question of an additional supply of water. They had the fact brought before them in 1879, when the water was first turned on, that they had an estimated available supply of 9 million gallons per day from the Moorfoots. They had used up 8 million gallons of this, and had now a surplus of a million. The total estimated available supply from the Pentlands and Moorfoots was put down at 16 million gallons, of which the Pentlands supplied 7 millions. To show that the Engineers were not over the mark in their estimate, they would see that during the past fortnight the actual supply had been 15,324,000 gallons per day; so that they were coming very close upon their total available supply. If they had any reason to believe that the city of Edinburgh, the town and port of Leith, the burgh of Portobello, and the places that were supplied with water outside this area, were likely to stand still, and that the demand for water would not increase, they might rest perfectly safe with their present quantity. But there was no reason to think that such would be the case; and it was not desirable that it should be so. In looking over the records of the Trust, he found that all the estimates of increasing population and demand for water had been greatly under-stated. An eminent Water Engineer in Scotland, in a report to the Trust in 1870, stated that 20 million gallons, in addition to the supply from the Pentlands of 7 million gallons, would give the increasing population of Edinburgh and district a supply of 50 gallons per head per day for 100 years. Now, 8 million gallons from the Moorfoots had been used in nine or ten years; so that the estimate should now be revised. As to where they should go for a further supply, he did not seek to bind the Trustees; but he had considerable sympathy with the Manor scheme—first, because it was nearer Edinburgh than St. Mary's Loch or the Talla (alternative places); and, secondly, because the water was of undoubted quality and purity. The only other question they had to consider was as to the reasonableness of the price. Mr. Leslie had estimated in 1870 that, allowing 6 million gallons for compensation, 13 million gallons would be available for the town's supply from Posso. If the Manor scheme were treated in the same way as the South Esk, they might, by constructing a compensation reservoir lower down the Manor stream, get from the Posso supply 17 million or nearly 18 million gallons of water per day. They had also to consider that, even supposing they were fortunate enough to pass a Bill during the session of 1889, it would be from six to seven years before the works would be completed and they could get any additional water. If they were now to have two dry seasons, their supply would be short of the demand; and he certainly did not think the present quantity would be adequate for the next seven years. It was clearly their duty, therefore, to take the initial steps to see what they could do to increase the supply.

Mr. COLSTON seconded the motion.

Bailie CRANSTON expressed the opinion that St. Mary's Loch would be a more suitable source of additional supply than the Manor Water. They would get four or five times the quantity from the loch; and therefore he thought it should not be put aside without consideration. Its distance was certainly greater from Edinburgh than the Manor Water; but this could be overcome by an additional expenditure on pipes.

Dean of Guild GOWANS said he knew the Manor district very well; and there was no doubt the water was very pure. They would have to make a new reservoir and new embankments; but possibly they could do this cheaper than by going to St. Mary's Loch. They must not, however, for the sake of cheapness, overlook the advantages of an inexhaustible supply. He would not support the St. Mary's Loch scheme if it were not found to be the best of the projects before them; but they must always remember that they could get as good water there as anywhere else, and that it could be had in unlimited quantities. He proposed a motion recommending the adjournment of the matter for the purpose of allowing the Engineers to report upon other schemes.

Bailie TURNBULL seconded the amendment.

Mr. BROWN asked if the Engineers were perfectly satisfied that they had completely exhausted the Pentlands and the Moorfoots.

Mr. LESLIE replied that these sources were practically exhausted.

Bailie ARCHIBALD said he had made a calculation as to the available supply. They had 16 million gallons from the present sources; 17 million gallons were estimated from the Manor scheme; and as the Manor was the headquarters for St. Mary's Loch and the Talla—and a tunnel could be made to connect these sources—they might add 30 million gallons for St. Mary's, and 22 million gallons for the Talla and the head waters of the Tweed; making a total of 85 million gallons, which would supply a population of 2 million people with 42 gallons per head per day.

Dean of Guild GOWANS then altered his motion to read as follows:—"That it be remitted to the Works Committee, with the aid of the Engineers, to bring up a report on the various available sources of water supply, keeping in view the quantity of water which may be required in after-time, including the Manor, St. Mary's Loch, Talla, and Tweed, and in the case of St. Mary's taking a sample of water down Yarrow."

Bailie Archibald withdrew his motion; and that of the Dean of Guild was unanimously adopted.

BRADFORD CORPORATION WATER SUPPLY.

THE NEW PUMPING STATION AT HEATON.

The new pumping station which the Bradford Corporation commenced about three years ago at Heaton, for the general improvement of the water supply of the district served by the Corporation, by bringing the high and low level systems into connection, is now practically completed. Although the work has only been in progress for the above-mentioned period, the subject had engaged the attention of the Water Committee for something like seven years previous to their decision to commence operations. We give below a few particulars of the new station, which, with the attendant works, has been erected from the plans and specifications of Mr. A. R. Binnie, M. Inst. C.E., the Corporation Water Engineer, with the assistance of Mr. Vaughan, of the Borough Surveyor's office, in the design of the architectural portion of the work. But first of all it may be interesting to give the *raison d'être* of the new station.

Bradford and its suburbs are supplied, as probably some of our readers are aware, with water flowing from gathering-grounds and reservoirs situated at such altitudes as to allow of the water running by the force of its own weight into every house and place where it is required. And because certain parts of the town and surrounding district are much higher than the rest, these have hitherto been served entirely from a separate system—the supply for the lower levels being obtained from tributaries of the Wharfe and Aire; that for the higher levels mainly from the upper waters of the River Worth and the Harden Beck. These systems have

so far been entirely unconnected, and therefore in no way auxiliary one to the other. Inasmuch as the low-level system supplies the central portion of the town, which is most completely covered with buildings, and in which in the nature of things actual increase of population does not go on very rapidly, the growth of the demand upon the sources of supply has not advanced at so rapid a rate as in the higher districts, where the extension of the town and district has been more progressive. The consequence is that the high-level system, which is a much smaller undertaking, is now, relatively to the demand, the less efficient. Thus, while the combined capacity of the low-level works is equal to about 190 days' supply, that of the high-level works is less than 150 days' supply; being a trifle over six months in the one case, and less than five months in the other—amounts which, it may be observed in passing, are seriously below what engineers hold to be a safe minimum for gravitation systems depending upon the fluctuations of rainfall. In the summer of 1884, and again in 1887, it was found to be absolutely necessary to supplement the high-level supply from the resources of the low-level service by temporary pumping apparatus. But as there was no main pipe connecting the two systems, the pumping had to be done through small service-mains only 6 inches in diameter, at a great waste of money for fuel, and with not a little grumbling on the part of those people who resided in the neighbourhood of the four temporary pumping stations. The principal object, therefore, which has been attained by the newly-completed connection may be said to be the strengthening or enlargement of the high-level system by the power of assisting it from the resources of the more extensive and less strained low-level system. But while the connection of the two systems will thus prove of great advantage to the former, it has also a very important bearing upon the position of the latter. The gathering-grounds of the two systems are widely separated, and by no means subject to the same meteorological conditions; and it may happen that an abundant rainfall may fill up the high-level reservoirs, while those on the low-level remain comparatively empty. Such an event is, of course, unlikely; but it occasionally occurs that the high-level system has the heavier rainfall. In such a case the low-level service can be assisted by running water down the main from the high-level service reservoir at Heaton to Heaton, which is the service reservoir for the low-level system. A more important consideration, however, is that this ability to draw upon the high level for the supply of the low gives the inhabitants an element of certainty in their supply which they have not previously felt.

Another purpose effected by the connection of the two systems may be briefly mentioned. The inhabitants of the borough are unanimous now in condemning the principle upon which the high-level system is based. The cost of constructing reservoirs and catchwater conduits at altitudes more than 1000 feet above sea-level, and upon sites not naturally adapted for the purpose, is necessarily very great, and out of all proportion to the advantages obtained; and in any future scheme for the extension of the supply, the water will be collected and stored at more moderate levels, and consequently at a lower proportionate cost. But this means that in the future any enlargement of the high-level supply must be obtained by pumping from the lower level. In this way the Heaton pumping station may be set down as an extension of the high-level service when required to the extent of 2 million gallons a day; or, to put it another way, it practically amounts to an enlargement of the high-level storage equal to 100 days' supply at the present rate of consumption. In determining the scale of the works of connection, regard has been had to all the foregoing considerations.

The pumping-engines which have been fitted up are only an instalment of the entire system. Although the pumping main is equal to conveying 4 million gallons of water per diem from Heaton to Heaton, it was not necessary to put up engines of this capacity just yet; and therefore those which have been erected, and which are in duplicate, are designed to lift 1 million gallons each per working day. They are of the Worthington type, and have been built by Messrs. James Simpson and Co., Limited, of Pimlico, who have supplied similar engines to several of the London Water Companies, as well as to water-works in all parts of Europe. One set of these engines, recently built by the firm for the West Middlesex Water Company, lift 2½ million gallons of water in 24 hours, or 2½ times the whole consumption of Bradford. The engines are compound, direct-acting, and have no rotary parts. Each engine has two high pressure and two low-pressure steam cylinders, arranged tandem fashion, and two double-acting pumps. The diameter of the high-pressure cylinders is 20 inches; of the low-pressure ones, 40 inches; of the pump-rams, 11 inches; the length of the stroke being in every case 2ft. 6in. The engines are provided with an ingenious arrangement of double plungers, which have the effect of greatly steadying the stroke. Power is derived from two three-flued Lancashire boilers, 30 feet in length and 8 feet in diameter; and the flues are two of them 3 feet, and one 2ft. 6in. diameter. To the bridge at the rear of the fire-grate they are fitted with Fox's corrugated flues. The engine-house is a substantial and not inelegant structure of stone, 41ft. 6in. by 35 feet internal area. It is flanked by the boiler-house, 50 feet by 40 feet, and by a mechanics' shop and a coal-house, each 23 feet square. The boiler-house is large enough to contain a third boiler of the same dimensions as those already fixed. What may be described as the basement of the engine-house is well lighted from an area extending round three sides, the walls of which are faced with white tiles. The chimney is 180 feet high; the main part of the shaft being octagonal. The contract for the engines was £5282; that for the buildings, £5186.

WOODEN WATER-MAINS.

[From the *Standard*.]

The exhumation not long ago of sundry wooden tubes or pipes in front of the new Law Courts in the Strand, has drawn attention to some of the bygone conditions of the water supply of the Metropolis. That wooden water-pipes were also used in the provinces in past years is well known; and the records of the Hertford Corporation contain sundry entries of money paid for the construction and repair of such pipes during the sixteenth century. To lay down a cast-iron main for the conveyance of water would seem a very simple and obvious contrivance. Yet the history of the water supply shows that it has required a long course of experience to bring the mode of distribution to its present point of refinement. There has been the leaden age, the wooden age, for a brief period the stone age, and now at last the age of iron.

It seems like a curious anticipation of the present schemes of Local Government and the possession of the Metropolitan Water Supply by a municipal authority, that quite at the commencement of the thirteenth century the Corporation of London intercepted certain springs feeding the watercourse known as the Tye Bourne, and gathered them into reservoirs situated near Marylebone Lane. From this point the water was conducted in a 6-inch lead pipe to Charing Cross, along the Strand and Fleet Street; crossing the Fleet by means of the bridge which then existed at that spot, and proceeding up Ludgate Hill to Cheap-side, where it was discharged into the conduit at the western end of that thoroughfare. This water was derived from the gravel beds forming the subsoil of Marylebone; and in those days was doubtless free

from any dangerous contamination. The degree of hardness attaching to it would also prevent any risk of lead poisoning. At the present time a portion of the water supply of the Metropolis is drawn from the gravel beds which underlie the banks of the Thames above London; and the Water Companies are endeavouring to increase the quantity taken from this source. These Marylebone Water-Works—if we may so term them—were the property of the Corporation; the owner of the land whence the springs issued being induced, under Royal influence, to make a grant of the water to the civic authority. The lead pipe was paid for by certain merchants of Ghent, Bruges, and Antwerp, who received as a *quid pro quo* an exemption for a term of years from river dues and tolls on the goods they imported into London. The King took his share of the benefit by having a gratuitous supply of water for his stables, situated on what is now the north-east corner of Trafalgar square. For many years the Corporation paid an annual visit of inspection to the Marylebone springs and reservoirs; celebrating the event by a dinner held in a banqueting hall constructed on the arches by which the reservoirs were covered.

The supply of water to the people of London by means of conduits, utilizing local springs, proved insufficient as the Metropolis grew in size. Traces of this obsolete method are preserved in the names of Conduit Street, Lamb's Conduit Street, and Conduit Vale. Towards the close of the sixteenth century, recourse was had to the Thames; and as the main drainage works were then altogether out of the reckoning, the river at London Bridge was deemed a source sufficiently pure for a domestic water supply. This was the beginning of a new order of things, and brought with it what may be called the age of wood. An enterprising Dutchman, named Peter Morrys, having obtained the consent of the Corporation, erected a tidal water-wheel under one of the arches of Old London Bridge, by means of which he worked a force-pump, raising water from the Thames, and driving it through leaden or wooden pipes laid in the streets, whence branch-pipes conveyed water into the houses. This was fairly the germ of the system which now governs the Metropolitan Water Supply. The tidal wheels under London Bridge were increased in number to meet the growing demand, until at last, in 1820, the works at the bridge supplied as much as 26 million hogsheads of water during the year. As the London Bridge water-works came into operation soon after 1582, it is possible that wooden pipes 300 years old are to be found in some parts of the City. But although the supply went as far west as Fleet Street, it is not certain that the Dutchman's wooden pipes extended beyond Temple Bar. When the London Bridge water-works were discontinued, consequent on the pulling down of the old bridge, the New River Company made an equitable arrangement with the proprietors, and absorbed the Dutchman's arrangement into their own. The area served by the New River Company extends along Fleet Street into the Strand; and wooden pipes have been dug up in Fleet Street, apparently continuous with those opposite the new Law Courts.

It was not long after Peter Morrys set up his water-wheels that the New River project was started, in some degree introducing a competing supply. It was a great achievement to bring the pure spring waters from the neighbourhood of Ware, in Hertfordshire, into the reservoirs at Clerkenwell; but it was also felt to be a difficult matter to distribute the water to the various parts of the Metropolis where it was needed. "This was done," says the record of the time, "with all possible diligence, by pipes of elm and lead, but for the most part elm, from which pipes many high streets and lanes within the City are plentifully served." This plentiful serving is exemplified by the circumstance that in 1616, in consideration of a certain sum to be paid yearly, Sir Hugh Myddleton granted to a citizen and his wife a lease for 21 years "of a pipe or quill of $\frac{3}{4}$ -inch bore, for the service of their yard and kitchen by means of two swan-necked cocks." Such a supply as could be obtained through a pipe "of the size of a goose-quill" was that which the King obtained from the Corporation in recognition of the Royal assistance in getting a grant of the water at Marylebone. Perhaps the supply was constant, in which case it would excel the present intermittent system; and, when the water flows continuously, a goose-quill will yield a considerable quantity. In the foregoing lease granted by Hugh Myddleton, the "quill" is specified as being $\frac{3}{4}$ inch in diameter, which shows that the term had a technical meaning when not otherwise expressed.

Some singular relics of the old water supply of London were shown in the International Health Exhibition, at South Kensington, in 1884. The New River Company sent a pail made out of an old wooden pipe dug up in Southampton Row, as also one of the actual pipes. The East London Company threw some light on the manufacture by exhibiting a set of cutters used in boring the wooden mains. These tools were said to be about 100 years old. The Grand Junction Company sent a specimen of a wooden water-main "as formerly in use in the London streets," dug up about seven years previously. The Southwark and Vauxhall Company exhibited some old wooden pipes and stop-valves taken out of the ground in Redcross Street, Southwark, and supposed to have been fixed about the year 1814—a somewhat late period. The West Middlesex Company sent specimens of stone pipes, "as used by the Company until 1807 for supplying the water into the district." The same Company also furnished specimens of the wooden pipes. They abandoned both stone and wood in 1807. Stone was tried as a substitute for wood, in the hope that it would prove less liable to leak. It probably proved the worse of the two, owing to the yielding of the joints under pressure. The West Middlesex Company appear to have entertained considerable hope at one time that stone pipes would answer, judging by the fact that they laid down a quantity in various parts of their district, the diameters ranging from 2 to 12 inches. The Hertford records show that wooden pipes were sometimes strengthened by means of iron hoops. Elm was used at Hertford, as in London; and the process of boring is mentioned. The date of 1814, when the Hertford Corporation resolved on using iron pipes instead of wooden ones, corresponds very closely to the time when the same change took place in London. The necessity of having mains of large diameter, and the general requirement for water at high pressure, would help to render wood an obsolete material. The East London Company laid iron pipes at the commencement of the present century, in lieu of the old wooden ones of the Shadwell and West Ham Companies; the complaint being that the wooden mains "were totally inadequate to withstand the pressure." But the cost of substituting iron for wooden pipes, together with the erection of some powerful pumping machinery, was felt as a heavy burden by the Southwark and Vauxhall Company about half a century ago.

INCORPORATION OF CHELMSFORD.—A movement was set on foot some months ago to obtain a Charter of Incorporation for the town of Chelmsford; and although it was opposed by many of the largest ratepayers, an overwhelming majority of the inhabitant householders was in its favour. In February last the Hon. T. H. W. Pelham held a three days' inquiry into the matter; and on the 15th ult. Mr. Furbank, the chief promoter of the project, received a communication from the Privy Council that the Queen had been pleased to grant the Charter. The event was celebrated in the borough last Wednesday in an enthusiastic manner.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

The Edinburgh and Leith Water Commissioners are earning "golden opinions" on account of their continued reduction of the water-rate. This is the second year in which they have relieved their ratepayers of a half-penny in the pound. This is not done with a view to "cook" the accounts of the Trust before going in for a scheme of extension. Mr. Colston made that clear in his speech yesterday, in moving the adoption of the report. The statement submitted by Mr. Oliver, the Interim Treasurer, showed that for 1888-9 the estimated expenditure was £82,304, and that with a domestic rate of 6½d. per £, a shop rate of 2d. per £, and a public rate of 1d. per £, the receipts would be £82,776. In 1887-8 the estimated expenditure was £82,622; and the amount actually spent was £81,827. The estimated receipts for the year from a domestic rate of 7d. per £ and a shop and public rate of 2d. and 1d. in the £ respectively were £84,510; but the actual receipts amounted to £87,925—thus showing that the receipts for last year exceeded the estimated amount by nearly £3,000, while the actual expenditure was less than the amount obtained from assessments by more than £600.

A proposal having been made that the local gas-works should be taken over by the Corporation of St. Andrews, a correspondent writes to a newspaper calling attention to the cost of gas in 18 Scotch towns of about the same size as St. Andrews. Of these, 5 towns already own the gas-works; and 13 are supplied by Companies. It is interesting, in view of the generally prevalent belief that Corporations supply gas at a cheaper rate than Companies, to find that, in nearly all the instances given, the cost in the case of Corporations is higher than in that of Companies. In the 13 towns supplied by Companies, the average price of gas is 4s. 4½d. per 1000 cubic feet; and in the 5 towns supplied by Corporations, the average price is 4s 8½d.

The Arbroath Gas Corporation had a somewhat excited meeting on Thursday over Mr. Michie's proposal to rescind their former resolution to immediately go on with the extension of the gas-works.* A majority has resolved to carry out the work; but they do not appear to know their own mind, and it is understood that no progress is to be made until after the municipal elections.

On Thursday, in the Bill Chamber of the Court of Session, Lord Fraser had before him a case in which Messrs. S. Clark and Co., Stove Manufacturers, of Park Street, Islington, asked that Mr. W. Bruce Dick, carrying on business under the name of the London Fire Appliance Company, in Buchanan Street, Glasgow, should be interdicted from infringing letters patent, dated Sept. 19, 1881, granted to the complainant for improvements in gas and oil stoves, or apparatus for heating and lighting purposes. In support of the application it was said that the invention had been found to be very useful; and that the stoves manufactured by the complainant to which it had been applied had found a large and ready sale. Until recently they were doing a good business; and they averred that the proceedings complained of had seriously checked their sale and injured their business. They alleged that the respondent was manufacturing and selling in his own name or that of the London Fire Appliance Company, of which he is sole partner, gas and oil stoves, in the construction of which the said patented inventions are used without their authority or licence, and was thus infringing their patent rights. The respondent resisted the application on the ground that the complainant's averments are irrelevant and wanting in specification, and that the letters patent are invalid in respect that the alleged invention, or a material part thereof, is not competently the subject-matter of the grant of letters patent; that the specification does not sufficiently distinguish between what is new and what is old in the invention; that the complainant is not the first and true inventor; and that the invention was publicly known and used prior to the date of his letters patent. He says that the stoves were extensively made and sold by several firms in London and Warrington, and that the complainant Clark was for some time Manager of one of these companies. After debate, Counsel agreed that the respondent should lodge a minute undertaking to keep an account of all sales of the articles in dispute; and in respect of this minute, the Lord Ordinary, upon caution being found by the respondent for all profits arising out of the sales, refused interim interdict, and, as regards the complainant, passed the note without caution.

The Stirling Water Commission on Tuesday were able to announce a reduction of the water-rate by 3d. per £; making a decrease of 6d. per £ within two years.

The Bervie Gas Company have reduced the price of gas 5d. per 1000 cubic feet; making it 8s. 9d., which is still a very high figure.

The Bo'ness Gas Company have contracted with the Police Commissioners to supply gas for the public lamps on 218 nights in the year at the rate of 16s. each for lamps burning to eleven p.m. during the week and twelve p.m. on Saturday nights, and 28s. each for lamps burning all night. This is a reduction of about 1s. 6d. per lamp.

The Keith Gas Company, it is reported, have recently made considerable improvements in their works, and have reduced the price of gas from 7s. 1d. to 6s. 8d. per 1000 cubic feet.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

At a meeting of the Gourrock Burgh Commissioners on Tuesday, it was resolved to reduce the price of gas to private consumers 2½d. per 1000 cubic feet—that is to say, from 4s. 7d. to 4s. 4½d.; and it was at the same time agreed to increase the charge for gas supplied to the public lamps by 3½d. per 1000 feet—from 4s. 1d. to 4s. 4½d.; so that henceforth the price in both cases will be the same. During the year 1874-5 the price to private consumers was 5s. 10d., and for the public lamps 4s. 6d. per 1000 feet. A reduction of 5d. per 1000 feet was made on June 1, 1876, to ordinary consumers; but the charge for public lamps remained unchanged. At the close of the year another reduction of 5d. was conceded to the private consumers; the price being thus brought down to 5s. per 1000 feet—that for the gas consumed in the public lamps still remaining at 4s. 6d. per 1000 feet. These two prices were continued till May, 1882, when 5d. per 1000 cubic feet was taken off in each case; the prices being 4s. 7d. and 4s. 1d. respectively. No further alteration was made in the charges till the reduction in the one case and the increase in the other were made at the last meeting of the Police Commissioners—not even when the gas supply of the town was taken over by the Commissioners on May 31, 1886.

It may be mentioned that Mr. D. M. Nelson, Gas Engineer, of Glasgow, has just been appointed by an eminent firm of foreign merchants to superintend the execution of a very extensive cast-iron pipe contract—no less, it is said, than 200,000 yards of pipes—for gas supply abroad.

The shares of the Partick, Hillhead, and Maryhill Gas Company have this week again been in demand. Business was done in them on the Glasgow Stock Exchange yesterday at 88s. 6d. per £5 share. Mention of this circumstance leads me to state that no further progress has been made with the negotiations for the acquisition of the Company's property on behalf of the Glasgow Corporation Gas Trust. It is but fair to say,

* A report of the discussion is given on p. 556.

however, that the negotiations up to the present have been conducted wholly on the authority of the Gas Committee, and without the official knowledge of the Gas Commissioners generally. The matter is now in the "simmering" stage.

At last Monday's meeting of the Glasgow Town Council, sitting as the Police Authority, there were submitted the minutes of the Watching and Lighting Committee, in which it was recommended that the salary of Mr. Hamilton, Inspector of Lighting, should be increased from £300 to £350 per annum. Ex-Bailie Dickson moved the approval of the minutes, and asked that the Standing Orders should be suspended, so that the recommendation might be agreed to. Mr. Paton said that he did not object to the increase of Mr. Hamilton's salary, but he thought that the usual practice adopted in such cases, of allowing the recommendation to stand over for a fortnight should be followed on this occasion. Bailie McFarlane interposed the Standing Orders. Bailie Gray, who presided (in the absence of the Lord Provost), pointed out that as the Standing Orders had been interposed, the recommendation to increase the salary must stand over till the next fortnightly meeting. It is not anticipated that there will be any difficulty in getting the proposal carried, as it is very generally admitted that Mr. Hamilton has been a most useful, zealous, and efficient public servant. Any person who remembers what the public street lighting was (say) ten or a dozen years ago, and can compare it with the present condition of things, will agree with me in what I have said of the Inspector of Lighting.

The half-yearly meeting of the Dalnair and Old Kilpatrick Gas Company was held last Saturday, when the Directors reported that, after meeting all expenses, they were able to recommend that a dividend of 5 per cent. be declared. The recommendation was agreed to. It is intended to reduce the price of gas 5d. per 1000 cubic feet.

Many readers of these "Notes" will doubtless learn with regret and surprise of the sudden death of Mr. James Boyd, the Manager of the Oban Gas-Works, which took place at his residence last Tuesday morning. After breakfast he was noticed by his daughter to fall back in his chair; his death being almost instantaneous. Dr. McKelvie, who was at once summoned, certified the cause of death to be heart disease. Though slightly ailing for some time, Mr. Boyd had been able to attend to his duties; and the news of his death came upon his numerous friends and acquaintances as a shock. The deceased had been the Manager of the Oban Gas-Works for the long period of 21 years. Being of a most kindly and genial disposition, he made firm friends of all persons with whom he was brought into intimate contact; and his loss will be widely felt. He has left two daughters, for whom much sympathy is expressed.

Prices in the Glasgow pig iron market have fluctuated very much during this week; but the tone has been decidedly firm throughout. In the beginning of the week the market was strong; business being done on Tuesday at 42s. 10³/₄d. per ton for Scotch warrants—the highest price for the past six months; but during the rest of the week the price was irregular, owing partly to operators taking profits and to "bearing." On the following day the price touched 42s. per ton cash; and the close yesterday was 42s. 2d. per ton cash sellers. The price of hematite iron fluctuated during the week between 46s. and 45s. 3³/₄d. per ton, and that of Cleveland iron between 35s. 1d. and 34s. 7d.; both being somewhat better at the close yesterday afternoon.

The coal trade continues active in all its departments; and the improved feeling in the trade is stimulating production in several directions. Prices are firming up; and an advance of 1s. per ton is expected on house coal within the next week or two.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Sept. 22.

Sulphate of Ammonia.—Business was done at the beginning of the week at £11 6s. 3d., f.o.b. Hull; but, in consequence of a good French inquiry, £11 7s. 6d. has since been readily paid for spot parcels, and at the close there are still buyers thereat. It is evident that the fine harvest weather has cheered the spirits of consumers; and that the orders, at any rate as far as France is concerned, have come in more freely than was expected. The present demand, however, will hardly make up for the shortcomings in respect to the exports to that country during this year. Germany and Belgium, most strangely do not appear to move much as regards present delivery; but, on the other hand, the inquiries from these countries for spring delivery are active. Little business passing, however, owing to the difference between the buyers and sellers. It is difficult to gauge the market at present; but should the present bright weather continue to prevail, it will retard the increase of the liquor supply which usually occurs on the approach of October.

LONDON, Sept. 22.

Tar Products are in better demand, and firm in price. There is no great activity in benzols; but last week's prices are maintained. Anthracene, creosote, and pitch are all in good request, at improving prices. Prices may be taken as follows:—Tar, according to position, 17s. 6d. to 22s. 6d. per ton. Benzol, 90 per cent., 8s. per gallon; 50 per cent., 2s. 4³/₄d. Toluol, 1s. 9d. per gallon. Solvent naphtha, 1s. 2d. per gallon. Crude naphtha, 30 per cent., 1s. per gallon. Light oil, 3d. per gallon. Creosote, 2d. per gallon. Pitch, 12s. to 13s. 6d. per ton. Carbolic acid (crude), 3s. 4d. per gallon. Cresylic acid, 9d. per gallon. Tar salts, 15s. per ton. Anthracene, 30 per cent., "A" quality, 1s. 6d. per unit; "B" quality, 1s. 3d. per unit.

Ammonia Products.—Sulphate is recovering from the lower prices of a few days ago, and is quoted at £11 7s. 6d. to £11 10s., less discount. Other products are as follows:—Gas liquor (5° Twaddell), 7s. 6d. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 1¹/₂d. per lb. Carbonate of ammonia, 3³/₄d. per lb. Muriate of ammonia, brown, £18 per ton; white, £27. Sal-ammoniac, £30 per ton.

[From the Chemical Trade Journal, Sept. 22.]

Sulphate of Ammonia.—The market is very dull; and dealers appear to be the only buyers at the moment. It is, however, rumoured that Hull business has been done at £11 6s. 3d. for prompt, which buyers are willing to pay; and there are several sellers at this price. There is a very large inquiry for spring delivery, which bodes well for the future, but makers decline to sell far ahead at the present prices, and even speculators do not seem inclined to commit themselves to any large transactions. Loth and Beekton prices may be taken as £11 5s.; while outside London makes are value for £11 8s. 9d.

Tar Products.—Benzols remain without change; and the prices quoted for last week—viz., 2s. 10d. to 3s. for 90's and 2s. 4d. for 50.90's—may be taken as about the figure for to-day. The demand still continues good for solvent naphtha at old rates; while creosote is, if anything, a shade firmer than before. Anthracene is still firm at 1s. 6d. for "A" quality, London; the value for "B" being as before, 1s. 2d. There is a very fair demand for pitch; and some considerable quantity of accumulated stocks has been moved off during the last month or so. With the single exception of benzol, which is, in spite of the maintenance of price, in an unhealthy state, the tar products market may be said to be in a satisfactory position; and so long as benzol prices are artificially inflated,

distillers may reckon on a fair margin of profit, even on the basis upon which many recent tar contracts have been secured.

SALE OF SHARES IN THE UXBRIDGE GAS COMPANY.—Last Thursday: Messrs. Morten and Sons sold by auction, at Uxbridge, a number of £10 shares in the Uxbridge and Hillingdon Gas Company. The sale included 21 original shares, paying 10 per cent. per annum; 9 of the 1861 shares, paying 7¹/₂ per cent.; and 19 of the shares of 1873, paying 7 per cent. The biddings for the last began at £10, and the first lot of two shares was sold at £12 10s. each; but others fetched as much as £13 15s., £14, and £14 5s. The shares of 1861 fetched from £14 10s. to £14 15s.; and the original shares went at £13 10s. each.

LAUNCESTON (TASMANIA) GAS COMPANY.—The Directors of this Company report that the business in the half year ending June 30 last made satisfactory progress. New consumers were supplied, and the use of gas was extended. In order to keep pace with the increasing demand, mains of larger size were put down in various parts of the town, whereby the supply was greatly improved. The coal and cannel carbonized during the six months covered by the report amounted to 2244 tons; the quantity of gas produced being 24 million cubic feet. The Directors recommended a dividend at the rate of 12 per cent. per annum, and this was declared; an interim payment of 5¹/₂ per cent. having been made in February last. The amount now standing to the credit of the profit and loss account is £3449 16s. The Directors announce a further reduction in the price of gas, from June 1 next, to 7s. 1d. per 1000 cubic feet. The Company's Engineer is Mr. T. S. Clemenshaw.

NORTHERN COAL TRADE.—In the steam coal branch of the Northern coal trade there is still a fair amount of business; but the prices continue low—about 7s. 6d. for best Northumbrian qualities. The demand shows some signs of flagging; but it will possibly flicker up again before the closing of the Baltic ports. In the gas coal trade there is great animation; and the tendency of some of the miners to restrict the output will increase the scarcity which is beginning to be felt for this class of coal. Tenders are asked for the supply for the Darlington Gas-Works; and it is expected that higher prices will have to be paid than on the last occasion. There is still a large demand for gas coal for export; and the growth of the British demand is now felt every week regularly. The price of gas coals is maintained. Manufacturing coal is also much dearer—possibly about 6d. per ton; and the activity at many of the factories causes a growing inquiry for this class of coal. Household coal is depressed by the finer weather. Coke is brisk, and sells at higher figures.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST. (For Stock Market Intelligence, see ante, p. 543.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			P. C.					£ s. d.
GAS COMPANIES.								
590,000	10	12 Apr.	10 ³ / ₄	Alliance & Dublin 10 p. o.	10	18 ¹ / ₂ —19 ¹ / ₂	..	5 7 8
100,000	10	"	7 ¹ / ₂	Do. 7 p. c.	10	13—14	..	5 7 1
900,000	100	2 July	5	Australian (Sydney) 5% Deb.	100	110—112	..	4 9 8
100,000	20	30 May	10	Bahia, Limited	20	23—25	..	8 0 0
200,000	5	11 May	7 ¹ / ₂	Bombay, Limited	5	7 ¹ / ₂ —7 ³ / ₄	+ ¹ / ₂	14 5 8
40,000	5	"	7 ¹ / ₂	Do. New	4	5 ¹ / ₂ —5 ³ / ₄	+ ¹ / ₂	5 4 2
380,000	Stock.	29 Aug.	11 ¹ / ₂	Brentford Consolidated . . .	100	220—225	..	5 4 5
110,000	"	"	8 ¹ / ₂	Do. New	100	161—166	..	5 5 5
220,000	20	19 Sept.	10 ³ / ₄	Brighton & Hove, Original .	20	43—45	..	4 13 4
320,000	20	12 Apr.	11 ¹ / ₂	British	20	46—48	..	4 13 9
50,000	10	19 Sept.	11	Bromley, Ordinary 10 p. c.	10	19—21	..	5 4 9
39,000	10	"	8	Do. 7 p. c.	10	13—14	..	5 14 8
828,750	10	30 May	8	Buenos Ayres (New) Limited	10	14 ¹ / ₂ —15 ¹ / ₂	..	5 3 2
200,000	100	2 July	6	Do. 6 p. c. Deb.	100	109—111	..	5 8 1
150,000	20	10 Aug.	7	Cagliari, Limited	20	25—27	..	5 3 9
550,000	Stock.	12 Apr.	13 ¹ / ₂	Commercial, Old Stock . . .	100	279—278	..	4 13 11
130,000	"	"	10 ¹ / ₂	Do. New do.	100	214—219	..	4 13 2
121,234	"	28 June	4 ¹ / ₂	Do. 4 ¹ / ₂ p. c. Deb. do.	100	123—128	..	3 10 5
557,320	20	14 June	12	Continental Union, Limited	20	45—46	..	5 4 4
242,683	20	"	12	Do. New '69 & '72	14	30—31	..	5 8 1
200,000	20	"	9	Do. 7 p. c. Prefr.	20	38—38	+1	4 14 8
75,000	Stock.	28 Mar.	10	Crystal Palace District . . .	100	205—215	..	4 13 0
284,063	10	27 July	13	European, Limited	10	25 ¹ / ₂ —26 ¹ / ₂	..	4 18 1
120,000	10	"	13	Do. New	7 ¹ / ₂	18 ¹ / ₂ —19 ¹ / ₂	..	5 0 0
354,060	10	"	13	Do. do.	5	12 ¹ / ₂ —13 ¹ / ₂	..	4 16 3
5,468,000	Stock.	29 Aug.	13	Gaslight & Coke, A Ordinary	100	251—255	-1	5 1 11
100,000	"	"	4	Do. B, 4 p. c. max.	100	98—103	..	3 17 8
665,000	"	"	10	Do. C, D, & E, 10 p. c. Pf.	100	260—265	..	3 15 6
30,000	"	"	5	Do. F, 5 p. c. Prf.	100	125—130	..	3 16 11
60,000	"	"	7 ¹ / ₂	Do. G, 7 ¹ / ₂ p. c. do.	100	187—187	..	4 0 2
1,300,000	"	"	7	Do. H, 7 p. c. max.	100	187—172	..	4 1 4
463,000	"	"	10	Do. J, 10 p. c. Prf.	100	258—263	..	3 16 1
1,061,150	"	14 June	4	Do. 4 p. c. Deb. Stk.	100	120—123	..	3 5 0
294,850	"	"	4 ¹ / ₂	Do. 4 ¹ / ₂ p. c. do.	100	125—130	..	3 9 8
650,000	"	"	6	Do. 6 p. c. do.	100	175—175	..	3 7 5
9,000,000	Stock.	11 May.	10	Imperial Continental . . .	100	209—212	+1	4 14 4
75,000	5	14 June	6	Malta & Mediterranean, Ltd	5	5 ¹ / ₂ —5 ³ / ₄	..	5 9 1
500,000	100	3 Apr.	5	Met. of Melbourne, 5 p. c. Deb.	100	114—116	..	4 6 2
541,920	20	14 June	6	Monte Video, Limited . . .	20	20—21	..	5 14 8
150,000	5	30 May	7	Oriental, Limited	5	9 ¹ / ₂ —9 ¹ / ₂	..	5 3 7
60,000	5	28 Mar.	10	Ottoman, Limited	5	6—7	..	5 0 0
People's Gas of Chicago—								
420,000	100	2 May	6	1st Mtg. Bds.	100	107—110	..	5 9 1
500,000	100	1 June	6	2nd Do.	100	95—100	..	6 0 0
100,000	10	26 Apr.	10	San Paulo, Limited	10	16—17	..	5 17 8
500,000	Stock.	29 Aug.	15 ¹ / ₂	South Metropolitan, A Stock	100	306—311	..	4 19 8
1,350,000	"	"	13	Do. B do.	100	241—245	-2	4 17 11
141,600	"	"	13	Do. G do.	100	245—255	..	5 1 11
550,000	"	23 June	5	Do. 5 p. c. Deb. Stk.	100	135—140	..	3 11 5
60,000	5	29 Aug.	11	Tottenham & Edm'ton, Orig.	5	11—13	..	4 4 0
* Ex div								
WATER COMPANIES.								
717,467	Stock.	28 June	9	Chelsea, Ordinary	100	260—265	..	3 7 11
1,720,560	Stock.	12 Apr.	7	East London, Ordinary . . .	100	197—202	..	3 9 4
700,000	50	11 June	9	Grand Junction	50	124—128	..	3 10 4
708,000	Stock.	10 Aug.	10 ³ / ₄	Kent	100	270—275	..	3 16 4
1,043,800	100	28 June	9	Lambeth, 10 p. o. max.	100	261—266	+1	3 7 8
406,200	100	"	7 ¹ / ₂	Do. 7 ¹ / ₂ p. c. max.	100	204—209	..	3 11 9
200,000	Stock.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	118—122	..	3 5 7
500,000	100	27 July	12 ¹ / ₂	New River, New Shares . . .	100	349—354	+2	3 8 6
1,000,000	Stock.	"	4	Do. 4 p. c. Deb. Stk.	100	124—128	..	3 2 6
902,300	Stock.	14 June	6	S'hwk & V'shall, 10 p. c. max.	100	166—171	+1	3 10 2
126,500	100	"	6	Do. 7 ¹ / ₂ p. c. do.	100	157—162	..	3 14 1
1,155,066	Stock.	11 June	10	West Middlesex	100	265—270	+1	3 14 1

† Next dividend will be at this rate.

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THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 2, 1888.

OIL-GAS FUEL SCHEMES.

If another confirmation were wanted, the truth that history repeats itself would be enforced by what is at present passing in respect of the revival of interest in oil-gas processes. For some years, while electricians were "making ducks and drakes" of other people's money, all kinds of illuminating and heating gases were popularly supposed to be on the verge of extinction. Now however, the tide has turned; and when one takes up a technical periodical published in the land of Edison, Brush, and Westinghouse, where the rashest speculation in manufacturing methods seems to rule triumphant, it is not a new electric lighting, but a novel gas-making scheme that calls weekly for favourable notice. In the ordinary way we are compelled to take account of the contents of the leading American engineering journals, in order to learn what is going on in the country whence the historical electric light "scare" was imported; and it is a striking fact that for some time past these publications have had little to say about electric lighting, but have been filled with descriptions of oil-gas schemes. The reason is obvious. Natural gas, while still maintaining its position in Pittsburgh and other places, has done its pioneering work. The natural gasiform fuel, which was once a wonder of the world, has been tamed and brought into the service of mankind. No longer

roaring aloud to heaven without purpose, as it issued tumultuously and uselessly as a volcanic eruption from the well sunk in vain search for oil or brine, flinging its flames aimlessly down the wind, a wonder to gaping witnesses, natural gas has been captured and enclosed in pipes. At first almost given away to anybody who would undertake to show how it might be utilized in place of solid fuel, natural gas has now found its value, like every other useful thing in the world; and the dreams of manufacturers who thought to obtain fuel in this shape for nothing have been rudely broken. Natural gas must now be paid for at rates approximating to its fuel value as compared with coal. The consequence of the long experiments that have been made with it, however, while it could be had for the asking, in connection with a variety of manufactures, is that artificers who have once grown used to it do not relish the idea of returning to coal. The raising of rates for natural gas in some localities, and the indications in others that this remarkable production of natural forces is not likely to prove permanently available, have inspired engineers with a desire to discover a substitute for it. Hence the popularity of oil-gas fuel schemes, not one of which would have been looked at a second time if natural gas had not prepared the field for them. The wastefulness with which natural gas was at first used in the arts, and for domestic purposes, was a preparation for the more economical methods required for dealing with a manufactured fuel of the same order. If natural gas had always been dear and scarce, or if even the most moderate degree of care in the use of it had been essential for its success as a fuel, it would not have ousted coal from its traditional place. Apparently as free and boundless as sunshine, however, natural gas conquered all prejudice against such a strange form of fuel, and won its way with the most obstinate puddlers, glass melters, and steam users of its native region. This stage was necessary. If any British Gas Company could afford to promise the inhabitants of their district a free and unrestricted supply of gas for lighting, heating, and developing power for a year, they would be able to secure a greatly increased rental for the following year; because gas, once adopted, would in very many cases be retained. So it has been with natural gas. By the very prodigality of its occurrence it won favour, which has been retained in spite of the return of economical considerations.

Therefore, the transition from natural gas to be had for nothing to natural gas that must be paid for at its comparative fuel value, is not more reasonable than the appearance of manufactured fuel gases of various descriptions to compete with the natural fuel in its latter days. As one of the American technical journals puts it: "Manufacturers have so fully appreciated the value of a gaseous fuel, that a recurrence to coal is 'out of the question—it is now a choice of gases.'" Consequently, a variety of gas-making processes, naturally enough depending upon crude petroleum as the raw material, are coming forward on all sides; and nobody seems to reflect that not one of them is entitled to be called new. It is as though the novelty of the demand for something of the kind covered the supply. This ignorance of what has been done in their own country in the way of producing gas from oil is only what might be expected of the writers in the ordinary American newspapers; but we have looked in vain for any trustworthy statement upon the subject from experts worthy of respect. Week by week gas-making processes, dubbed by strange proprietary titles, are described and warmly recommended by newspaper writers, who assure their readers that every one in turn is the solution of the problem that everybody has been looking for; and nobody attempts to instruct the public concerning the rights of the subject. There is never anything new in these devices. They all rest upon the gasification of petroleum in tubular retorts, and the dilution of the products with heated steam or air, or both—a notion as old as the hills. We take the contents of a single advertisement page of the *American Manufacturer*, and herein we find no less than five oil-gas processes offered to the bewildered inquirer. There is the "Brooks" process, recommended to Gas Companies for competition with electric light, and to manufacturers as a substitute for natural gas. Then there is the "Eureka" process, the name of which is almost enough to condemn it, but which is stated to be cheaper than natural gas. Next comes the "Loomis" process, claimed to be the "cheapest" gas-generating system in the world." This is a generator system, using coal however; and it therefore scarcely comes within our present notice. The "Naysmith" process is an example very much to the point; the gas being advertised as

"made from oil, steam, and air, and costs less than natural gas." Last comes the North-West Gas Improvement Company, licensees of Dr. J. J. Johnston's process of manufacturing gas from crude oil at "less than the ordinary cost of natural gas. Illuminating gas at 4 cents per 1000 cubic feet." We take the occasion for declaring that there is nothing in any of these advertised oil-gas processes that they should be distinguished by any man's name. A small iron retort, a barrel of oil, a furnace, and the necessary pipe connections, are all that is needed to make gas as good as can be produced by the best of them; and the gas when manufactured can be diluted to taste with steam or air. There is nothing proprietary in all this. Neither is there any limit to the bulk of "gas" that can be made from a given quantity of oil and steam or air, on the homœopathic principle that the more the dose is diluted the more effective will it become. The only possible difference there is between the new oil fuel gases that are recommended as substitutes for natural gas and the illuminating oil gases that were tried and abandoned years ago is the very small one that the former are more diluted than the latter. Are they really worth anything, however? That is the question for the public. We answer roundly in the negative. The various patterns of apparatus, by whatsoever name known, are only calculated to deceive purchasers at first, and to be consigned to the waste heap after a short and troublesome existence.

It is very easy to support this statement with reasons well known to everyone who has essayed the delusive experiment of making gas from petroleum in closed retorts. Half of the raw material is deposited in the form of carbon on the interior surfaces of the retorts, where it acts as a non-conductor of heat; clogging the retorts and preventing gasification even while the outside temperature is increased to the melting point of the iron. Frequent cleaning is necessary, or gas making cannot be continued. Then it is impossible to continuously superheat steam—to the point, that is to say, when it will not condense again—in closed iron pipes. The metal quickly oxidizes, or the steam passes unaffected. As to the utility of introducing air into the gas, while in course of production, it is no more competent to form gas than it is if mixed with the hydrocarbons in an atmospheric burner at the point of ignition. The only means by which steam and air can be made instrumental in producing a real gas is in open converters such as are employed in water-gas processes. Everything else, in the character of retort, superheater, or what not, is a delusion. If natural gas is to be replaced by a manufactured gaseous fuel, this must be made in generators or producers, resembling nothing which enters into the scheme of the crude oil processes under examination.

We have been thus particular in exposing the futility of these oil-gas schemes, not wholly in the interest of the American manufacturers to whom they are in the first place addressed, and who are not likely to be deceived by them to any notable extent, although strongly recommended by their own technical organs. It is quite possible, however, that, like "Lawrence" gas and other similar revivals of exploded delusions, a few of them may cross the Atlantic, and receive the *imprimatur* of some of those lights of English science who are always open to sell certificates of character for any scheme that is sufficiently strongly supported in the City. We notice the rise of this movement in favour of oil gas for fuel in order that, if such development should be in store for it, our readers may not be taken by surprise.

THE ACCOUNTS OF THE COMMERCIAL GAS COMPANY.

The report of the Directors and the statement of accounts of the Commercial Gas Company for the six months ended June 30 last have been issued, in view of the half-yearly general meeting which is to be held next Friday. Before dealing with the matter of the report and accounts, we may be permitted to express the satisfaction with which we notice that they are still signed by Mr. R. Bradshaw, as Chairman; and we hope that Mr. Bradshaw's health is sufficiently restored to enable him to assume the chair as usual at the meeting. The report is the baldest statement of the chief figures of the accounts. It recites that there has been a net profit of £52,166 on the half-year's working of the undertaking; making, with £1044 received for interest, a gross sum of £53,210, which the undivided balance brought forward swells to £97,293, as the amount from which the dividend and other charges may be taken. Deducting interest on debenture stock, there remains a balance of £94,565, of which £44,800 is available for division. The handsome dividends

already announced, of £13 15s. per cent. upon the old, and £10 15s. per cent. upon the new stock of the Company, are then recommended. The report says absolutely nothing respecting the condition of the Company's business; and one is left to find out whether the consumption of gas in the district, or any other of the circumstances of the undertaking, show improvement, stagnation, or decline. Twelve months ago the accounts for the corresponding period of 1887 showed a net profit of £43,008; so that there has been a great improvement in this respect—the price of gas having been the same. In the present accounts, gas-rental stands at £116,947, as against £112,176 a year ago. Residuals also are returned at £37,523, as compared with £34,533. The gross revenue, therefore, shows an improvement of £7755. On the other side of the account, coals have cost £57,694, as against £59,009, which is very satisfactory economy. The manufacture of gas altogether cost the Company £85,972, instead of £87,496. Distribution is a little more, but some of the other charges show a slight diminution; so that altogether the expenditure has been reduced from £106,545 to £105,141. For this, 96,080 tons of coals were carbonized, including 3426 tons of cannel; as compared with 95,063 tons of coals, including 3638 tons of cannel, for the first half of 1887. The cannel shows a slight decrease, but we cannot help thinking that there is still plenty of room for improvement in this respect. The gas sold amounted to 918,668,000 cubic feet, or an increase of 4.53 per cent., which cannot but be regarded as remarkably good. It is a long time since the Company had so large an increase; and we trust it is a good sign both for the future of the undertaking and the prosperity of that part of London in which its business lies. Meteorological influences may have had something to do with the sudden expansion of the consumption of gas within the Company's district, which we have on a previous occasion described as being within a ring fence. After all has been said upon this score, however, it remains open to remark that trade in the East-end of London cannot be in a very bad way when the consumption of gas shows this strong growth. From all this it will be seen that the proprietors of the Commercial Company have every reason to be satisfied with the condition and prospects of their property; and they will be able to pass the high rate of dividend recommended by the Board with the comfortable feeling that it has been well earned.

THE EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

An Eastern Counties Association of Gas Managers was founded last Wednesday at Peterborough; thus crowning with a well-deserved success the public-spirited endeavours of Mr. Wimbhurst, of Sleaford, who, with Mr. J. Barton, of Peterborough, and Mr. J. Carter, of Lincoln, undertook and performed with much address the troublesome preliminary work required for the establishment of such an organization. Mr. Wimbhurst and his colleagues issued a circular-letter to gas managers resident in the district to be covered by the proposed Association; and although they only received 24 entirely favourable replies, they decided—and it is to be hoped wisely—that this was a sufficient basis upon which to start the society. It is, of course, impossible to forecast the career of the institution which was created in such a hopeful spirit last week; but we are at least free to assert that its beginnings have been as promising as the most sanguine of founders could desire. Mr. Barton, in the remarks (reported elsewhere) which he made respecting the desirability of an Association for the district, struck the right chord; and he was well supported by Mr. Wimbhurst, who formally moved, in singularly frank and appropriate terms, the resolution in favour of founding such an Association. The rules of the new body are closely modelled upon those of the Midland Association; and, by what may be regarded as the fundamental law of its existence, it is enacted that "the Association shall consist of 'Engineers, Managers, or Secretaries exclusively engaged 'upon gas-works, in the service of Gas Companies or Local 'Authorities.'" Thus there is to be only one order of members, and from this traders—and, in short, all the outside world, as the Secretary put it—are to be excluded. The style in which the formal work of passing rules and choosing the first office-bearers was performed, augurs well for the future of the Association. Mr. W. Barratt, of Grantham, was elected first President; and there can be no doubt that the choice is a thoroughly judicious one. It will not be Mr. Barratt's fault if the roll of members is not greatly lengthened before he quits the chair. The first ordinary meeting is to be held on the third Wednesday in March next, at Grantham; and thenceforward there will be

two meetings a year, in March and September. It is wise not to overburden the young organization with too frequent meetings, especially as the towns from which its members hail are scattered over a wide expanse of country, and each gathering will mean practically a day's work for the majority. It is gratifying to know that the suggestion on the vexed subject of papers for these District Association meetings, which we offered in last week's JOURNAL, has been well received by some of the founders of the new society. It is to be hoped, of course, that the Secretary will be able to obtain a fair supply of papers for some at least of the meetings; but it is very certain that it would be found a mistake to rely so exclusively upon formal papers that the occasional paucity of this kind of attraction to the meetings could be regarded as depriving them of all interest. We wish the new Association all possible success, and trust it may prove an influence for good in the district over which that influence will extend.

AFFAIRS AT HALIFAX.

MATTERS at Halifax seem to be ripening, and by this time next week the local public ought to be in possession of something definite in connection with the so-called "scandal" that has vaguely excited them for the past three months. Mr. W. Carr left the service of the Corporation on Saturday last; and to-morrow the Mayor is to lay before the Town Council the terms of the undertaking which has been arranged between himself, as representing the Corporation, and Mr. T. K. Fox. It has taken a long time to settle the provisions of this interesting document, the purport of which we publish elsewhere, together with other information relating to the development of this extraordinary business. As we have already remarked, Mr. Carr's "strategic movement to "the rear" has left the Mayor and his advisers pretty much as they were; since it throws upon them the responsibility of taking action. It has had the good effect of bringing the sense of this responsibility home to them, however, as we learn that the Mayor is fully determined to take steps to clear up the matter, either in his official capacity or as a private citizen. This is as it should be; for the one solicitude of honest men in and out of Halifax at the present juncture must be that right should be done. Meanwhile, we do not mean to depart from the attitude of strictest reserve which we have taken up in regard to the merits of the affair, until the verdict of a competent final tribunal has been placed upon record. This determination, however—which is, after all, no more than the course pointed out by the sense of common justice as between man and man—will not prevent our expressing freely an opinion upon the methods by which the development of this business may be forced forward. Up to the present time there has been little to give satisfaction in the conduct of most of the parties concerned. Some allowance must, of course, be made for town councillors placed in such a delicate position as that occupied for some time past, while these matters have been coming to a head, by the members of the Halifax Corporation. Hounded on by public clamour to "do something," uncertain what course to adopt, doubtless agitated by opinions which they dare not openly avow, and some perhaps uneasily conscious through it all of the near approach of the November elections, the distracted town councillors have been beset with difficulties to which all their political troubles and vexations of ordinary times must seem like child's play in comparison. But they may be certain of one thing, which is that public opinion outside as well as in the town looks to them to remove this shadow upon the fair name of their corporate organism, and that speedily, lest those now free from blame fall under the same reproach.

We are pleased to learn that Mr. Alderman Wood, Chairman of the Gas Committee of the Leicester Corporation, has been unanimously selected by his colleagues on the Council for nomination for the office of Mayor at the forthcoming election. Mr. Wood is by no means the senior member of the Council—his first election only dating back to 1880; but he has exhibited such conspicuous ability in all his municipal work, that he has made himself specially worthy of selection to fill the highest office in the borough. His choice was, however, influenced to a very large extent by his success as Chairman of the Gas Committee. In the supervision of the gas undertaking he has displayed ability and energy that command cordial recognition; and when to these qualities are added the remarkable regularity and tact with which he discharges his duties, it will be acknowledged that the decision of the Council has been a wise one. Mr. Wood's interest in gas matters is by no means confined to the undertaking with which he is immediately concerned; and to all connected with the gas industry, and especially to gas engineers and managers, he has always shown himself to be a staunch friend.

Water and Sanitary Affairs.

THE eighth annual issue of the valuable "Analysis" in which Mr. Alfred Lass deals with the accounts of the Metropolitan Water Companies, has just been issued. The completeness and accuracy of this important work render it all that could be desired, as showing the position of the Companies in regard to their finances and their operations. The figures are vast, and bear witness to the energy with which the water supply of the Metropolis is administered. If we go back to the first year of Mr. Lass's "Analysis," we find the London Water Companies furnishing a supply to a population of less than four-and-a-half millions. This now becomes very nearly a million more. The volume of water has risen in the meantime, from an average of rather more than 142 million gallons per day to nearly 164 millions. The constant supply is now given to more than 372,000 houses, in place of less than 161,000. The capital, which was £12,690,000, is now £14,350,000; but economy has been so well practised that the amount per 1000 gallons has become 57·66d., instead of 58·60d. Rates and taxes, exclusive of income-tax, have made a sensible advance—rising from about £90,000 to £142,000. The cost of filtration is nearly doubled; while pumping shows a moderate rise. The net profit per 1000 gallons displays no very great advance; being 3·68d., as compared with 3·51d. Comparisons of this kind may be pursued to almost any extent, and will serve to throw light on many questions connected with the progress of the London Water Supply. Taken by itself, apart from any comparison, the present issue affords a fund of particulars which may be of special use to the new body which is about to take the reins of local government in the Metropolis. How soon the members of the County Council of London will turn their attention to the Metropolitan Water Companies, is of course problematical; but when they choose to enter on the subject, they will do well to study the tables of Mr. Lass. The responsibilities and troubles of the Companies are also indicated by the presence of two Acts of Parliament at the close of the book; the latest being that which is designed to "limit the powers of the Water Companies" in cutting off the supply when they cannot get their money. As in the former issues, the legal position of the Companies is shown, with regard to their rates of supply and other matters; quotations being made from their Special Acts. The statutory powers as to dividends are given, as set forth by Sir John Lambert. Information is thus at hand for the private consumer, as well as for those who take an interest in the Metropolitan Water Question on public grounds.

MESSRS. H. AND C. DAVIS AND Co., of the Metropolitan Gas-Stove and Engineering Works, Camberwell, have opened new show-rooms at No. 59, Queen Victoria Street, E.C.

IN *La Semaine des Constructeurs* there is published a recipe for preserving cast iron from rust while giving it a pleasing surface. The casting is to be thoroughly cleaned, and then washed in dilute acid. When dry the surface is to be well rubbed with a metallic brush or a file, and then painted several coats with raw (crude?) petroleum; care being taken to let each coat dry thoroughly before the next is applied. When the last coat is dry, it is to be well rubbed with a stiff hair brush, and the result will be a beautiful dull polish that will resist a high degree of heat, and will not be attacked by rust. The polish may be indefinitely preserved and improved by the occasional application of a single coat of petroleum followed by brushing, exactly as in the ordinary course of black-leading. If there is any value in this process, it ought to supersede the objectionable Berlin blacking for stoves of all kinds.

THE latest speculation in the way of distributing heat and power from a central station is the venture of the National (American) Superheated Water Company, in the city of Boston, Massachusetts. The partial success of the American steam-heating companies has been the incentive to this new departure; but it is claimed that the distribution of heat by means of hot water is more economical than steam. Supposing that it is desired to maintain a coil at a temperature of 350° Fahr., by means of water at 400° Fahr., and that a cubic foot of water, weighing at this temperature 58·63 lbs., is introduced into the coil for this purpose, in cooling down through 50° this water will liberate $54·63 \times 50 \times 1·0174 = 2728$ units of heat. The circulation of a cubic foot of water requires as much time as 9·87 cubic feet of steam. The isothermic volumes having the ratio of 1:13·7, and the ratio of velocities being 1:9·87, it follows that the consumption of steam must be 1·35 times that of water in order to produce the same effect. The mechanical work gives the final measure of the expenditure caused by the flow of a fluid; and it varies according to the cube of the velocity of the circulation of the fluid. If, therefore, the values 1 and 1·35 are cubed, we obtain, for the distribution of equal quantities of heat, a relative expenditure of 1:2·5 for water and steam.

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(FOR STOCK AND SHARE LIST, see p. 604.)

PRICES have fluctuated in most markets during the past week; the expectation of dearer money being the forcing-down factor. The Bank Directors made no change in the rate on Thursday; but money is in strong demand, and gold is being steadily drawn away, so that the Directors may be compelled to put the rate up this week. Business on the Stock Exchange has been pretty brisk; but the adjustment of an unusually heavy settlement has engrossed most attention. In the Gas Department there has been about the same degree of activity as the week before. Taking the Metropolitan Companies first, the leading feature has been the continued weakness of Gaslight "A." The stock was not dealt in at all on Monday; but on Tuesday the opening mark was 253. From this point it fell away gradually, till on Saturday it was done at 249½—the quotation showing a drop of 2. Electrical influences are probably the cause of this; and if the gas "bears" can manage it, we may perhaps soon have another run against the stocks. If so, the wise man will keep cool and watch his opportunity to buy. The "B" is 2 higher, and now stands at a far higher relative price than the "G"—the anomaly of which we have pointed out before. South Metropolitans have hardly been touched; two or three transactions, at moderate figures, being all. The same may be said of Commercial. The Directors' report and accounts were to hand on Saturday, and were found to be quite as satisfactory as had been anticipated, if not even more so. The market quotation, however, was not affected. The Foreign Companies have been stronger than the Home. Imperial Continental has been in good demand and very active; and the price has risen 1 more. Buenos Ayres debentures are also in increasing favour, and improved a point. All stocks marked *ex div.* show out better on adjustment of quotation. The Water Companies were more active in the earlier part of the week; but they quieted down later on. Prices have been well sustained, but have not advanced.

The daily operations were: Only moderate business in Gas on Monday; and prices did not run more than up to average. Buenos Ayres debenture, however, rose 1. Good business in Water, at firm figures. Gas was rather more active on Tuesday, but showed no particular strength. Gaslight "B" advanced 2. Water business was quieter. On Wednesday, dealings in Gaslight "A" were the bulk of the business in gas. Weakness was apparent; and the quotations fell 1. Business in Water was next to nothing. On Thursday, Imperial Continental was most favoured; and it rose 1. Other issues presented nothing remarkable. A few transactions in East London, and one in Lambeth, comprised the Water business. On Friday, there were a few dealings in Gaslight "A," at moderate prices; but better figures were obtained for some of the secured issues. Very little else was dealt in. In Water, the only transaction was one in New River. On Saturday, Gaslight "A" showed further weakness; and the quotation fell 1. Nothing at all was done in Water.

ELECTRIC LIGHTING MEMORANDA.

THE AFFAIRS OF THE MAXIM-WESTON COMPANY—MR. GEORGE OFFOR AND HIS INTERVIEWERS—A GLOWING PICTURE.

THE Directors of the Maxim-Weston Electric Company, Limited, have issued a statement of the affairs of the Company for the information of the hardly-used shareholders, in which (as published in the *Financial News*) some very peculiar things are said about the behaviour of the late Chairman and Managing Director, Mr. Hugh Watt, M.P. The present Board have only been in office a short period; but have seen enough of the Company's business to know that the position of the concern is very different from what it was represented to be in Mr. Watt's time. The assets, according to the report of the firm of accountants employed to investigate the books, appear to amount to £81,997; but of this no less than £40,737 is for patents. No provision had been made for the gradual extinction of this item, which, in the accountants' opinion ought to be depreciated at the rate of at least £2500 a year. Then it appears that there is a lot of the Company's manufactured goods in the hands of agents, very little having been sold; but credit in full has been taken in the books for it all, as though the value was so much actual book debts. Altogether, the report of the accountants as given abundantly bears out their conclusion that "the results of the trading have not been truly stated in the past, by reason of the non-provision for bad debts, and by the over-valuation of the stocks." The new Directors claim to have reduced the management expenses by £1000 a year; and they express the opinion that, notwithstanding the present unsatisfactory position of the Company, "with honest and attentive management, a good and profitable business may be carried on." To do this, however, sufficient working capital must be found to replace the money muddled away in the past. The question is whether anybody has sufficient confidence in the concern to advance the necessary funds to keep it going. The experience of the shareholders has been a bitter one; and it is no relief to them to know that they are only a few among the many confiding investors who have reason to repent having put their money into electric lights. It should be noted that Mr. Watt denies the accuracy of the statement published in the *Financial News*, so far as it relates to him; and his solicitors have written to that newspaper to state that the questions between

him and the Company "are about becoming the subject of proceedings in a Court of Law." Said we not rightly some time ago that electricians cannot keep out of the Law Courts, and can always find money for litigation if for nothing else?

Mr. George Offor seems to have lately succeeded to the office of peripatetic advertiser of electric lighting, *vice* Mr. Robert Hammond, compulsorily retired. Mr. Offor has profited by the experience of his predecessor, and goes to work in a more economical way. Instead of carting about the furniture for a drawing-room, and arranging these effective but costly "properties" in lecture-halls hired for the purpose of carrying on the electric light propaganda, Mr. Offor simply allows himself to be interviewed by the patient reporters of enterprising provincial newspapers. The advantages of this arrangement to all parties are obvious. The newspaper gets in a dull season as much of the new and readable matter as the editor chooses to find room for; the reporter does good business; and Mr. Offor gets a capital advertisement for nothing. He probably enjoys the freedom of the interview system, by which the communicator is able to fill his visitor's note-book with anything he pleases, reserving the right of throwing all blunders upon the innocent scribe. Mr. Offor is at present connected with the firm of Woodhouse and Rawson, Limited, after a varied experience of other and less successful electrical companies. His cue for the time being is to disparage all direct systems of lighting from the dynamo, and to recommend the battery transformer system "by means of which electricity may be laid down to your houses just as gas is, only with much greater safety, facility, and healthfulness," as he told a reporter of the *Newcastle Daily Chronicle*. Mr. Offor informed his auditor, and through him the public, that, with 20,000 lamps in regular use in Newcastle, the electric light could be supplied at a charge equivalent to 3s. per 1000 cubic feet for gas. This was a bold statement, even for Mr. Offor; but even so it failed to favourably impress the local public, which obtains high quality gas for 1s. 10d. per 1000 cubic feet. Indeed, the effort was completely thrown away; for not even the Editor of the newspaper which published Mr. Offor's statements believed that electricity could be supplied in the town at anything like his estimate of about 3½d. per Board of Trade unit, or even if this could be done that it would secure much custom in face of gas at less than two-thirds the price.

A London weekly journal supposed to be printed in the interests of inventors, and consequently given to imitations of the style and matter of the *Scientific American* and its fellows, recently came out with the following effusion, the source of which is not given. "When," asks this contemporary, "will London or Liverpool present a picture like the following:—From the shore of Staten Island New York on a dark night looks like fairyland; a thousand electric lights dancing from out of a sea of inky gloom, with here and there a cross, and there a crown, near which fireflies of huge dimensions start here and there with phosphor fires aglow; the streets a shimmer with silver, with calcined towers lumined against the unfathomable gloom beyond. Staten Island, as you approach it, is like a mountain touched by an enchanter's wand; the electric lights about the Nero show, and the docks at St. George, shining on the hill behind them, the blue and red and green fires streaming high above like a cloud of brilliant colouring." This is quite too delicious, both to read and think about. The passage is manifestly taken "all standing" from a New York newspaper, but is incomplete. If one could lay hands upon the original, it would be found to tail off into an artless recommendation of some place of public resort, admission to which is obtainable for a small payment, and from which the deliriously beautiful panorama described may be seen to the best advantage. With one phrase of the composition we cordially agree. It is that in which the poetic writer describes the electric light as "dancing from out of a sea of inky gloom." That is precisely the effect which was produced by the arc lamps once used to light the Thames Embankment and certain of the City bridges over the river, to the confusion of pilots responsible for taking craft up and down the stream after dark. It may look pretty from a long way off; but it is eminently a case in which "distance lends enchantment to the view." London and Liverpool have both tried these marvellous "dancing" lights, and neither city likes them. It is amusing to see how, when electric lighting is to be vaunted, all unfavourable experience is ignored.

DEATH OF MR. GRIFFITH THOMAS.—The death is announced as having taken place on the 20th ult., at his residence at Englefield Green, in his 82nd year, of Mr. Griffith Thomas, the Deputy-Chairman of the Commercial Gas Company.

THE ARTESIAN BORING AT EALING.—We learn that Messrs. Le Grand and Sutcliffe have now reached a depth of 350 feet with their artesian boring at Ealing, to which reference was made in the *JOURNAL* last week, and that already there are indications of a good supply, as water has risen to within 55 feet of the surface.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.—The twenty-third half-yearly meeting of this Association will be held at the Gas Offices, West Hartlepool, on Friday, the 12th inst., under the presidency of Mr. T. Bowor, Engineer and Manager of the West Hartlepool Gas Company. An address will be delivered by the President, and a paper on "Modern Methods of Increasing Gas-holder Storage" will be read by Mr. J. Wright, of Stockton. If time permits, a short sea trip will be made round the port; after which, at the invitation of the President, the Association will dine at the Royal Hotel, West Hartlepool.

THE FUTURE OF ARTIFICIAL LIGHTING.

It is an old observation that invention goes in cycles, the reason for which is obvious. Somebody startles the world with a novel device, perhaps embodying a discovery, or only showing how a well understood object may be attained by a new and simple process. Forthwith general attention is directed to the same line of effort; and the single innovator is followed by a pack of imitators and rivals. It must frequently occur to a thoughtful observer of the development of the arts and industries, when he sees patentees flocking after one another with modifications of a particular idea, until the very name of the subject of their attentions becomes a weariness to the flesh, that even at such times patient workers in obscure places may be preparing the next surprise for the world; and he is often tempted to imagine what may be the nature of the forthcoming attraction. Inventors' crazes follow one another with such regularity, that an observer is sure to be right in dwelling upon the probability that a new departure of some kind must be in preparation while its predecessor is still engrossing the public attention. In invention, however, the only safe thing to look for is the unexpected. It is impossible to foresee the line that inventive effort will take; but it is tolerably certain to break out in the least likely places. In gas engineering we have witnessed many waves of invention flow and ebb of late years; and nobody can say when or where the next will arise. Gas inventions may for our immediate purpose be divided into two great classes, in both of which there has of late been considerable activity. One class will embrace all the inventions connected with gas making and gas-making appliances, which generally originate with professional men more or less identified with the industry. The other includes all devices designed for the utilization of gas; and in this field the inventors do not belong to any particular order of the community. Professional gas engineers do not bulk largely in the list of patentees of successful gas-burners, engines, stoves, and similar commodities. This is rather a remarkable fact; and it would be possible to draw from it some very uncomplimentary conclusions as to the interest commonly taken by gas engineers, properly so called, in the uses of the article to the production of which the best of their energies are devoted.

The object of this article is not to indulge in general reflections of this kind, however; but to discuss one or two points connected with the present use of gas for illuminating purposes. In this branch of gas utilization there have been cut two well-defined grooves, which apparently include all progressive efforts. One is the improvement of the lighting power of gas by heating it and the air required for combustion, preferably by the recuperative process; the other is the production of light from gas by so-called incandescence methods. There has been plenty of effort devoted to increasing the amount of lighting duty that may be obtained from the combustion of coal gas; and this endeavour has been very conspicuously crowned with success. But it has all gone in one or the other of these ruts. We have always favoured the heat recuperative principle as applied to gas-lamps; and we have never felt convinced of the value of its rival, brilliant as its promise has been. The time has come, however, to ask whether it must be taken as settled that the production of the best light that can be possibly obtained from gas must be by one or the other of these methods. To say truth, it is becoming wearisome to see how patentees continue to flutter round the high-power lamp, like so many infatuated moths. To partly change the figure it may be said of this craze that the crowd of inventors, again like moths, persistently waste their time and strength in struggling to get at this gaudy flower, the honey of which has been abstracted long ago by others who were earlier afield. Only the poorest sustenance remains for the late comers. Can they not discover some new pasturage?

There are indications that some of the keenest minds among the votaries of physical science are at the present time engaged in the study of the fundamentals of the production of artificial light; and it would not be surprising if the next great move in the application of science to this object should be of a nature to astonish electricians not less than gas engineers. For some time past the halo that once surrounded electric lamps, both arc and incandescent, has disappeared before the scrutiny of the philosopher. There are many now who flatly refuse to electricity, as at present applied, that claim to be regarded as the "light of the future," which has consoled its partizans amid so many present disappointments. They have come to regard electric lighting as little higher in the scheme of development than gas, and to deny finality to any such round-about method for converting the energy of coal into light. The gas maker has been called unscientific, because he merely converts the raw material, coal, into gas which, when purified, is distributed for the purpose of affording light by its combustion with air. The electrician has called himself scientific, because he burns the coal for raising steam, and uses the steam for actuating an engine, whose power he converts into electric energy, and this again into heat and light for his lamps. If, according to Mr. W. H. Preece, 1000 watts have been delivered from a dynamo driven by an engine requiring a fuel consumption of only 2lbs. of coal for this duty, and if modern incandescent lamps only absorb 3 watts per candle power, it follows that these 2lbs. of coal thus used are capable of giving the light of 333½ candles by electrical incandescence. Converted into gas, 2lbs of the best coal cannot be credited with yielding more than 9 cubic foot of nominally 16-candle gas, which in the best regenerative lamps will not give more than 90-candle power of actual light. Thus stated, and neglecting all other considerations,

electric lighting is capable of giving a higher duty from the raw material—i.e., it is more scientific—than gas lighting. Of course, to arrive at such a conclusion, which is not borne out by reference to actual experiments in which practical and commercial considerations assume their natural importance, one must be content for the time to shut one's eyes to everything but the purely philosophical aspect of the problem of lighting. Continuing in this point of view, however, we shall find that electric lighting is only just barely more acceptable than gas lighting. The natural philosopher looks down upon all known methods of procuring light by combustion or incandescence as indirect, empiric, wasteful, and, in short, altogether despicable in the scientific eye. Light, he tells us, is due to rapid vibrations of the ether which fills cosmic space. If we turn upon him and ask what he means by this term ether, which physicians use in a different sense, we only gain a shallow victory. He will perhaps admit that he has imagined the matter itself, and has named it; but he will utterly rout us and silence all objections by asking in turn, if there is nothing to undulate how it is that the light of the sun reaches us through the void that separates his atmosphere from ours? Thus reduced to impotency, we must listen to the philosopher's remarks with what patience we can muster. He will go on to assure us that to him the word ether means in this connection nothing more than "that which undulates." We may call it what we please; the only thing the natural philosopher will insist upon being that, so long as the undulatory theory of light holds good, we accept the existence of his hypothetical substance as explaining how light-waves travel through interplanetary space. Light being an undulatory movement, therefore, the question is how to produce this movement. It is the extremist pitch of vibratory movement, to which the sharpest vibrations of air that we recognize as sound are sluggish. Flames, incandescent wires, give light because they set up some of these very rapid vibrations of the ether; but the number and value of the vibrations that we can see are the merest fraction of all the vibrations in which the potential energy of the matter concerned is consumed. Dr. Oliver J. Lodge has been discoursing eloquently upon this subject in terms which we reproduce elsewhere. His words are worthy of the most careful study, and suggest infinite reflections. They recall to us, in the most forcible way, the truth that in producing light, either by electricity or by direct combustion, we waste by far the greater part of the material which we consume for this purpose. We cannot separate light from heat, much as it would be to our advantage to do so. Heat without light we may have, as in a can of hot water. Light with comparatively little heat we may also have, as in the case of the incandescent electric lamp. To produce the latter, however, there has been a great deal of heat developed in the boiler furnace; and the lamp is in reality only a part of this transported to a distance at a heavy charge for carriage. With a gas-burner we have both light and heat; but, having developed a minimum of heat for the visible effect, we know that, if we increase this heat by a comparative trifle, the light will be augmented in a very much greater ratio. This concentration of heat, and corresponding increase of the visible vibrations, obtains its present superlative in the electric arc, where the energy of a horse power, which may be spread over a square foot of furnace area at a low temperature, is concentrated into a space of three-eighths of an inch square. Yet the philosopher is not satisfied with this. He calls it still wasteful; and will not be satisfied with anything short of the presentment of light vibrations separated, as cream is separated from milk, from the great heat vibrations on the summit of which they float into our cognizance.

Will this ideal of a cold light ever be realized? Who can say? Strange things have been done ere now, before and since the time when Comte, who pretended in his way to know everything that man could do, made himself an example of presumption by laying down the proposition (which then appeared incontrovertible) that we should never be able to ascertain what the stars are composed of. The eye of the philosopher is turned once more upon the lowly glow-worm, and the strange West Indian lantern-fly. Why and how do these creatures show their light? That is the question upon the answer to which the future of artificial lighting is held to depend. What is the mechanism of this cold incandescence which land and marine insects display in such perfection? The jelly fish is as cold as the water in which it floats, and of which it is chiefly composed; yet when agitated in the dark, it emits a startling flash—how? Here then, according to the newest philosophy of the subject, the "light of the future" is hidden away. Without effort, and so far as we can tell, with little or no waste, the so-called phosphorescence of insects is kept up. It is possible that this peculiar light really is due to the excitation of luminous waves, [without the simultaneous production of those heat-waves which cost us so much to make, and which we do not want. If so, how is it done? The subject is very fascinating, possibly because it seems so hopeless to seek a solution to the problem it presents.

For the immediate present, however, as we began with the consideration of gas lighting, so we will conclude with the same. If the reflections set forth in this article teach anything, it is that, while increasing the light vibrations of a centre of gas consumption by heightening its temperature, a profitable field for effort may be found in concentrating the effect. How this concentration may be practised cannot, of course, be stated. This must be the opportunity for the inventor. It is sufficient to show that in concentration may be found the next great advance in the development of the illuminating power of gas-flames; and that this is the truth may be gathered from the various analogies cited.

THE HALIFAX GAS SCANDAL.

ALTHOUGH no official statement has been made during the past week respecting the "gas scandal" at Halifax, matters are speedily approaching a crisis, and public feeling in the district has become very strong indeed. The opinion prevalent among the ratepayers generally is overwhelmingly in favour of the Mayor signing the indemnity. He has decided to bring the subject before the Town Council to-morrow (Wednesday) evening; and will ask the members to pass a resolution approving of his appending his signature. The matter will be discussed in presence of the reporters; and his Worship will, it is expected, be prepared to state at the meeting certain grave reasons justifying the course he wishes to take. But our local correspondent has good reasons for thinking that Alderman James Booth (the Mayor) has fully made up his mind to go beyond this; and should a majority of the Council disapprove of his signing the indemnity, he will at once accept the whole responsibility, and sign it on his own account. He is even fully prepared, it needs be, to go to the extent of resigning his office and appealing to the ratepayers. The indications, however, are that a large majority of the Town Council will support him.

During the week, for about four days, Mr. Ellis Lever's private secretary was at the Town Hall, examining and comparing papers and documents relating to the coal contracts; and there is a prevailing opinion in the district, which is somewhat angrily discussed in many quarters of the town, that it is now high time that some specific charges should be made, if there are any to make, and that the matter should be brought to daylight. On Friday, Mr. Ellis Lever, Mr. T. K. Fox, and their solicitor, had a long interview with the Town Clerk; and it is understood all round that specific charges will be made, and made public, by Thursday morning next. There are three persons against whom Mr. Fox is prepared to prefer certain specific charges. One of these is a prominent member of the Halifax Town Council, and another is an extensive "middle-man" in the coal business. The name of the third has already been openly stated to be Mr. William Carr. It is believed to be Mr. Fox's intention to bring charges against these gentlemen both individually and conjointly.

The full text of the indemnity, the terms of which were stated in the JOURNAL last week, have now been fully agreed upon. It is as follows:—

This Indenture, made the day of one thousand eight hundred and eighty-eight, between James Booth of Halifax, in the county of York, Esquire, the Mayor of the said borough of Halifax, of the one part, and Thomas King Fox, of Silkstone, near Barnsley, in the said county, commercial traveller, of the other part.

Whereas the Corporation of Halifax are the proprietors of the works which supply the borough of Halifax with gas, and the same are worked and managed by them or their officials. And whereas the said Thomas King Fox has written certain letters to Keighley Walton, Esquire, the Town Clerk to the said borough of Halifax, concerning the supply of coals to the said gas-works. And whereas the said Corporation expressed a desire to have the said statements in the letters of the said Thomas King Fox fully and thoroughly investigated, and requested him to furnish them with any information he might have in his possession relating to the same, which the said Thomas King Fox declined to do unless he received a complete indemnity against all fines, costs, charges and expenses, which he might incur, or moneys he might have to pay in obtaining proof of, and in proving the same, provided he successfully established the truth of the same. And whereas the said James Booth has unconditionally accepted the offer of the said Thomas King Fox, and has agreed to give him his personal indemnity and undertaking hereinafter contained.

Now this Indenture witnesseth that, in consideration of the premises, it is hereby covenanted, agreed, and declared, by and between the said parties hereto, as follows:—

1. The said Thomas King Fox shall, on the signing hereof, state in writing to the said James Booth the name or names of the person or persons referred to in his letters as the objects of the charges therein referred to, and will make libellous charges of such a nature as will entitle the parties named to bring an action or actions against the said Thomas King Fox.

2. On the said Thomas King Fox so stating the name or names of the said person or persons, and the charges so referred to as aforesaid, the said Corporation shall, if the said person or persons be a servant of the said Corporation, insist upon the person or persons named bringing a civil action for libel within one calendar month from the date hereof against the said Thomas King Fox, and if the said person or persons be not a servant of the Corporation, shall call upon the said person or persons named to bring a civil action against the said Thomas King Fox, for the purposes of having the said charges fully and completely investigated and inquired into before a Judge of the Queen's Bench Division of the High Court of Justice and a Special Jury, or Judge of the Division without a Jury, as the said Thomas King Fox shall think fit and the Court allow. The said Thomas King Fox shall not plead any privilege as a defence to any such action, but shall justify the said charges. But if criminal proceedings are taken against the said Thomas King Fox, he shall be at liberty to plead that the charges were made in confidence, and as a privileged communication; it being the intention of the parties hereto that the charges should form the subject of investigation in a Civil Court.

3. In the event of the plaintiff or any of the plaintiffs in the said proceedings to be taken as aforesaid failing to obtain a verdict and judgment for damages of £10 or upwards and costs, or, in the event of criminal proceedings, an acquittal or verdict of not guilty, then and in every such case the said James Booth hereby for himself, his executors and administrators, expressly covenants with the said Thomas King Fox that he the said James Booth, his executors or administrators, will save harmless and keep fully indemnified the said Thomas King Fox, his estate and effects, from all costs (as well between solicitor and client as between party and party), charges, disbursements, and expenses of what nature or kind soever, which he or his duly authorized solicitors and agents shall properly incur (as well before as after action brought) in, about, or relating to obtaining information, the preparation or conducting of his defence to the said proceedings, and the bringing of the same to trial, in a full, complete, and proper manner; it being the full intention and meaning of these presents that the said Thomas King Fox shall not be put to or incur any expense personally in the event herein provided for, and that what-

ever expense he may incur or be put to he shall be fully recompensed, reimbursed, and indemnified by the said James Booth.

4. And the said James Booth, on behalf of the said Corporation of Halifax and their officials, covenants and undertakes that every reasonable opportunity and facility shall be given to the said Thomas King Fox and his solicitors for inspecting all the Corporation books relating to the gas-works, and also all tenders, contracts, and papers relating to or affecting the working and management of the said gas-works, and will place no obstruction whatsoever in the way of the said Thomas King Fox, but, on the contrary, will give him every opportunity and facility for making a complete and thorough investigation into the matters complained of as hereinbefore mentioned.

5. In case the said plaintiff or plaintiffs in the said action for libel shall obtain a verdict and judgment for damages of £10 or upwards, and costs, or in the event of criminal proceedings a verdict of guilty against the said Thomas King Fox, then in such case the indemnity herein contained shall be null and void; otherwise the same shall remain in full force and effect.

6. Provided also, and it is hereby agreed, that the said James Booth shall pay to the said Thomas King Fox the sum of one hundred pounds, and for agreed costs, charges, and expenses before action, and if no proceedings be taken against the said Thomas King Fox within one month from the date hereof, then the said James Booth shall forthwith pay the said sum of one hundred pounds to the said Thomas King Fox or his solicitors.

In witness whereof the said parties to these presents have hereunto set their hands and seals, the day and year first before written.

Notes.

ESTIMATING THE VOLUME OF GAS IN PIPES OR FLUES.

The subject of the difficulty attending the estimation of combustion or generator gases by means of mechanical appliances has lately been dealt with by the *Chemiker Zeitung*. It appears that hot gases are liable to destroy the apparatus; ash and dust may render them inefficient; and, further, they ought to occupy the whole cross-section of the flue, as in the various parts of the flue the gas will have a different velocity. In Munich the estimation of the volume of the smoke gases from the kilo. of coal is done in the following manner:—If, for instance, the combustion gases have a percentage composition of 6.12 of carbonic acid, 0.89 per cent. of carbonic oxide, 0.10 per cent. of hydrogen, 14.21 per cent. of oxygen, and 81.60 per cent. of nitrogen, and if the coal used contains, according to combustion, 81.6 per cent. of carbon, then one cubic metre of the gas (contained as carbonic acid or carbonic oxide), at 0° C. and 760 mm. pressure, contains 0.5364 kilo. $[0.0612 + 0.0089] \times 0.5364 \text{ kilo.} = 37.60 \text{ grammes of carbon.}$ Now, 1 kilo. of coal contains 81.6 per cent. = 816 grammes of carbon, and will therefore yield $816 \div 37.6 = 21.7$ cubic metres of dry smoke gases. These figures are sufficient to estimate the loss of heat from 1 kilo. of the fuel.

THE PROBLEM OF ARTIFICIAL LIGHTING.

In the course of a series of articles setting forth the modern view of electricity, Professor Oliver J. Lodge arrives at the conclusion that "light is an electrical disturbance, and that light waves are excited by electrical oscillations;" which conclusion he believes must ultimately have a practical import. Professor Lodge remarks that our present systems of making light artificially are wasteful and ineffective. We want, he says, a certain range of oscillation—between 7000 and 4000 billion vibrations per second; no other is useful to us, because no other has any effect upon our retina. But we do not know how to produce vibrations at this rate. We can cause strings to vibrate one or two hundred or a thousand times per second, with the result of emitting a pure tone of definite pitch; but to get much faster rates of vibration, we have to fall back upon atoms. We can make atoms vibrate by what we call heating the substance; but the vibrations are then infinite in number and mode, and only a few of them are of use to us. As we do not yet know how to separate the vibrations that are useful to us from the great majority, we are obliged to excite them all together, at an obviously unnecessary expense. We take a lump of matter—say, a carbon filament or a piece of quicklime—and by raising its temperature, we impress upon its atoms higher and higher modes of vibration; not transmuting the lower into the higher, but superposing the higher upon the lower, until at length we get such rates of vibration as our retina is constructed for, and we are satisfied. The process is evidently wasteful, and indirect and empiric. We want a small range of rapid vibrations; and we know no better than to make the whole series leading up to them. It is, says Dr. Lodge, "as though, in order to sound some little shrill octave of pipes in an organ, we were obliged to depress every key and every pedal, and to blow a young hurricane." If this remark applies to the incandescent electric lamp and to lime light, it also applies with even greater force to lights of combustion, in which a great amount of radiation is produced but is not wanted: the only result really desired being the minute, almost infinitesimal fraction of the whole effect which enables us to see. In short, the production of light-waves, without any others, is held out by Professor Lodge as the problem of artificial lighting for the future.

THE QUALITIES OF A GOOD ROPE.

In an article on rope-making credited to a German periodical, but quoted in *Iron*, it is remarked that the appearance of a hemp rope affords to an experienced eye very fair indications of its quality. A good hemp rope is hard, but pliant, yellowish or greenish grey in colour, with a well-defined silvery or pearly lustre. A dark or blackish tint indicates that the hemp has suffered from fermentation while curing; and brown spots show that the rope was spun while the fibres were too damp, and is consequently weak and soft in the stained places. Sometimes a rope may be made up

of inferior hemp on the inside, while upon this, as a core, good yarns are overlaid. This fraud may, however, be detected by unlaying a portion of the rope; and it generally betrays itself in use, if not otherwise discovered. Another variety of inferior rope is that made of short fibres; or the strands may be of unequal length or unevenly spun. In the first case the rope has a woolly or rough appearance, on account of the number of projecting ends of fibres; and in the latter case the irregularity in laying is easily perceived upon inspection by anyone who knows what a good rope should look like. The combustion test for ascertaining the purity of Manilla rope has been published, but may be usefully repeated here. It consists in unravelling some of the fibre of the rope to be tested, and forming it into a loose ball, which is to be completely burnt upon a clean surface such as an iron plate. Pure Manilla hemp burns to a dull greyish-black ash; Sisal leaves a whitish-grey ash; combinations of Manilla and Sisal show themselves by gradations of the greys.

THE CALORIMETRY OF COAL—A CORRECTION.

In the JOURNAL for Jan. 10 last, there appeared a "Note" upon a calorimetric experiment with English coal conducted by MM. Scheurer-Kestner and Meunier-Dollfus, made at the request of Mr. Bryan Donkin. The results of the experiments are given as they were printed in the *Comptes Rendus*. It has since been discovered, however, that this statement is wrong, owing to the fact that, by an error of calculation, the initial temperature of the feed water was deducted twice. The net duty of the coal being 10.44 of water at 0°C. per unit of fuel, the total quantity of heat absorbed by the kilogramme of evaporated water was 651 calories instead of 632.5. Consequently, the number of calories contained in a kilogramme of water is 6796, and not 6603. The corrected statement of the distribution of heat is therefore as follows:—

In the steam	6796 calories, or 74.68 per cent.
In the combustion gases. . .	481 " " 5.28 "
In the aqueous vapour of the combustion gases . . .	252 " " 2.76 "
Loss by external radiation . .	395 " " 4.34 "
	7924 calories, or 87.06 per cent.
Unaccounted for	1175 " " 12.94 "

Total . . 9099 calories 100.00 per cent.

The correction appears as a preface to the full report of the experiments presented as a memoir to the Société Industrielle of Mulhouse, which has been printed separately as an extract from the *Bulletin* of the Society.

GAS-FIRES.—Messrs. T. Fletcher and Co., of Warrington, have brought out this season a series of entirely new gas-fires, both in principle and design. The heat, before passing into the chimney, circulates in a radiating canopy, with internal convoluted and studded flues. This radiator utilizes the waste heat very effectively, and the whole stove becomes a powerful radiating medium. In larger sizes, the same principle is further carried out by the waste heat being conveyed down the side of the stove, through a hollow fender, and up a return flue to the outlet at the back. The stoves are finely finished in Italian Renaissance style, and present a very handsome appearance.

PROHIBITION OF THE IMPORTATION OF SACCHARINE INTO PORTUGAL.—A despatch dated the 18th ult. has been received from Sir G. F. Bonham, Her Majesty's Chargé d'Affaires at Lisbon, enclosing copies and translation of a decree which had been published in the *Official Gazette*, prohibiting the importation into Portugal and the islands, except under certain specified conditions, of saccharine, and of any articles of food into the composition of which it enters. The following is a copy of the translation of the decree in question:—"Article 1. The importation of saccharine, whether pure or mixed with any article, and likewise any articles of food that may contain the same, into the continental part of the kingdom, or into the adjacent islands, is prohibited, except under the conditions set forth in the following article. Article 2. Chemists will be allowed to import this product after having obtained the permission of the Government, who must take the advice of the General Board of Customs. For the intents and purposes of this article, importers will have to make a petition, stating the amount of saccharine which they wish to import, and through which custom house they wish to do so."

WATER PURIFICATION BY IRON.—In a pamphlet written by Mr. E. Devonshire, Assoc. M. Inst. C.E., the Resident Engineer and Manager of the Antwerp Water Company, he gives an account of three years' experience of water purification by means of iron in Anderson's revolving iron purifier; this being the period during which the system, in its complete form, has been in operation at Antwerp. The process, which has frequently been referred to in our columns, is fully described by the aid of some well-executed lithographical diagrams of the various appliances employed; and the analytical results of the treatment of the water are given in the second part of the pamphlet. The author states, as the result of his observations, that waste or scrap iron, when used in revolving purifiers, is not less efficient than spongy iron (the material originally employed), while it is more suitable in form, and cheaper in application. The little book is issued by Messrs. Easton and Anderson, of London and Erith, and merits the attention of water engineers from the fact that it contains particulars, gleaned from the author's personal experience of the working of the process he describes, which they may find of much practical value.

Communicated Article.

THE GUIDE-FRAMING OF GASHOLDERS.

FOURTH ARTICLE.

As some time has elapsed since the appearance of the third article on the above subject, it may be as well to briefly recapitulate what has already been advanced.

The first article was an inquiry into the general principles involved in the stability of gasholders, and the effect produced by shortening the guide-framing. It was proved that in any gasholder the depth of each lift must be equal to at least one-seventh of the diameter; and that *under certain conditions* it may be admissible to reduce the height of the guide-framing to that of the depth of the outer lift only, but no shorter.

The second article treated of the first condition necessary for the stability of gasholders having reduced guide-framing—viz., that *each lift must be rigid in itself, and unable to distort under the strains induced*. We gave rules for determining the magnitude and character of the extra strains induced by this method of construction, illustrated by examples; and found as general results that in three-lift gasholders the guide-framing must reach *at least as high as the top of the middle lift* when fully up (fig. 32), otherwise the holder would be unsafe, and that double-lift gasholders

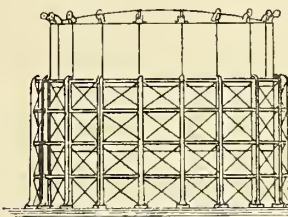


Fig. 32.

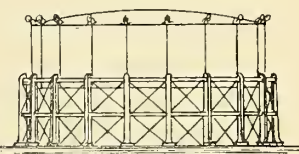


Fig. 33.

could be made with the guide-framing stopping short at the outer lift, providing the depth of each lift is fully one-fourth of the diameter (fig. 33).

In the last or third article, we considered the second condition necessary for the stability of gasholders with foreshortened guide-framing—viz., that *the guide-framing itself must be perfectly rigid and unyielding*, otherwise it will admit of the projecting lift or lifts swaying over dangerously. We resolved that it was practically a matter of strength, or of determining the strains, and then designing the guide-frame to meet them. We divided gasholder guide-framing into two distinct classes—viz., the simple cylinder and the multipost types. (See Note N.) We then demonstrated the principles to be observed in finding the strains, and deduced simple, practical rules for gasholders of the former or perfect cantilever class (figs. 32, 33, and 34.)

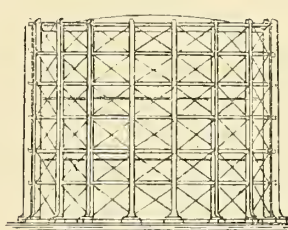


Fig. 34

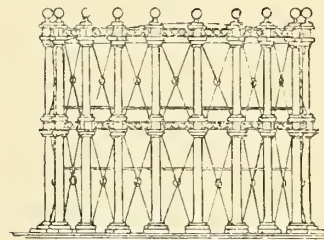


Fig. 35.

We will now treat of the second class or independent post type (fig. 35), and then apply the rules to a few examples; concluding with a summary of the whole question.

GASHOLDERS OF THE MULTIPOST TYPE.

In determining the strains on gasholders of this type, we are met with the difficulty of variety in design. We have, indeed, everything from the simple gasholder with vertical posts and no connecting girders or ties whatever, to that having one, two, three, and occasionally four tiers of girders; the girders being sometimes of wrought iron, deep, strong, and well-attached to the columns, or they may be poor frail things, insufficiently attached, perhaps of cast-iron open work, practically useless except for ornament and the bare appearance of strength. Then, again, the girders may be either upright, or lying on their sides so as to form a stiff ring; or both plans may be blended in one structure. Then, the columns or standards may be of any variety of shape—round, tripod, or T shape; I shape, diamond, or square (figs. 36, 37, and 38, on next page)—all having their peculiarities and influence on the strength of the structure as a whole. They may be of cast iron, wrought iron, or steel; arranged in pairs or singly; either with or without diagonal rods between them; and perhaps with horizontal bracing at the top—Paddon's ties. We then have the excess of strength in the gasholder bell in cups and curbs lending horizontal stiffness to the frame. (See Note O.) All this makes it very difficult to give general rules which will apply with equal truth to every variety; but we may lay down the following principles to aid us in classifying the different features and their influences.

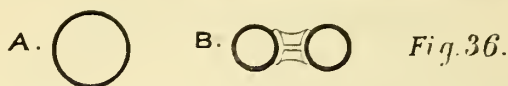


Fig. 36.

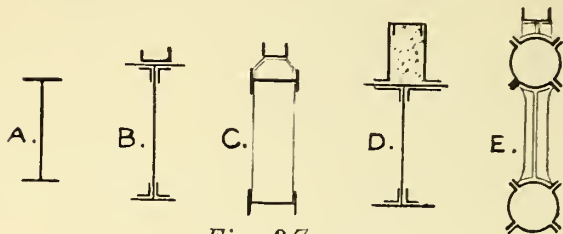


Fig. 37.

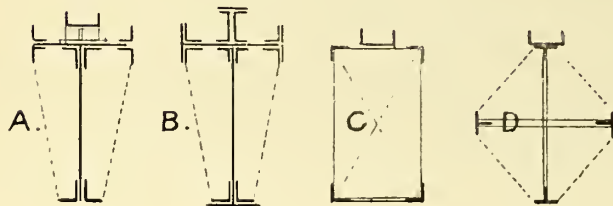


Fig. 38.

The strength of gasholders may be considered to vary as—

1. The number of columns or standards.
2. The transverse strength of one column taken independently of the rest.
3. The total overturning pressure.
4. The number of tiers of girders and their stiffness, and the extent of the bracing (if any) between the columns.
5. Surplus strength of gasholder bell, in cups and curbs—stiffness generally—to resist distortion. The more cups and curbs, the greater the resistance to distortion.
6. The workmanship, material, nature of junction, and design of details generally.

We can construct formulæ embodying these variations which will give the bending moment each column or standard is called upon to resist. It is then, of course, very easy to proportion the column to meet this bending moment, as will be shown when we apply the formulæ to examples.

Let D = the diameter of the outer lift (feet).

d = the total depth of gasholder when right up (feet).

N = number of columns.

C = constant, varying according to design and wind pressures, thus: For gasholder having guide-framing the full height—

3 lifts and 3 tiers girders	=	300
3 " 2 " "	=	250
2 " 2 " "	=	200
2 " 1 " "	=	150
1 " 1 " "	=	100

In applying these constants, they must be modified as follows:—If the gasholder be well sheltered from wind all round, 25 per cent. may be added to them. If, on the other hand, it is exposed to great wind pressure, 25 per cent. should be deducted; and in special cases, where erected on the coast (and unprotected in any way from furious gales), they may be reduced as much as 50 per cent., as it is absolutely necessary to err on the side of safety, to allow for contingencies even under the best supervision.

Having modified the constant according to wind pressure, call it C_1 ; and then still further modify it as follows:—

If diagonal ties, add from $\frac{1}{2} C_1$ to $\frac{3}{4} C_1$, according to strength and attachment of same.

If curbs and cups are very strong, add $\frac{1}{10} C_1$.

If girders are shallow, and not well attached or bracketed to columns, deduct $\frac{1}{4} C_1$ to $\frac{1}{2} C_1$.

If standards lack lateral or side stiffeners, deduct $\frac{1}{2} C_1$.

If workmanship or materials are of inferior character, deduct $\frac{1}{2} C_1$ to $\frac{3}{4} C_1$. (This embraces unfair holes and bad riveting; loose fitting bolts, instead of rivets; work unduly strained by drawing together; ties not taut; junctions and details generally badly designed and proportioned; guides out of plumb; rollers badly adjusted, &c., &c.)

Then M the bending moment at foot of one column or standard (in foot-tons)=

$$\frac{D \times d^2}{N \times C}$$

Having determined this, we know, of course, that the moment of resistance, R , of the column or standard must be equal to it.

R , for ordinary round cast-iron columns = approximately,

$$\frac{Ad}{1.6} \text{ foot-tons.}$$

Where, A = the sectional area of column (in square inches),

d_1 = the diameter of column (in feet).

R , for latticed standards, or web plate standards of symmetrical cross-section, wrought iron = $5 A d_1$, steel = $8 A d_1$.

Where, A = effective sectional area of back flange (square inches),

d_1 = depth of standard from front to back (feet).

NOTE.—The constants 5 and 8 may well be reduced if the standard be of the lattice type and the "pitch" of the lattices is excessive.

Cast-iron standards, with open webs and various thicknesses of metal

are in every way inferior to wrought iron; so that we need not consider them. The same remark applies to cast-iron girders.

Where the section of a web-plate standard is unsymmetrical, it requires special treatment. The resistance of one flange must be multiplied by its distance from the centre of gravity of the cross section of the standard (assumed neutral axis), then double of this product will give approximately the resistance of the standard to bending (R).

Gasholders with reduced guide-framing should have diagonal ties added to the guide-framing, of sufficient strength to bring them under the cantilever cylinder type described in the third article; and the several lifts must be stiffened up to meet the extra strains, as directed in the second article, also tangential as well as radial rollers should be adopted to assist in getting a good fit and grip between the holder and the guide-framing.

NOTE N.

Other forms of gasholders, besides those treated of in these papers have been proposed; but they have not met with much favour. Notably, the gasholder having the guide-framing attached to, and supported by, the tank only (see fig. 41), and having a domed bottom tank, as described by Professor Otto Intz.* Also

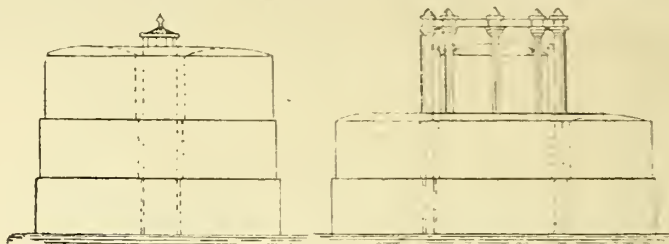


Fig. 42.

Fig. 43.

the central column gasholder and the annular gasholder (see figs. 42 and 43) treated of by Barker, Wyatt, Meigel and Couffinal, and others. There are so many things against them that they are not likely to make very rapid strides. We may at some future time consider these forms of gasholders more minutely.

NOTE O.

Gasholders without any connection between the standards are never made now; so we need not consider them. Gasholders with twin columns are rare; for all practical purposes, in determining the strains, the columns may be treated as equally divided round the circle, instead of being in pairs; and then the rules which apply to the ordinary construction will likewise apply for this. It is an expensive and unnecessary mode of construction. The object in making them in pairs appears to be to get strength with several light columns, in preference to half the number of heavy ones, as well as to avoid cutting up the gasholder into so many narrow bays. Frail cast-iron girders with open webs may also be struck out, as being unreliable and out of date.

THE MANAGEMENT OF THE MARYPORT GAS-WORKS.—The Maryport Trustees have appointed Mr. E. Smithard, of Derby, as successor to Mr. D. Irving in the management of their gas-works; the latter gentleman having, it may be remembered, been selected to fill the position of Resident Engineer of the Stapleton Road works of the Bristol Gas Company. There were originally 52 applications for the Maryport appointment (which was advertised in the JOURNAL for the 11th ult.); and these were brought down to three—the final selection being as above stated.

THE QUALITY OF THE NEW GAINSBOROUGH WATER SUPPLY.—Dr. Percy F. Frankland has called our attention to a slight error in the last line but one of the paragraph under the above heading which appeared in the JOURNAL for the 18th ult. It was there stated that, according to his analysis of the water, the total solid matter in it was 49.97 grains "per gallon." These figures relate to "parts per 100,000," as do those contained in the preceding line of the paragraph. This would be equivalent to 34.98 grains per gallon, which compares well with a report which Dr. C. Meymott Tidy has submitted, giving the quantity as 36.77 grains, nearly the whole of which consists of the carbonates and sulphates of lime and magnesia, with some chlorides of sodium and magnesium. As regards dissolved organic matter, Dr. Tidy adds that the water must be considered as one of great—almost exceptional—purity.

SOCIETY OF ENGINEERS.—Last Tuesday the members of this Society, with a number of friends, paid a visit to the locomotive, carriage, and waggon works of the South-Western Railway Company, at Nine Elms. Among the party were Mr. A. T. Walmisley (President); Messrs. J. R. Baillie, H. Adams, and R. Harris (Vice-Presidents); Messrs. Perry F. Nursey, C. Gandon, and H. Robinson (Past-Presidents); Messrs. Chris. Anderson, J. H. Cunningham, W. A. Valon, and J. W. Wilson, jun. (Members of Council); Mr. Alfred Williams (Hon. Sec. and Treasurer); and Mr. G. A. Pryce Cuxson (Secretary). These famous works, which cover 45 acres of ground, were originally designed by the late Mr. Joseph Beattie, and at that time considered very complete, have been, owing to the increase of traffic and stock, considerably altered and enlarged by Mr. William Adams, the present Superintendent, and employ between 2000 and 2500 men. The party were entertained at luncheon by Mr. Adams.

* See Appendix to The Gas Institute Transactions, 1885.

Technical Record.

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

A meeting of gentlemen having the management of gas-works in the Eastern Counties was held at the Gas-Works, Peterborough, last Wednesday, in accordance with the circulars recently issued by Mr. H. Wimhurst, of Sleaford (*ante* pp. 369, 510), to consider the feasibility of forming a Gas Managers' Association for the Eastern Counties. Mr. WILLIAM BARRATT (Grantham) having been elected to the chair,

The SECRETARY *pro tem.* (Mr. H. Wimhurst) read the circular convening the meeting, which he had issued with the co-operation of Mr. J. Barton, of Peterborough, and Mr. J. Carter, of Lincoln. They had, he said, received replies in favour of the formation of an Association from the following gentlemen:—Mr. W. Brown, of Brandon; Mr. Jackson, of Skegness; Mr. W. Palgrave Brown, of Southtown (Yarmouth); Mr. T. Greaves, of Melton Mowbray; Mr. A. J. Yorston, of Ely; Mr. W. H. Willis, of Yarmouth; Mr. A. H. Rose, of Wainfleet; Mr. J. Carter, of Lincoln; Mr. J. Barton, of Peterborough; Mr. W. J. Best, of St. Ives; Mr. B. H. Vores, of East Dereham; Mr. E. J. Brockway, of Oakham; Mr. C. Wright, of Saffron Walden; Mr. J. T. Jolliffe, of Ipswich; Mr. J. Kemp, of Haverhill; Mr. C. W. Grimwood, of Sudbury; Mr. F. Weller, of Southtown; Mr. W. H. Stout, of Boston; Mr. W. Wells, of Stamford; Mr. J. Heydon, of Mansfield; Mr. A. Mead, of Chelmsford; Mr. W. Barratt, of Grantham; Mr. H. Wimhurst, of Sleaford; Mr. C. Dixon, of Horncastle. There were in all 24 favourable replies. He had also received replies from other gentlemen, which he read. Some of the writers were undecided at present; a few were unfavourable to the proposal; others considered themselves situated in out-of-the-way places; while one or two intended waiting to "see what steps The Gas Institute would take in their present difficulty."

The CHAIRMAN remarked that, having heard the communications *pro* and *con.*, he presumed the matter they were to settle was whether or not there was to be an Association. They had heard what had been stated by those who were unfavourable to the project; and now he should be glad to hear what any gentleman present had to say with regard to it—whether or not it was necessary to establish an Association for the district. Personally, he considered it essentially necessary. He thought they must have all come to the conclusion that it was time something was started to get them out of the difficulty in which they were now placed. It had been a matter of surprise to him, and he had mentioned it more than once to his brother managers, that that part of the country—he would stand corrected if he was wrong—had only been once represented in what he might call the parent society, and that was by the gentleman who was at Grimsby, and whom Mr. Jowett succeeded.* This state of things he thought ought not to exist at all; it appeared to him to be rather one-sided—perhaps more one-sided than it should be. He should be glad to hear what gentleman present had to say as to the necessity of an Association being established.

Mr. W. J. BEST (St. Ives) asked what the "Eastern Counties" comprised.

The SECRETARY replied that, in sending out the circulars, he had included the whole of Lincolnshire, Cambridgeshire, Norfolk, Suffolk, parts of Essex and Huntingdonshire, Northamptonshire, and a little corner of Nottinghamshire. He also went up as far as Doncaster, as he did not know whether they might not get Mr. Bridge. Altogether, he sent out about 250 circulars.

Mr. J. BARTON (Peterborough) said he thought the time had arrived when they ought to form an Association for the Eastern Counties. When he first came to Peterborough, he felt very lonely indeed. He did not know his neighbours; and he did not suppose he had been to half-a-dozen works since then—some four years ago. When they had not an Association, they had not so much freedom; they could not go and inspect gas-works and make friends with the manager when they did not know him. They wanted a sort of introduction. If they had an Association, it would bring them together, and they could talk over affairs, compare notes, and exchange ideas. No doubt, as they went along, they would visit different works; and no matter how small the works might be, they would pick up something new. He thought when they became associated together in this way, it did a very great deal of good. They would have to arrange rules that day. They wanted to begin right; and if they began right, they would end right. He considered they had sufficient promise to warrant them in starting an Association.

Mr. BEST said that he had felt like Mr. Barton. When he first came into the Eastern Counties, he did not know many gentlemen. They had virtually to introduce themselves; and consequently he knew very few managers indeed in the Eastern Counties. At the same time, he failed to see any utility in joining The Gas Institute. He thought it was a long way to their meetings; while, with a local Association, they could go to some of the neighbouring towns, and compare notes with their fellow-managers. As far as he was concerned, he should say by all means have an Association for the Eastern Counties.

The SECRETARY remarked that, ten years ago, he felt himself in

a similar position to those who had already spoken. At that time he went to his friend Mr. Stout, and asked him whether they could not start an Association for the Eastern Counties, as he found them in all parts of the country. Mr. Stout, however, felt that at his time of life he could not embark in anything of the kind; and he referred him (the Secretary) to Mr. G. E. Stevenson, then of Peterborough. For some cause or other, he did not put himself in communication with Mr. Stevenson. He had felt a difficulty himself in not being able to meet his fellow-managers. If they would allow him, he should have pleasure in proposing that they form themselves into an Association comprising the districts he had already named. He thought they would be able to "paddle along," and in a short time get several more members. Mr. White, of Sherborne, told him that, when they started the South-West of England Association they only had 18 members; and in their (the Eastern Counties) case they had a larger guarantee. If they decided to start the Association, he had drawn up some rules for consideration. They were on the lines of the Midland Association rules, which he considered the best; excluding as they did a good deal of the outside world—such as traders and others. He had pleasure in proposing that an Association should be formed.

Mr. T. GREAVES (Melton Mowbray) seconded the proposition.

Mr. J. CARTER (Lincoln) considered that the amount of support which had already been promised to the projected Association was quite sufficient to warrant them in laying the foundation of what he hoped would be a considerable structure before very long. In his own mind, he did not agree with those who had any idea of withdrawing sympathy or support from what had been referred to as the parent body of gas managers. He thought there was plenty of room for one central body and for District Associations as well. It seemed to him very essential that they should continue their support to The Gas Institute, because it was important that there should be some thoroughly general representative body to speak with authority upon gas matters. At the same time, there were undoubtedly local circumstances which they felt more or less weighty, and which could be more thoroughly discussed by a body of gentlemen who themselves had to manage works situated within certain localities. They would find an Association extremely useful. They were all concerned in the management of the same business, and their deliberations and their visits to one another's works would, no doubt, do something to improve and perfect their education.

The proposition was then carried unanimously.

RULES.

The CHAIRMAN said that, having decided to form an Association, the Secretary would read the rules which he had drawn up.

The SECRETARY having read the rules he had prepared, they were discussed *seriatim*, and certain modifications were made. By Rule 1, the title of the Association is "The Eastern Counties Gas Managers' Association." Rule 2 says: "That this Association shall consist of engineers, managers, or secretaries exclusively engaged upon gas-works, in the service of gas companies or local authorities." Rule 5 declares that there shall not be less than four members of Committee. The tenth rule states that the meetings are to be held on the third Wednesday in March and the third Wednesday in September each year.

THE FIRST MEMBERS.

On the motion of Mr. F. WELLER (Southtown, Yarmouth), it was decided to enrol the gentlemen who had promised to support the Association—see list given above—as members. The name of Mr. F. A. Ward, of Amersham, was afterwards added.

ELECTION OF OFFICE-BEARERS.

Mr. GREAVES proposed that the Chairman that day should be elected the first President of the Association. He did not think they could have a better man.

Mr. BARTON thought that Mr. Barratt would make a good President, as he had had a great deal of experience.

The motion was carried *nem. con.*

The PRESIDENT briefly acknowledged the honour conferred upon him, and assured the members that he would do the best he could during his term of office.

On the motion of Mr. WIMHURST, seconded by Mr. CARTER, Mr. Barton was elected Vice-President.

Mr. CARTER moved the appointment of Mr. Wimhurst as Secretary and Treasurer.

Mr. HEYDON seconded the motion, which was carried.

Messrs. Best, Carter, Greaves, and Heydon were next elected to serve as the Committee; and Messrs. Weller and Yorston were appointed to the position of Auditors.

PLACE OF FIRST GENERAL MEETING.

The PRESIDENT suggested that Grantham should be the place of the first general meeting; and thereupon

The SECRETARY proposed that the first general meeting should be held, on the third Wednesday in March next, at Grantham.

Mr. WELLER seconded the proposition, which was carried.

PAPERS.

The SECRETARY observed that they would require one or two good papers for the meeting.

Mr. CARTER remarked that he very much favoured the idea advanced in the current issue of the JOURNAL OF GAS LIGHTING—that it should not be a *sine quâ non* that there should be papers. He considered that free-and-easy discussions upon matters of interest to all the members would do them more good than long papers.

* The speaker was not quite accurate in this statement; as we find, on reference to the Transactions of The Gas Institute, that Mr. G. Ernest Stevenson, formerly of Peterborough, was a member of the Council from 1881 to 1884.—Ed. J. G. L.

Mr. GREAVES concurred in Mr. Carter's remarks.

Mr. WIMHURST said that at all events they would have the Inaugural Address by the President at the next meeting.

VOTES OF THANKS.

Mr. CARTER moved that a vote of thanks be given to Mr. Wimhurst for the patient labour he had bestowed on the formation of the Association; as well as to the President for presiding, and to Mr. Barton.

Mr. YORSTON seconded the motion, which was heartily confirmed.

A vote of thanks having been passed to the Directors of the Peterborough Gas Company for the loan of the room, the proceedings were brought to a close.

Some of the members afterwards made a tour round the gas-works; being accompanied by Mr. Barton, who very courteously afforded all desired information.

SOUTH-WEST OF ENGLAND DISTRICT ASSOCIATION OF GAS MANAGERS.

THE HALF-YEARLY MEETING AT WESTON-SUPER-MARE.

We conclude to-day the extended report of the proceedings at the recent meeting of the South-West of England Association of Gas Managers. At the close of the discussion on Mr. Davis's paper, on "Naphthalene," the attention of the members was directed to the subject of

GASHOLDERS WITH SPIRAL GUIDES.

The PRESIDENT said that Mr. W. Gadd, of Manchester, had been kind enough to bring models of his patent system of gas-holder construction to show the members; and he would now ask that gentleman to explain them to the meeting.

Mr. GADD said that he would briefly describe his invention, beginning with the model of the single-lift holder. He would cause it to rise; and it would be seen that it was guided from the bottom entirely, there being no columns or girders above the ground. Yet it was held rigidly all round the bottom; each guide forming a holding point. Taking a hat, he might illustrate the ordinary way of supporting a holder with columns and framing, by supporting the hat on a stick from the centre of the crown inside; but in his system, the hat would be held down at points equidistant round the rim. The rollers played in lines preferably tangential; but this was in no wise a part of his system. They could be radial if desired. The guides in the tank, instead of being vertical, were disposed at an angle, forming a spiral, or quick thread of a screw. The angle might range from 45° to 60°; and anything between these limits was workable. Each roller formed a point of support; so that the holder was held in just as many places round the ring as there were guides. In the model before them there were six. Each roller formed a solid bearing; rendering the holder as stable as if it was resting on the floor. There was first a slight play on the bearings; and then the whole structure, holder and tank, could be turned bodily over as if one piece—the holder being gripped by the guides as in a vice. The holder formed a cantilever of the elbow kind—the height being the extent of one limb, and the diameter that of the other; so that if the wind pressure was concentrated at the top, the resisting leverage would still be much longer than the acting leverage. Another advantage obtained was that the pressure was rendered vertical. The shallower the holder, the more capable of resistance did it become; and in this respect it was just contrary to the ordinary system. He could make a very shallow frying-pan-like holder that would be perfectly stable. To illustrate the effect of unequal loading, such as an accumulation of snow on one part of the top, he would place a pile of lead weights near the circumference; and it would be seen that the holder rose and fell vertically, without tilting or straining. This showed that under any circumstances the strain on the guides was perfectly vertical. There could be no tilting, because the guides pointed in opposite directions on opposite sides of the tank; and therefore the rollers were gripped as between the blades of a pair of shears. He then showed the working of the three-lift model holder. The principle of his invention, he went on to say, was not affected by the manner in which the rollers and guides were designed; for instance, the rollers might be fixed on the tank, and the guides on the holder if preferred. The rollers could be built in the tank, in recesses of solid masonry, or the same might serve for the guides. In fact, the actual working arrangements might be modified in any practical way. The whole depended on the screw action. The three-lift holder might be compared to three screws, one inside the other. The interior framing, especially of telescopic holders, would have to be modified considerably to meet his system. The uprights could be made triangular in form, with base at the bottom of the curb, which would give more strength, and at the same time use no more weight of metal. The rollers could be double flanged, single flanged, or made in pairs without any flanges, having the guide between them.

Mr. WALTER FIDDES (Bristol) said he remembered that, when he was a boy his father made a model holder without columns and girders, guided by a central column, having a coarse screw on it for the rollers to work in. He asked if Mr. Gadd had any idea of the increased pressure that would be given by a holder on his system, as compared with the ordinary ones? Suppose, as was often the case, that 100,000 cubic feet of gas per hour were being delivered into the holder, and 300,000 feet per hour were passing out at the same time. Circumstances would differ from the ordinary working,

because there would be the effect of the lateral motion, and also the fact that the bottom must be heavier. The conversion of all wind pressure, &c., into a downward vertical strain would tend to influence the degree of pressure given by the holder. A heavy wind would increase the pressure. In connection with wind pressure, he would ask if the sucking or vacuum on the lee side, as well as the direct force on the windward side, had been taken into consideration. This was very considerable, and acting in the same direction practically increased the wind pressure. He had known the barometer on the lee side of a holder, during a strong wind, to stand 3-10ths of an inch lower than on the wind side. So the real wind pressure was really represented by that experienced on the windward side, *plus* the exhaust on the lee side. There was much difference of opinion with reference to wind pressure, the range over which it should be taken, &c.; and he thought that very few really understood the force of wind.

The PRESIDENT believed that the models before them to some extent represented the gasholders of the future, though all might not live to see them. Mr. Gadd had kindly attended the meeting at only a day's notice; and he had given a very interesting description of his invention.

Mr. GADD thought that the difference of pressure between a holder on his system and one on the ordinary plan would not be appreciable. Certainly in his case there was a slight lateral motion to overcome; but when the holder was floating in water like a ship, the force required for this would be very slight. A boat could be pulled along in still water with very small force, and twisted round with still less; and there was only the slight twisting action to be overcome in his holder. This might make it a trifle lighter in rising and a trifle heavier in falling; but he could say that it was so slight as to be quite inappreciable in the models, and he had tried one model 6 feet in diameter. It was simply a matter of the friction of the core of gas on the water and iron, and also of the part of the iron that was immersed on the water. As to the force of the wind, the Tay Bridge disaster showed our want of knowledge on the subject; but he had calculated on the data usually accepted by engineers. No doubt there was a violent wind action exerted over a small space at times. He thought his experiments showed that the degree of stability afforded by his plan was far greater than that of ordinary columns and guide-framing. He hoped before long to institute a series of tests, carried out to point of fracture, which would effectually determine this point. He would be quite satisfied to submit his system to any test of that kind, to see whether a greater force would be required to determine fracture than in the ordinary holder.

Mr. A. THOMAS (West Cowes) read the following description of

A PRESSURE-GAUGE HAVING NO FIXED JOINTS.

Pressure-gauges, as you are aware, although only small articles, are very important ones in gas-works. We frequently look at them as we pass from one part of the works to another, and become so used to seeing the water-line at about one height that I think if it altered only half an inch we should detect it. The pressure-gauge is the manager's friend, as it gives him timely warning of any coming stoppage. It is the "weather-glass" of a gas-works—the foreteller of coming trouble; and although the manager dreads the stoppage especially in winter, yet he is pleased to know of its approach before it actually takes place. What could we do without the pressure-gauge; and yet what appliance is there so frequently out of order. In saying this, I allude to gauges used for foul gas. How often has it occurred that, when some of the men have reported that something is wrong at the condenser or scrubber, or that gas is "blowing" at such a point, and we go to the gauge to find out what increase of pressure there is, we cannot even see the water in the glass, it being so foul. Then comes the scolding of the man whose place it is to keep the gauges clean; but all the scolding in the world does not rectify the matter. It must be cleaned; and how often the glasses are broken in doing so? Then a gauge has to be brought from some other part of the works, and valuable time is spent in removing and refixing. The question is asked, "Why is the gauge not kept clean?" and the real cause is found to be that the men dread the cleaning, as the glasses so frequently break with the least touch. I believe the men would prefer working up to their elbows in tar than have to clean some of the gauges in use at the present day; and the question with me has been, Why are gauges so complicated and delicately made?

The pressure-gauges of the present day that I have seen are altogether behind the times. Efforts have been made to beautify their outward appearance; but very little has been done to simplify them. Many of them are so tender that the least touch breaks them; and some will break even without a touch. So long as glass is fixed to brass or any other metal, just so long will the gauges be a trouble and a nuisance to both man and master.

Some years ago, when at Alton, I had a serious stoppage on the works; and when I went to the gauge to examine the pressure, the glass was so foul that I could not see the water-line, and trying to clean it in a hurry, as a matter of course, I broke it. It being necessary to know the pressure at once, I obtained a long bottle; and, putting a piece of glass tube into it, used it as a pressure-gauge, and from that I took my first idea of the gauge you have now before you. I do not for a moment claim that using two glass tubes, one inside the other is new, in whatever form they may be; but the general arrangement of the gauge, together with the rule being in the centre, acting for two gauges, is new—at least, the Patent Office admitted it was so, for they granted a patent for it. The gauge is made of glass tubes one inside the other. The brass mountings are steel

bronzed, or can be plated. The rule is made of boxwood; and the wooden back is polished.

I think with the ordinary gauges there are as many glasses broken by expansion and contraction of the metals surrounding them, as there are by the men when cleaning them; but in the case of the one before you, there is no possibility of breakage from undue expansion or contraction, for the reason that there are no *fixed joints*. What I have aimed at, in producing the present gauge, has been to do away with the trouble the ordinary gauges give in cleaning, and the risk of breakage when doing so. This I think you will admit, I have accomplished. Then, again, I have aimed at making a gauge that can be easily cleaned by an ordinary man or boy upon the works, and one that requires no skilled labour to fix. This I think you will also admit I have done.

The kind of gauge required for use in a gas-works where the pressure of crude gas has to be ascertained, is one that stands out bold and clear, and in which the water-line can be plainly seen. Such a gauge you have before you. We want a gauge that can be handed about without the fear of breakage—a something without the delicacy of the present style of gauge; so that, if it should be broken by accident, it can easily be repaired. Another thing about a gauge is that it should be so made that it can be taken from one place to another for use, if required, without any trouble in taking down or refixing; and with my gauge, all that it is necessary to do is to loosen the flexible tube, lift it from the nail, and it is ready for use in a moment where required.

While I am mentioning the fixing of gauges, I should like to say that when preparing the pipes for them, it is best to bring them up the walls on either side, and fix the tap below the gauge, and finish with a T 3 inches above the gauge, taking the supply from the side outlet, and fix a small tap upon the top of the T. If this is done, you will have a supply of air between the lower tap and the water in the glass tube, instead of crude gas; and if these taps are turned once a day, so as to allow the water to run level, the gauges will operate for a long time without getting discoloured, as you will have air only pressing upon the water. Nine inches of flexible tube is sufficient for each gauge.

Then another thing about a gauge is its cost. I am told that the price charged for 12-inch gauges and upwards is 1s. 6d. per inch. This, however, does not apply to gauges under 12 inches; for the one upon the table is a 6-inch, and cost, I believe, 14s. 6d. When you examine it, I do not think you will consider it is dear. It is a fair sample of an ordinary gauge, well made, and manufactured by a good firm; but there it is, both glasses are broken, and that without the help of man. It was broken by expansion or contraction while hanging in the office. I may say it broke itself; but, the one I bring before you to-day is not guilty of such tricks, for in it nothing is set fast, yet sufficiently fixed to produce a good, useful, and reliable gauge. As they are made chiefly for use where the pressure of crude gas has to be indicated, and where it is necessary to have both inlet and outlet before you, they are made in pairs, and commence at 12 inches, though shorter can be made if required for the inlet and outlet of governors, where excessive pressure is not likely to be met with.

The question of marking the rule has been raised. Some gentlemen think it should commence at the bottom, others that it should begin at the top. I have some made both ways, and have come to the conclusion that it would be better to mark them at the inches with the figures 10 to 20, and so on, from one end of the rule to the other. To have a zero upon a rule is a farce; for if you water the gauge to zero to-day, how long does it stay there. Which of us here can remember if the water was at zero when we left the works to attend this meeting, and which of us will complain if it is not at zero when we return. If the inch lines are carried across, and the half-inch lines half-way across, you then have all that is necessary for ordinary working purposes, without the tenths being upon the rule. I am now speaking of the manufacturing department. For "finished" gas, I admit that tenths are required; but as it costs nothing to put them on, perhaps it is as well to let them appear.

Discussion.

Mr. J. J. JERVIS (New Swindon) said he had pleasure in testifying to the efficiency of Mr. Thomas's gauge; having used one similar to it at his own works for the last six years. But he put india-rubber stoppers at the bottom of the large tubes in preference to making them solid. In this form the water was never blown out; and he would not think of returning to the old U-tube gauge. He exhibited the gauge referred to, which was made years ago from his own design.

Mr. H. G. CROWE (Wellington) remarked that he too had had a gauge on a similar principle, consisting of a glass tube immersed in an hydrometer glass, in use for some years. It was made by Mr. Lowe.

Mr. J. LOWE (Weymouth) thought that Mr. Thomas had put a new dress on a very old friend. He had known the principle for 25 years. About five years ago, he was induced to design a new gauge for his exhaustor-house; and he fell back on this plan, adopting with it the method of making a rubber joint for a steam-gauge. He had only used this arrangement (which he exhibited to the meeting) on the exhaustor. It consisted of an hydrometer glass, and an inner tube, kept in position by metal clamps, and graduated in inches. The gas supply was connected to this by the steam-joint above named. He preferred that the inner glass tube should be of the kind lately adopted for boilers; having an opaque half with a thin red line, as this clearly showed the water-level. The advantage of this form of gauge was that it showed the vacuum

as well as the pressure on the one tube. It could be very easily fixed, or made up to any length; and his was provided with an air-cock on the top. It was easily cleared; and he strongly recommended it as superior to the ordinary form of gauge.

Mr. S. W. DURKIN (Southampton) said he had tried one of Mr. Thomas's gauges, and used it in conjunction with one of the ordinary U-shape. With regard to the latter, he was occasionally troubled by the glass-tubes breaking. He connected up with rubber joints; and if the ordinary gauge had a plug at each end of the tube, there was not much difficulty in keeping it clean.

Mr. W. FIDDES (Bristol) said that this form of gauge was very old. One pattern, made of tin, would have been seen by many present. There was an outer cylinder 5 or 6 inches in diameter, and an inner tube; the gas being admitted to the space surrounding the tube. There was a float, having a wire pointer which extended above the inner tube, and worked in conjunction with an index, and also a little whistle which sounded when a certain pressure or exhaust was exceeded.

The PRESIDENT said that, while there was nothing new under the sun, Mr. Thomas had certainly shown an apparatus which was a great improvement on the ordinary form of gauge. One would hardly think a simple pressure-gauge could be the subject of so much discussion. With regard to the escape of gas in blowing, he observed that, in Mr. Lowe's arrangement, a very considerable quantity—enough to cause an explosion—could get out in this way. In the old gauge the tubes were smaller, so there would not be so much loss. Therefore the smaller the diameter of the centre tube, the better.

Mr. THOMAS was glad so much attention had been given to gauges, which had always seemed to him to be rather neglected. As to the principle, he had used it for the last 18 years or more; but having a little spare time lately, he devoted it to designing a simple and cheap form which could be easily cleaned and was not liable to be broken.

VOTES OF THANKS.

This being the last item on the programme of business,

Mr. LOWE said he was very pleased to propose a cordial vote of thanks to the gentlemen who had contributed to the proceedings at the meeting; and he would couple with the vote the name of Mr. Gadd, who had travelled a long distance in order to be present and explain his most interesting invention.

Mr. T. W. R. WHITE (Sherborne) seconded the proposition with pleasure, as the proceedings that day, he was sure, had furnished most useful information to all present. He had been pleased not only with the papers, but with the discussions, and the practical exposition given by Mr. Gadd, who also had greatly enhanced the interest attaching to his invention by the exhibition of models, which were so much more easy to understand than diagrams.

The proposition was unanimously carried.

Mr. GADD said that, as a visitor, he was pleased to respond on behalf of himself and those gentlemen who had contributed papers. It was a pleasure to him to be present; and he desired to acknowledge the courtesy and kindness he had received.

Mr. T. HARDICK (Salisbury) proposed a vote of thanks to the President for the energetic and able manner in which he had conducted the affairs of the Association during the past year.

Mr. CROWE seconded the proposition, which was agreed to.

The PRESIDENT, responding to the vote, said that he deeply felt the kindness of the Association, in the first place in putting him into the honourable position of President, and subsequently for the kind support extended to the very inefficient way in which he had carried out his duties. No one could exceed him in desiring the success of the Association; and he had endeavoured to secure it so far as his abilities would permit. If he had failed, it was not because he had not tried, and if he had succeeded, it was with the aid of the members generally. One duty he had to fulfil before sitting down, and that was to propose a very hearty vote of thanks to the Honorary Secretary and Treasurer, who was a right hand to the President. In fact, he thought the President was only a sort of ornamental head.

Mr. DURKIN seconded the motion, remarking that he was sure the Honorary Secretary had helped the Association on in every possible way.

The proposition having been carried,

Mr. HUMPHREYS replied, expressing his gratification at the kindly appreciation extended to his endeavours, and warning the members not to depend too much on their officers, but to bear in mind that the success of Associations such as these depended principally on the exertions of each member in attending the meetings whenever possible, in providing papers, taking part in the discussions, and suggesting subjects for consideration.

The meeting then terminated.

We learn from the *American Gaslight Journal* that a son of Mr. R. P. Spice, C.E., of Westminster, has been appointed Gas Inspector at Brooklyn, N.Y.

THE absconding Town Clerk of Salford (Mr. J. Graves) having been adjudicated bankrupt on the petition of a lady creditor for £818 6s., the first statutory meeting of creditors took place on the 25th ult., at the offices of the Official Receiver in Bankruptcy in Manchester. Proofs to the amount of £3805 had been lodged; among them being the £655 15s. 6d. claimed by the Corporation of Salford. A trustee was appointed, and a day fixed for the public examination. It was stated that if the debtor did not appear, a warrant would be applied for to arrest him.

THE LIGHT-GIVING POWER OF GERMAN CANDLES
OF VARIOUS MAKES.

A recent number of the *Journal des Usines a Gaz* contained the tabulated results of some experiments very carefully carried out by Herren A. Bunte and Scheithauer, with the object of ascertaining the illuminating power of various kinds of candles of German make. The figures given below show the conclusions arrived at by the experimenters, as far as regards stearine candles of the best quality (of which the characteristic is the perfect whiteness of the material), and paraffin candles of an opal-white colour. The heights

				Stearine Candles.				Paraffin Candles.			
Dimensions and weights—											
Length, in centimetres				28.6	25.7	19.00	25.6	28.0	29.6	24.0	24.0
Diameter, do.				2.0	2.0	2.40	2.1	2.0	2.1	2.0	2.0
Average weight, in grammes				79.1	74.9	77.86	78.6	78.1	96.1	70.3	70.3
Wicks and combustible material—											
Weight per metre, in grammes.				0.908	1.29	2.15	1.58	1.24	1.68	1.13	1.13
Fusion and solidification points, in centi- grade degrees				54°-56°	50°-51°	55°-58°	54°-56°	50°-53°	51°-56°	54°-56°	54°-56°
Consumption per hour, in grammes				8.576	9.636	10.89	9.84	9.57	10.36	8.46	8.46
Heights of flame, in millimetres—											
Maximum				50	51	78	60	57	63	63	63
Minimum				47	48	57	53	52	57	55	55
Ordinary				48	50	67	57	55	60	60	60
Luminous intensity in English candles—											
Maximum				1.18	1.28	2.10	1.20	1.33	1.40	1.50	1.50
Minimum				1.01	1.20	1.60	1.08	1.13	1.13	1.23	1.23
Mean				1.09	1.23	1.79	1.13	1.24	1.32	1.35	1.35
Consumption per candle per hour, in grammes				7.868	7.835	6.08	8.71	7.72	7.84	6.273	6.273
Number of candle-hours per kilogramme				127.000	127.600	164.00	114.80	129.50	127.40	159.400	159.400

A DISTRICT SURVEYOR ON THE SUPPLY
OF WATER.

At the last Annual Meeting of the Association of Municipal and Sanitary Engineers and Surveyors, held in London, a paper on the subject of "Water Supply" was presented by Mr. W. SANTO CRIMP, Assoc. M. Inst. C.E., F.G.S. The following is an abstract of the communication:—

The author commenced by saying that pure water is an absolute necessity for the domestic uses of mankind; and where persons congregate together in large towns, the problem of its supply is frequently one difficult of solution. The quantity necessary for the various uses of the community is the first aspect of the question. During the seven years 1880-7, the average volume of water supplied per head per day in London was 31.32 gallons; the maximum rate of supply was 34.53 gallons; and the minimum, 28.12 gallons. The maximum rate of supply is in the months of July and August; whilst the minimum is during December, January, February, and March. It will be observed that the mean rate of supply is exceeded by very nearly 10 per cent. during the summer; whilst in winter the consumption is about 10 per cent. below the mean. To be accurate, the range between the minimum and maximum is, as nearly as possible, 22 per cent.

Whilst an ample supply should be furnished, waste should be strenuously guarded against, since waste of water is waste of money; and indeed during periods of prolonged drought, serious inconvenience, if not actual disaster, may result from a want of care in husbanding the stores of water available for the use of man. The following table will show what has already been done by the adoption of the very excellent system for detecting waste devised by Mr. Deacon:—

Table of Water Supply to Towns.

Town.	Daily Supply before Waste was stopped, in Gallons per Head.	Present Supply in Gallons per Head.
Atherton	no record	11.4
Abergavenny	42.0	17.2
Bath	36.0	12.0
Birkenhead	24.0	17.7
Bolton	32.5	14.8
Bradford	22.5	14.3
Carlisle	42.5	24.0
Chelsea Water Company	40.0	16.0
Chorley	not known	7.8
Chester	31.0	13.5
Clevedon	40.0	20.0
Exeter	60.0	25.0
East London Water Company	26.5	16.1
Gloucester	32.0	17.0
Glasgow	51.3	40.8
Hereford	53.0	24.0
Hertford	38.5	17.5
Lambeth Water Company	35.0*	24.8†
Lancaster	51.3*	34.3†
Liverpool	33.5*	17.0†
New River Water Company	26.4†	14.0§
Norwich	40.0†	15.0§
Portsmouth	35.0†	18.3§
Southampton	60.0†	39.5§
Southwark and Vauxhall Water Com- pany	38.0†	22.2§
Stamford	24.0*	18.0†
Salisbury	50.0*	31.6†
Averages	38.6	20.13

* Intermittent. † Constant. § Exclusive of Trade.

The table shows that the proportion of waste is much higher than had been anticipated; and in towns of the ordinary class, 14 gallons only are used by each person daily, and allowing 6 gallons

of flame were measured by the Kruss method; and readings were taken every half minute during a quarter of an hour. The luminous intensity was ascertained by means of a Bunsen photometer; the unit of light being a Hefner-Altenack amyl-acetate lamp, equivalent, on an average, to the English candle. It will be seen from the figures how difficult it is to assign an exact light-giving value to a candle, of which the weight, hourly consumption, and luminous intensity vary (within very wide limits) with the make, and consequently render anything like effective comparison impossible.

for trade purposes, the total is 20 gallons per head per day. The consumption of water is not, as before pointed out, constant month by month. In the summer there is an increased demand on the mains for water for laying the dust on the streets, and for sewer-flushing, and other purposes. Then the water is not drawn from the mains at a regular rate throughout the whole 24 hours. During some of the night hours very little water is required, whilst in the forenoon water is constantly being drawn for domestic and other purposes. In laying down mains, therefore, not only must increase of population be provided for; but the main must be sufficient in size to admit of the maximum daily demand being satisfied. Disastrous results might follow on the breaking out of a fire during the hours of maximum draught, should the pressure not be maintained. If the mean yearly consumption be 20 gallons per head, 10 per cent. must be added for the summer requirements; making 22 gallons per head. Then this volume will be doubled during the hours of greatest consumption; hence the main must be capable of delivering about 44 gallons per head, if the generally approved system of "constant supply" be adopted.

The chief objections urged against the supply of water being "intermittent" are that the cisterns and other receptacles which are necessary for storing a day's supply, often become foul by reason of their position in the roof, under floors, or elsewhere, where they are difficult of access. Dr. Letheby stated, in giving evidence before the Rivers Pollution Commissioners, that the water drawn direct from the mains would be cooler and less liable to pollution, since the "receptacles of the poorer people were often close to privies, dirty cellars, &c." The chief objections to a constant supply (as recorded in the report of the Commissioners) were: (1) the leakage from fittings; (2) insufficiency of strength; (3) the greater consumption during the forenoon, rendering larger mains a necessity, and larger pumps where a service reservoir was not employed; (4) the greater draught in the forenoon reducing the pressure in the mains at the higher levels; (5) an accident to, or repair of a main, cutting off the house supply altogether, there being no house cisterns to keep up the supply. The Commissioners considered that a sufficient answer to these anticipated difficulties existed in the fact that at that date 72 towns had adopted the constant-supply system. Indeed, the better kind of fittings used with constant supplies had led to a great saving of water. The average supply per house per day of the 72 tabulated towns was 134.4 gallons, or about 24.4 gallons per head; whilst in the case of 24 towns—including London—supplied intermittently, 204 gallons were supplied to each house per day, or 37 gallons per head.

Turning to the general sources of water supply, the author said that the primary source is rain, and then went on to speak of the various modes of collecting it. The water yielded by gathering-grounds is frequently of a peaty colour, owing to the colouring matters in the dead plants being dissolved out just as ordinary water may be discoloured by placing in it a wisp of hay. The rains following prolonged droughts are specially affected; and means are sometimes adopted for the separation of highly coloured streams from the general supply. The vegetable organic matter is lessened by exposure to atmospheric oxidation in lakes and reservoirs; and, therefore, the larger these are in proportion to the water drawn from them, the purer will the water become. It has sometimes occurred that the soft waters collected in lakes and reservoirs possess the property of dissolving lead from the services by which it is taken from the mains into the houses. Loch Katrine water is especially active in this respect. The question was very fully examined by the Rivers Pollution Commissioners; and they arrived at the conclusion that, in order to secure immunity from attacks upon lead, it is necessary that these soft waters should contain a certain proportion of phosphate of lime. They also stated in their report that new untarnished lead pipes are acted upon much more violently than those which have been in use for some time; a protecting film soon being deposited upon

those surfaces in contact with the water. Pipes lined with tin in such a manner that the tin does not form an alloy with the lead, but remains pure, are not affected by the attacks of soft water. In the case of shallow well waters, the action upon lead and galvanized iron is in some instances of a continuous and violent kind. Such a case was that of the Oakfield well at Wimbledon, mentioned in the report referred to, in which an analysis of the water showed it to be deficient in carbonic acid, and wholly free from phosphates.

Returning to the "gathering-ground," the water falling as rain soon forms little streams. These unite as their courses tend to the lower levels, until low down the valley, their aggregation is seen in the roaring torrent, or the placidly flowing river. At what point in the valley should the water be intercepted? If there is a natural lake of sufficient size, its waters may be abstracted, or its area may be added to by means of an embankment or wall, should that course be necessary. If no lake exists, a natural one must be formed by means of a wall or an embankment; but in selecting the point for its construction, an accurate knowledge of the geological strata of the immediate locality must be ascertained. If the strata are of a rocky nature, with fissures, it may be necessary to carry the retaining medium to a very considerable depth, in order to prevent the escape of the water, and the possible destruction of the embankment. The bottom of the reservoir must also be made water-tight so far as is practicable; and very great care must be taken in the design of the outlet arrangements. In short, as the most disastrous results to life and property might follow the failure of a reservoir dam—as at Sheffield in 1864—it is impossible to exercise too much care in all the details affecting its design and construction.

Possibly the greatest difficulty in connection with proposed water-works of the kind under discussion is that of ascertaining the volume of water that will be yielded by a given gathering-ground, or watershed. If the surface is largely composed of steep, rocky, impervious formations, the water will be rapidly delivered into the valleys, with the retention by the surfaces of a comparatively small quantity. Should the area, on the other hand, be of a flat character, with much vegetation, large quantities of water will be retained by the plants, particularly in the case of thick deposits of peat; the water remaining in the pores of which, and on the various surfaces, evaporates on the cessation of the wet weather. Some of the water might also be lost by percolation, should porous strata be present. In the case of great chalk formations, it is rarely that any water flows off the surface. Dr. Dalton, who has given many years of study to the question of the volumes of water available for water supply proportionately to the rainfall of this country, states that the amount is about one-third of the total rainfall. At Loch Katrine in 1854, the rainfall for the year was 103 inches, four-fifths of which were discharged by the loch; one-fifth being lost by evaporation, percolation, and absorption. It will, however, be much more correct to assume that the losses through the various causes will be certain in amount yearly, than to calculate that it will be proportional to the rainfall. Dr. Pole estimated that the losses would vary from 12 to 18 inches in depth per annum, accordingly as the gathering-ground might be of steep impermeable rock, or of flatter permeable formations. In calculating the size necessary for a storage reservoir, the mean annual rainfall of the district in which it is to be situated must be ascertained; and as the yearly fluctuations of the rainfall are very considerable, provision must be made for impounding a supply sufficient for the wants of the community during periods of drought. Dr. Pole, in his work on "Water Supply," stated that, in the judgment of experienced practitioners, 150 days' storage should be provided in wet districts, and 200 days in dry. In very wet districts the storage to be provided might be less.

Objections have been frequently urged to the abstraction of raw river water for domestic supplies, in consequence of the fouling of the streams by sewage and by other matters. As diphtheria and typhoid fever are most readily communicated by means of water, every endeavour should be made to obtain a supply free from suspicion. Five of the London Water Companies take their supplies direct from the Thames; and, with the great improvements in the construction of filters during recent years, experience shows that such water may be rendered wholesome and fit for domestic purposes. Wimbledon is supplied by two of the Companies, and for years the death-rate has averaged about 12 per 1000; there being no wide fluctuations such as are indicative of defective sanitary conditions.

Referring to the filtration of water, the author said that the rate of filtration, to be effective, should not exceed $2\frac{1}{2}$ gallons per square foot of filter per hour, or 540 gallons per square yard per 24 hours. Subsidence of the suspended matters was desirable before the water was admitted to the filters, in order to prevent the pores of the filters being choked. The filters must be kept in a cleanly condition; the top inch or so of sand being periodically removed and replaced by clean sand. As the London water supply for the year 1886 averaged 80.47 gallons per head per day, each square foot of filter served for the filtration of the water required for two persons, or one acre would be necessary for 87,000 persons. As, however, portions of the filtering area were always undergoing cleaning operations, the area of filter actually provided was necessarily in excess of the estimated amount.

Passing on to consider the quality of water, the author said it must be remembered that water procured from wells was simply that portion of the rainfall which passed downwards through porous strata, and was stored in the crevices and pores of the various formations suitable for its reception. When the strata

passed through by the water were of limestone, a portion was dissolved; and waters derived from these formations were said to be hard—in other words, they contained various salts in solution, in consequence of which they had a harsh feeling when used for personal ablution, and much soap was destroyed in artificially softening them. He went on to explain that water is said to be "temporarily" hard, or "permanently" hard, according as the water may contain the bicarbonates of lime and magnesia, or the sulphates of the same minerals. The term "temporary" hardness is used because the water so hardened may be softened by boiling; the salts being decomposed into free carbonic acid and the carbonates of lime and magnesia, which latter are sparingly soluble. When water cannot be softened in this way—as when it is hardened by the sulphates of lime or magnesia—it is said to be "permanently" hard. All hard waters may be softened by distillation, as the salts will not pass over with the vapour; but water so softened has a flat, unpalatable taste, owing principally to the absence of carbonic acid gas, and to the presence of volatile organic matter. The remedy is to filter the distilled water through animal charcoal; but the process is a costly one. Water is commonly softened by boiling, and the separation of the hardening salts may be effected by constant ebullition for half an hour. The salts which are present as bicarbonates are decomposed into insoluble, or sparingly soluble, carbonates of lime, magnesia, or iron; carbonic acid gas being expelled by the process of boiling. Water so softened is frequently muddy, in consequence of the dissolved solids becoming changed into visible suspended matters. In order to raise the temperature of 1000 gallons of water to the boiling point, and to maintain it in this condition for half an hour, $2\frac{1}{2}$ cwt. of coal would be required. This method of softening water is therefore an expensive one. The process of softening water by means of lime, as devised by Dr. Clark, is the cheapest yet known, and is in extensive operation at many water-works situated on the great limestone formations. The process, however, is only applicable to those waters which owe their hardness to the carbonates of lime and magnesia; that is, to waters which are said to be temporarily hard. The chemical action is a simple one. The chalk or other hardening salt exists in water as a bicarbonate, which is soluble; lime is added to the water to be softened, and, combining with a portion of the free carbonic acid, forms carbonate of lime; the bicarbonate present in the water is decomposed—into carbonate also—by the withdrawal of a portion of the carbonic acid, and the water so treated becomes turbid from the production of nearly insoluble salts. Settling-tanks are provided in which the suspended solids may subside; and the softened water, as then distributed for use, contains only about 4° of hardness. Mechanical filters, as in the "Porter-Clark" process, have more recently been introduced for the purpose of separating the suspended solids produced; thus rendering unnecessary the settling-tanks at first used. Chalk water with $17\frac{1}{2}$ ° of hardness would contain 1 lb. of chalk in 400 gallons. In order to precipitate the chalk, 9 oz. of lime, dissolved in 40 gallons of water, would be necessary. The lime would combine with the free carbonic acid to produce 1 lb. of chalk also; and the precipitate would be 2 lbs. of chalk, assuming the chemical action to be complete. As 1 cwt. of lime only costs 8d., it is to the great benefit of the community that hard waters should be softened by means of this material at the works.

With regard to the internal distribution of water after its collection and filtration, the author thought this question was one which did not require to be considered at very great length. The sizes of the various subsidiary mains would, he said, be regulated by the probable demand. In his district, the smallest branch-mains used are 3 inches in diameter; this size being considered sufficient for the greatest demand likely to arise in the case of a fire breaking out in a side street. The mains should be jointed with lead only, if turned and bored joints were not used; as the use of tow or gaskin had led to the pollution of the water supply. This was notably the case in a main laid by the Southwark and Vauxhall Company in 1869. The mains must be furnished with the necessary valves, hydrants, and means for washing out. Pumping machinery should be provided in duplicate, in order to allow for a possible breakdown, should it be necessary to pump the required water. The service reservoir is a necessary adjunct of a water supply scheme, in order to regulate the fluctuations of the demand, and to contain a store for sudden emergencies. According to Dr. Pole, such reservoirs should contain from one to one and a half day's supply, and should be covered, in order to exclude dirt, and diminish the risks of pollution.

The author closed his communication with a few remarks on the prevention of waste; dwelling on the importance of the house fittings being of the best quality and type, and so arranged as to prevent contamination of the main supply. He pointed out that the regulations made under the Metropolis Water Act, 1871, were very valuable from a sanitary point of view; and in the hope that they might be of service to members of the Association, he included them in his paper.

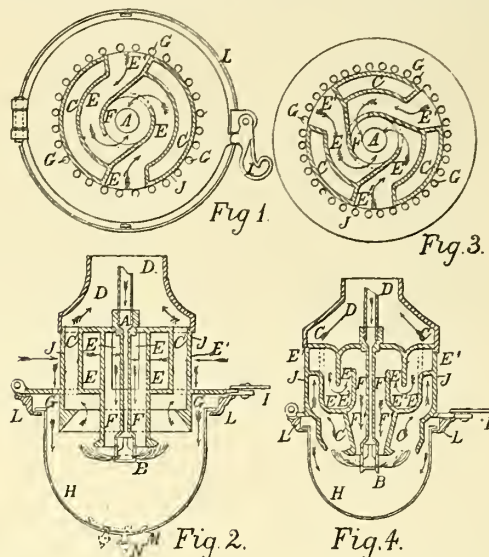
THE works of the Eye Gas Company have been let to Mr. T. Faulkner, formerly Manager of the Stowmarket Gas-Works, who will take possession on the 1st prox.

MR. E. D. WALKER, the present Chairman of the Gas Committee of the Darlington Corporation, who is retiring from the representation of one of the wards, has announced his decision to leave the Council at the end of the present month.

Register of Patents.

GAS-LAMPS.—Cole, H. W. and A. F., of Stourport. No. 11,669; Aug. 27, 1887. [8d.]

This invention relates to improvements in the construction of the air passages of regenerative gas-lamps, so as to render them applicable for ventilating and lighting purposes generally.



In figs. 1 and 2, the gas is arranged to pass down the pipe A to the burner B; and, issuing out through the holes of the burner, forms a round flame. The heat and products of combustion from the flame, on passing up the combustion chamber C to the chimney D, surround and impinge on the shoulders and walls of the hot-air chamber or box E, and also on the shoulders and around the hot-air passages E1; thereby highly heating the same. The air to supply the top side of the flame enters through the passages E1 round the circular or tangential passages in the chamber or box E, and down the centre tube F, to the top of the flame. The surface so exposed to the action of the flame highly heats the air on its course from the passages E1 to the burner B. Air is supplied to the under side of the flame through the air-holes G, in the usual manner; the air descending the sides of the glass H, and then rising heated to the flame. By the passages E being circular or tangential, a whirling motion is imparted to the heated air passing there-through; and the heated air being properly regulated, ensures practically perfect combustion, and a steady and brilliant light. The gas is lighted by moving the catch I, and opening the ring L, which holds the glass in position; or else by opening a plug or cover N, as shown in the bottom of the glass at M.

The lamp in figs. 1 and 2 is shown as having two circular or tangential hot-air passages; but the number and size of such passages will be varied according to the size of the lamp and the amount of heating surface required. For instance, in the lamp fig. 3, three passages are employed.

The centre tube F in fig. 2 is shown the same diameter throughout; but it may be made to partly taper, as in fig. 4 at F1, or made taper its whole length.

In the modification fig. 4, a hot-air chamber or box E is used, which is heated in the same manner as the lamp in figs. 1, 2, and 3; and it is supplied with air through the passages E1 into the chamber or box E. The air, as it is being heated, takes a circular course, in the direction of the arrows, through the chamber or box E, down the centre tube F, to the burner B. The tube F is by preference tapered as shown at F1; and a few holes can be drilled at E2, if desirable, to admit more air to the tube F, and also to prevent dust accumulating. Air passes through the holes G to supply the underside of the flame with air; and the heat from the flame passes up the combustion chamber C to the chimney D. The number and size of the air passages E1, supplying the chamber or box E with air, will be varied according to the size of the lamp.

GAS-ENGINES.—Day, C., of Sheffield. No. 13,916; Oct. 13, 1887. [8d.]

This invention relates to improvements in gas-engines of single or twin-cylinder type, using a practically homogeneous mixture of air and gas, and working on the four-cycle principle.

It has for its object, first, to enable the residual gases of combustion to be wholly swept out of the working cylinder, by a "scavenger" charge of pure air, whilst the working piston is making its exhaust stroke. For this purpose, there is combined with the working cylinder, an air pump working in such manner that the delivery of air therefrom to the working cylinder takes place coincidently with the discharge of waste gases during the exhaust stroke of the working piston; the air being delivered from the pump to the cylinder directly in front of the working piston in such a direction as to force out of the working cylinder as much as possible of the residual gases of the previous explosion, so that there shall only remain in the cylinder pure air to be mixed with the next incoming charge of gas and air. To this end the air-pump cylinder is in connection with the working cylinder through an ordinary lift discharge-valve which may either be lightly loaded and open automatically, or be worked by suitable gear. The scavenger charge of air is forced, under slight pressure, into the working cylinder, preferably through the working piston itself, which has for that purpose a passage through its back end in communication (by a longitudinal groove in its side) with the port leading from the air-pump discharge-valve. By this means, the gases of combustion will be expelled through the exhaust-valve of the working cylinder, partly by the working piston and partly by the scavenger charge, which is forced into the working cylinder during the exhaust stroke in such a way as to carry before it,

and expel from the cylinder, the residual gases from the previous explosion. By this means the combustion chamber will contain at the end of the exhaust-stroke nearly pure air instead of gases of combustion. To ensure the intimate and homogeneous mixture of the inhaled charge of combustible gas and air with the air remaining in the combustion chamber from the previous scavenger charge, the inlet port of the combustion chamber is covered with a fine rose, through which the charge passes (at a high velocity) in fine jets directed towards different parts of the combustion chamber; the resulting explosive mixture being thus practically homogeneous.

The invention has, secondly, for its object to regulate the speed of the engine in which a scavenger charge of pure air is used. As the combustion chamber contains only pure (or nearly pure) air at the commencement of the inhaling stroke, the inhaled combustible charge must be more than usually rich in gas in order that the gas and air—including the residual scavenger charge—may be present in the proper proportions in the cylinder to constitute an efficient firing mixture. When the maximum power of the engine is required, the explosive mixture is relatively rich; and in order that the speed may be regulated within certain limits, the engine is made to automatically reduce the quantity of gas, or of air and gas, inhaled. Before, however, the mixture in the cylinder becomes so impoverished that it will not fire with good effect, the engine is made to cut off the gas supply entirely; and the engine will then, without loss, miss fire by the exhaustion of unexploded gas, until the speed of the engine is reduced sufficiently, whereupon the normal working will be resumed.

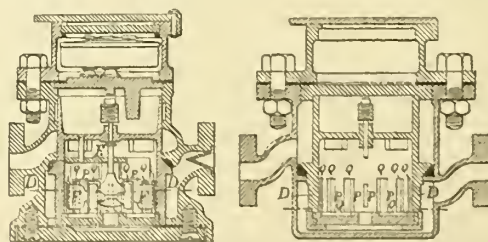
SOFTENING AND PURIFYING WATER.—Porter, J. H. and G., of Queen Victoria Street, London, and Porter, J., of Leicester. No. 13,943; Oct. 14, 1887. [8d.]

This invention is designed primarily to facilitate the adoption of Clark's process for the softening and purification of water for the supply of towns, in the same way as at present available on a small scale.

In carrying out the process for the water supply of towns, such as Canterbury, Caterham, and other places, large reservoirs or tanks (each capable of containing one day's consumption) are necessary, by reason of the many hours required for the clearing of the water by the precipitation and subsidence of the finely-divided chalk and other matters produced in the process. In lieu of such large duplicate reservoirs or tanks, the patentees propose to employ one of smaller dimensions, or utilize a portion only of a large storage reservoir, and expedite and perfect the clearing of the chalky water by causing it to pass into a series of filtering partitions extending across the reservoir or tank. To construct these filtering partitions in an economical manner, and to admit of the convenient cleansing of the filtering surfaces and of their renewal when necessary, a series of wires or rods under tensile strain are stretched across the reservoir or tank, with upright supports at intervals to maintain the wires or rods in a horizontal position. On one or both sides of the skeleton thus provided, there is placed a backing of matting or fabric, metallic or textile; and this is secured to the wires or rods with a covering of filtering cloth arranged for easy removal when desired. In this way the inner fabric serves to convey through its interstices or channels, or by what may be called capillary action or attraction, the clear water that, having deposited the chalk or other matter in suspension upon the surfaces of the outer cloths, has passed through them to the inner sides. The lower edges of the inner matting are confined between the lips or flanges of an outlet channel or pipe; and, where the top of the partition is below the surface of the water in the reservoir or tank, the filtration may be expedited by connecting the outlet-pipe with the suction of a pump.

LIQUID-METERS.—Tylor, J. J., of Newgate Street, London. No. 14,652; Oct. 27, 1887. [8d.]

This invention relates to inferential liquid-meters; and has special reference to the kind of meter described in patent No. 10,443 of 1885. The object of the invention is to provide means whereby the range of correct registration of meters of this kind is increased beyond what can be obtained by any form of brake heretofore used, and to increase the sensitiveness of the meters themselves. Illustrations are given of two vertical sectional elevations of meter cases constructed in accordance with the present improvements.



The invention consists, firstly, in forming the internal surface of the circular chamber D, in which the registering fan or wheel F revolves, with a series of alternate projections P, and hollows or grooves Q, which retain the outer layer of water in the fan chamber D, in such a manner that it has a retarding or brake-like effect upon the revolving wheel or fan F, whereby the latter is prevented from moving at a speed which is inconsistent with the quantity of water passing through the meter. The projections and hollows may either be formed on the cylindrical sides of the chamber D, as shown at P' Q', or on the bottom, as at P1 Q1, or on both sides and bottom; and they may be placed in a vertical or radial direction, or at any suitable angle with reference to the direction of the stream of water. Meters constructed in this way enable the current of liquid passing through the meter to act centrally upon the measuring fan, whereby the side action, and consequent wear and tear on the toe-pieces, occurring the meters with oval cases having only two brake surfaces is obviated; the brake action due to the projections and hollows being equal at every point of the circumference. The measuring fans of meters so constructed may also be run much faster, it is claimed, and with less noise than those of meters as ordinarily made; and this

increased speed of the measuring fan gives a greater range of correct registration.

The invention consists, secondly, in forming the parts of the registering fan or wheel F near the axis, so that each part slopes alternately in an opposite direction. In this way the tendency of the fan to be raised off its toe-piece, or to be pressed down thereon by reason of all the parts of the blades near the axis being sloped in one direction, is obviated.

APPLICATIONS FOR LETTERS PATENT.

13,651.—LUTSCHAUNIG, A., and WARREN, H. N., "Improvements in or relating to gas lighting." Sept. 21.

13,696.—SCOTT, C. H., "Improvements in brick-kilns fired by gas." Sept. 22.

PATENTS WHICH HAVE BECOME VOID.

[AFTER THE FOURTH YEAR.]

9033.—CAINK, T.—"Lighting gas, &c."

9065.—SALISBURY, S. C., "Making of gas."

9072.—BOYD, R. W., "Gas or oil stove."

9084.—BOULT, A. J. (Hanlon), "Illuminating gas."

THE PUBLIC LIGHTING OF BROMLEY.—At a meeting of the Bromley Local Board last Thursday, it was decided to erect twelve additional lamps, to be lighted with oil, as an experiment.

THE PRICE OF GAS IN THE MANCHESTER OUT-DISTRICTS.—At the meeting of the Newton Heath Local Board of Health last Thursday, the Chairman (Mr. J. M. Elliott) reported that, as representing the Board, he attended a meeting of Local Authorities held at the Grand Hotel, Manchester, on the previous day, as to the price of gas supplied by Manchester to districts beyond the city. It was stated that the Manchester Corporation last year made a profit of £70,727 out of the supply of gas, to which the out-districts contributed £26,550. The whole of the £70,727 went to Manchester, and no portion was returned to the out-townships. It was contended that a fair and equitable charge would be 2s. 3d. per 1000 cubic feet in Manchester, and 2s. 6d. outside; and at these rates there would remain a considerable profit in favour of Manchester. The meeting decided to wait upon the Corporation by deputation, with the view of arriving at a mutual and satisfactory arrangement.

NORTHERN COAL TRADE.—The northern coal trade continues active, except in the steam coal branch. At this season of the year, steam coal usually begins to show signs of falling off in the demand. At present about 7s. 6d. is the current price for best qualities. In gas coal the inquiry is growing, and many of the largest collieries find that the amount needed is more than at this season of any previous year. The demand for gas for fuel and power is being extended; and this, coupled with the increased quantity needed for lighting purposes, causes an additional inquiry for gas coal as a whole. There was no change in the price last week. Manufacturing coal is very firm, and most of the contracts which expire are renewed at advances varying from 3d. to 6d. per ton, according to the lowness or otherwise of the price in the current contracts. The bunkering coal trade is stronger; but prices do not rise for this class of coal as for manufacturing and gas coal. The demand for coke of all classes increases, especially for blast-furnaces and cement works.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.—According to the accounts presented to the shareholders of the above Company at their half-yearly meeting last Saturday, the total income for the six months ending June 30 last, including the balance of interest on the invested funds, amounted to £119,084, against an expenditure, including debenture interest, of £83,250; leaving a net profit of £35,834. Adding to this sum the balance of £1325 brought forward, there was £37,159 available for division. The Directors recommended dividends of 10½ and 7½ per cent. per annum on the respective shares, payment of which would absorb £35,725; leaving a balance of £2434 to be carried forward. Compared with the corresponding period of 1887, there was an increase of £1762 in the receipts for gas, and of £1981 in those for tar and ammoniacal liquor; but the value of coke having considerably decreased, there was a loss of £1476 under this head. The amount of coal carbonized during the six months was 58,431 tons; and the quantity of gas made was 610,960,000 cubic feet. Of which 532,688,000 cubic feet were sold. The residuals were: Coke, 70,366 chaldrons; breeze, 1954 chaldrons; tar, 593,946 gallons; ammoniacal liquor, 1,493,308 gallons. Of the tar, 12,236 gallons were utilized in the manufacture of gas.

THE TYNEMOUTH CORPORATION AND ELECTRIC LIGHTING.—At a recent meeting of the Watch Committee of the Tynemouth Town Council, letters on the subject of electric lighting were read from the Local Government Board, the Clerk to the Barnet Local Board, and several of the electric lighting companies. It was resolved that the matter should be left in the hands of the Watch Committee, with the addition of two members of the Council, for them to report to the Council; the Borough Engineer in the meantime to prepare a plan showing the public buildings in the vicinity of the market which it had been suggested should be lighted by the electric light. A special meeting of the Town Council has been convened by the Mayor (Mr. G. Dodds) for Thursday next, for the purpose of considering, and, if so ordered, of adopting a resolution approving of the intention of the Council, as the Local Authority under the Electric Lighting Act, to apply to the Board of Trade for a Provisional Order to authorize the supply of electricity for public and private purposes within their district, and also to consider the terms of the Order. The question of extending the electric light in the borough is one that is now engrossing public attention, and the outcome of the special meeting of the Council is awaited with considerable interest.

TORQUAY GAS COMPANY.—At the half-yearly meeting of this Company held last Thursday, at the Company's new offices, Torquay, under the presidency of Mr. W. H. Kitson, the Chairman, it was stated that the receipts for the half year amounted to £11,189, and the expenditure to £7155; leaving a balance of £4034. The Chairman having welcomed the shareholders to the Company's new premises, alluded to the accounts; remarking that the Company was in a much better position now than it had been for some time—the balance in hand after paying the dividend being £1081, as against a few shillings. There was an increase of nearly £1000 in the sale of gas. He then spoke in defence of the Directors on the question of allowing a discount to the Local Board on the gas consumed for public lighting—a matter which had been the subject of some correspondence; and showed, from statistics, that in the majority of towns throughout the country the authorities were charged at the same rate as the private consumers. He also proved that although the amount allowed to be charged by Act of Parliament was 5s. 6d. per 1000 cubic feet, the Directors had always kept the price as low as possible—3s. 6d. being the present charge. He moved the payment of dividends at the rates of 10 and 7 per cent. per annum; and the proposal was adopted.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

MODIFICATION OF HARCOURT'S COLOUR TEST.—GAS ANALYSIS.

SIR,—I have read Mr. Leicester Greville's article on the above subject published in this week's JOURNAL.

Shortly he remarks: (1) That there is no connection between my apparatus and Mr. Harcourt's. (2) My methods are simply those already well known to chemists. (3) The determination of ammonia by means of passing a known quantity of gas through test acid is in daily use as the Referees' test; that the direct passage of the gas through the solution makes this a rough test, which is only practically available where the proportion of ammonia is comparatively large. (4) The estimation of carbonic acid by means of barium hydrate is a well-known method. (5) The process for the estimation of sulphuretted hydrogen is open to very grave objection, owing to the well-known solubility of the gas in aqueous solutions. (6) With regard to temperature and pressure corrections in determinations of this character, he must confess to have as a rule ignored them, as the modes of operation are not, in his opinion, sufficiently correct to necessitate such refinement, and Mr. Hicks obtained 6½ inches exhaust from using two tubes, which is really unnecessary.

In reply, I may say: (1) That the platinized pumice bulb and the test-glasses are the same as used by Mr. Harcourt; but the methods of using them are certainly not like his. Does Mr. Greville really think that an unskilled person can more easily judge the colour of solutions to be of the same tint, or discriminate between a strong contrast such as red and blue or a colourless liquid and a bright red liquid? (2) The test solutions are not in general use, they being gas normal solutions; and the method of using these solutions in the test-glasses is new, as far as I am aware. (3) The first part of this is answered by No. 2; and as to the direct passage of the gas through the solution in fine bubbles, I am of opinion that it must be better than passing the gas through beads wetted with the acid. (4) Mr. Greville makes no objection to the test for carbonic acid. (5) I must distinctly state that the water in which the acetate of lead is dissolved has but little retaining effect on the sulphuretted hydrogen, to prove which I have made the following experiment:—I placed in the test-glass B (which is employed for sulphuretted hydrogen) an amount of distilled water equal to the acetate of lead solution usually used (about 70 cc.). I then connected it to the inlet of the purifiers, and to the aspirator; but before I had time to open the tap of the aspirator, two or three small bubbles of gas passed through the water (due to the pressure in the main), and the lead paper was immediately discoloured. (6) Mr. Greville must please himself about these corrections; but I might state that the variations due to temperature and pressure are greater than those due to the use of aqueous solutions. I have tried a great many experiments with this apparatus, and have found that two vessels are necessary. I have worked with Mr. Sheard's apparatus for carbonic acid (which I consider a most perfect test) against mine with one vessel and with two. With one the result was nearly a third less than with Mr. Sheard's; but with two glasses both results were the same. I might add that the current of gas should be slow, especially with the sulphuretted hydrogen test.

The last paragraph of Mr. Greville's article may be taken as the key to the whole. He says in effect that my apparatus does not come up to his modification of Harcourt's colour test? This, however, is only a matter of opinion from a not unprejudiced source, which each reader of the JOURNAL will better decide for himself.

In reply to Mr. Whieldon's letter, also published in this week's JOURNAL, I may say that, now he has explained what a "slight under-pressure" means, this can be done by lowering the water in the neck. The 0.3 per cent. of ammonia mentioned in the article was, as stated, an assumed figure taken for illustration, and not as a positive; hence Mr. Whieldon's mistake.

Further, he remarks that the effect of surface contact with the water is to vitiate the tests; and, again, he does not see the use of corrections for temperature and pressure. This is very fast and loose. If he really thinks corrections are needed for surface contact with water, how much more so for temperature and pressure, where the range of error is greater and more uncertain? While for water contact, if any error exists, it can be correctly ascertained and allowed for; the maximum quantity of gases absorbed by water having been already stated by Mr. Whieldon.

In conclusion, I may say that the results obtained by my bottle have been carefully checked by those from Mr. Wanklyn's; and in every case they have agreed. This does not bear out Mr. Whieldon's opinion that the results by my apparatus would be practically valueless.

I may say with regard to the cost of the apparatus, which Mr. Whieldon says is of no consequence, that to the Commercial Gas Company this may be so, as doubtless they can afford, and may possess whatever they desire without reference to cost; but while this may be of no very great consequence to them, to private individuals or small companies, who are compelled to study economy in small matters, I think it is of the utmost importance.

Ramsgate, Sept. 28, 1888.

WILLIAM G. HICKS.

THE PUBLIC LIGHTING OF EXETER.—The Exeter Gas Company, replying to the Town Council's request to determine the existing contract for lighting the public lamps at Michaelmas, said the Directors were willing to have a yearly contract as heretofore, or would enter into a contract for seven years for the whole of the lighting area of the city, at 2s. 9d. per 1000 cubic feet, provided the Council would use lamps of a higher power for the principal streets; the basis of the old agreement to remain in other respects the same as before. It was mentioned that a communication had been received from the Defries Safety Lamp Company, informing the Council that they were prepared to tender for supplying as many of the Company's lamps as might be required, including all labour, for £2 12s. per lamp per annum; the lamps to be alight from sunset to sunrise. The Surveyor was requested to obtain a sample lamp, and any other lamp he might consider suitable, and report to the Committee. After some discussion, it was decided to accept a contract with the Gas Company for another year.

Miscellaneous News.

COMMERCIAL GAS COMPANY.

The following is the report of the Directors of this Company, which, with the accounts for the half year ending June 30 last (the principal portions of which are given below), will be presented at the ordinary general meeting of the proprietors to be held on Friday next:—

The revenue account shows a net profit for the half year of £52,166 9s. ; making, with £1044 1s. 3d. received for interest, £53,210 10s. 3d. This, added to the amount brought forward from previous half years, makes £97,293 3s. 9d. Deducting therefrom £2727 15s. 4d. for interest on debenture stock, there remains standing to the credit of the net revenue account a balance of £94,565 8s. 5d., of which, having regard to the sliding scale and the price of gas charged during the half year, £44,800 is available for dividend. The Directors recommend the payment of dividends at the

rates of £13 15s. per cent. per annum upon the old stock of the Company, and of £10 15s. per cent. per annum upon the new stock, both less income-tax. The balance of the net revenue, £49,765 8s. 5d., will be carried forward to the next half year.

The accounts accompanying the report consist of the usual statements ; those relating to the capital of the undertaking (Nos. 1 to 3) showing only one change as compared with the preceding half year. The statement of capital stock (No. 1) stands as it did on Dec. 31 last—viz., £680,000 paid up, out of a total of £830,000 authorized. The statement of loan capital (No. 2) also stands as before—viz., £121,234 borrowed, out of £300,000 authorized. The total capital called up at the end of the past half year was, therefore, £801,234. The capital account (No. 3) shows a total expenditure of £808,098 19s. 1d., of which £2037 19s. 1d. was laid out on new works, mains and services, meters, and stoves in the six months covered by the report. The amount by which this account has been over-drawn has, therefore, been increased from £4826, on Dec. 31 last, to £6864 19s. 1d. The remaining statements are as follows:—

No. 4.—REVENUE ACCOUNT.

To Manufacture of gas—	
Coals, including dues, carriage, unloading, and trimming (see account No. 8)	£57,694 12 7
Salaries of Engineers, Superintendents, and other Officers at works	1,993 9 8
Wages (carbonizing)	13,498 17 8
Purification, including £1293 2s. 9d. for labour	2,919 0 9
Repairs and maintenance of plant and works, materials and labour (less £246 0s. 10d. received for old materials)	9,866 9 9
Distribution of gas—	
Salaries and wages of Officers (including Rental Clerks)	£2,195 17 0
Repairs, maintenance, and renewals of mains, service-pipes, and fittings, including labour	1,648 13 2
Repairs and renewals of meters and stoves	1,656 15 5
Public lamps—	
Lighting and repairing	5,501 5 7
Rent, rates, and taxes	2,102 2 6
Management—	
Directors' allowance	4,890 19 3
Company's Auditors	983 17 11
Salaries of Secretary, Accountant, and Clerks	75 0 0
Collectors' salaries and commission	1,039 9 6
Stationery and printing	1,576 2 3
General charges	391 6 4
	559 1 2
Bad debts	20 7 8
Law charges	923 14 8
Superannuations	98 5 0
Official officers	
	£105,141 17 10
Balance carried to profit and loss, net revenue account (No. 5)	52,166 9 0
	£157,308 6 10

By Sale of gas—	
Common gas, per meter, at 2s. 6d. per 1000 cubic feet	£107,911 19 1
Public lighting and under contracts, common gas	9,035 19 1
(See statement No. 10.)	
	£116,947 18 2
Meter-rental	£2,291 9 10
Stove-rental	404 0 9
	2,695 10 7
Residual products—	
Coke, less £2655 6s. 10d. for labour	£21,768 13 6
Breeze, less £343 14s. 3d. for labour	498 14 9
Tar	5,526 3 6
Ammoniacal liquor and sulphate	9,819 14 3
	37,523 6 0
Miscellaneous receipts—	
Rents	£117 12 1
Transfer fees	24 0 0
	141 12 1
	£157,308 6 10

No. 5.—PROFIT AND LOSS (NET REVENUE ACCOUNT).

Interest on debenture stock	£2,727 15 4
Balance available for dividend, carried to balance-sheet	94,565 8 5
	£97,293 3 9
Balance, Dec. 31, 1887	£88,032 13 6
Less amount of dividend paid for half year ending Dec. 31, 1887	43,950 0 0
	£44,082 13 6
Balance from revenue account (No. 4)	52,166 9 0
Dividends and interest	1,044 1 3
	£97,293 3 9

No. 6.—RESERVE FUND.

Balance on June 30, 1888	£44,379 5 1
Balance on Dec. 31, 1887	£44,379 5 1

No. 7.—INSURANCE FUND.

Balance on June 30, 1888	£34,000 0 0
Balance on Dec. 31, 1887	£34,000 0 0

No. 8.—STATEMENT OF COALS.

Description of Coal.	In Store, Dec. 31, 1887.	Received during the Half Year.	Carbonized during the Half Year.	In Store, June 30, 1888.
	Tons.	Tons.	Tons.	Tons.
Common	26,897	87,576	92,654	21,809
Cancl	1,233	4,857	3,426	2,674
	28,120	92,443	96,080	24,483

No. 9.—STATEMENT OF RESIDUAL PRODUCTS.

	In Store, Dec. 31, 1887.	Made during the Half Year.	Used during the Half Year.	Sold during the Half Year.	In Store, June 30, 1888.
Coke—chaldrons of 35 bushels*	5,533	125,788	86,208	94,980	133
Breeze do. do.	1,065	11,461	—	13,393	133
Tar—gallons	156,800	991,424	—	984,824	163,400
Ammon. liq.—butts of 108 gals.	5,107	35,370	36,376	—	4,801

* Under "Weights and Measures Act, 1878."

No. 10.—STATEMENT OF GAS MADE, SOLD, ETC.

Description of Gas.	Quantity Made, Meter Register.	QUANTITY SOLD.			Quantity used on Works, &c.	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lights.
		Public Lights and under Contracts (estimated).	Private Lights (per Meter).	Total Quantity Sold.				
Common	Thousands. 977,908	Thousands. 55,365	Thousands. 863,303	Thousands. 918,668	Thousands. 10,767	Thousands. 929,425	Thousands. 48,483	5,072

BALANCE-SHEET.

To Net Revenue—	
For balance, per account No. 5	£94,565 8 5
Reserve Fund—	
For balance, per account No. 6	44,379 5 1
Insurance Fund—	
For balance, per account No. 7	34,000 0 0
Unclaimed dividends	1,811 12 9
Deposits	8,061 9 7
Interest on debenture stock	164 8 2
Sundry tradesmen and others, for amount due for coals, stores, and sundries	11,608 14 6
	£195,185 18 6
By Capital—	
For balance, per account No. 3	£6,864 19 1
Cash at Bankers	28,576 13 9
Cash in hand for current expenditure	1,300 0 0
Amount invested in Consols	78,879 5 1
Stores in hand—	
Coals	£16,228 0 0
Coke and breeze	45 0 0
Ammoniacal liquor and tar	7,641 3 9
Sundries	5,805 9 2
	29,719 12 11
Accounts due to the Company—	
Gas-rental, quarter ending June 30, 1888	£43,121 16 11
Arrears outstanding	1,822 11 8
	44,944 8 2
For coke and other residual products	£4,956 6 9
Sundries	444 12 9
	5,400 19 6
	£195,185 18 6

OTTOMAN GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Tuesday, at the London Offices, No. 9, Queen Street Place, E.C.—Mr. E. HORNER in the chair.

The SECRETARY (Mr. A. J. King) read the notice convening the meeting; and the Directors' report, and the accounts for the half year ending June 30, reference to which was made in the JOURNAL last week, were taken as read.

The CHAIRMAN, in moving—"That the report of the Directors be received and adopted," referred briefly to the position of the concern. He thought the shareholders would find from the accounts that the Company had not gone back in any way; but, on the contrary, that they were quite as sound—perhaps rather more so—than they were at the close of the June half of 1887. The most important feature was that they had £1258 more cash in hand than they had at the end of the corresponding period. This he considered exceedingly satisfactory. The wages and materials had cost about the same. The item of lamp-lighting was £36 less. Salaries and office expenses had cost them £285 less. He called attention to these things to show that great pains were taken by their Engineer and Manager (Mr. H. W. Andrews) to do the best that was possible for the Company at Smyrna. On public lights they had received £147 more; but the payments by general consumers were unfortunately £54 less. The other items all stood very well indeed. The gas made per ton of coal amounted to 10,308 cubic feet; and the unaccounted-for gas was 8½ per cent. He thought they might congratulate themselves on the way in which the concern was going on, notwithstanding the very depressed state of affairs in the East, especially in Smyrna. Great credit was doubtless due to their officers for this condition of things.

Mr. A. J. DOVE seconded the motion, and it was carried.

The CHAIRMAN next moved the declaration of a dividend at the rate of 7 per cent. per annum on both classes of shares, free of income tax.

Mr. A. CLARKE seconded the motion, which was agreed to.

The CHAIRMAN, in proposing a vote of thanks to the officers of the Company, said that it was perfectly clear that great difficulties occurred in such a place as Smyrna. Mr. Andrews had recently had very arduous circumstances to contend with. Only lately he had been twice back from Smyrna on the Company's affairs. The Directors, seeing that he had done so much for the Company, had determined at their meeting that morning to present him with £100.

Mr. A. CLARKE seconded the proposition; and it was heartily acquiesced in by the shareholders.

Mr. ANDREWS, in reply, said it afforded him great pleasure to be at the meeting. He was returning to Smyrna the next day; and he should, especially after the substantial manner in which the shareholders had acknowledged his services, start back with renewed vigour and energy. Alluding to the position of the Company, he said he thought they would all like a little more dividend; but Smyrna had, as the Chairman had mentioned, been passing through a most depressed time. However, there was no doubt that the tide had now turned. It was true that the consumers' rental was somewhat reduced; but he confidently hoped they would overcome this little difficulty. It was a source of great happiness to him to receive the approval of the shareholders; and the Board had always treated him with the greatest kindness and cordiality. Of their Secretary (Mr. King) he could not say a word too much. The 15 years he (Mr. Andrews) had been connected with the Company seemed a long term; but Mr. King had been with the Company longer.

Mr. SHAND moved a vote of thanks to the Chairman and Directors, and expressed great satisfaction at the economies which had been introduced by Mr. Andrews.

Mr. R. L. ANDREWS seconded the motion, which was carried *nem. con.*

The CHAIRMAN acknowledged the vote, and the proceedings terminated.

HARROW DISTRICT GAS COMPANY.

The Half-Yearly General Meeting of this Company was held at Harrow on Monday last week—Mr. J. GLAISHER, F.R.S., in the chair.

The ENGINEER and SECRETARY (Mr. J. L. Chapman) read the notice convening the meeting, and the report and accounts, which were referred to in the JOURNAL for the 11th ult. were presented.

The CHAIRMAN, in moving the adoption of the report, said if the shareholders compared the balance-sheet with that for the corresponding half of 1887, they would see how similar they were, both as to the creditor and the debtor sides. It implied great uniformity of work—a uniformity more than he liked, for the progress was not such as one might expect in a suburban district like theirs. In other districts, gas companies had doubled their work in about ten years; but they had not done so, although they had been in existence fifteen years. What could be the reason? What blighting influence was at work in their beautiful district of Harrow: for beautiful it was. When there was the talk of the Metropolitan Railway coming to Harrow how often he spoke to the shareholders about the change that was to take place. The railway had come, but the hope that he had indulged in was a "hope deferred." Still he did not despair. It was impossible for so beautiful a district not to improve. In looking to see whether there was any progress, he considered first the consumption of coal, and took it for four half years. In 1885 it was 1265 tons; in 1886, 1308 tons; in 1887, 1388 tons; and now it was 1394 tons. This showed only 6 tons increase over the corresponding half of last year; but still it was an increase. At this rate, he would not see the figures doubled in his time. There was, however, an indication in the balance-sheet that they were in progress. Then as to the price of coals, he found that in 1885 they paid 18s. 2d. per ton; in 1886, 18s. 3d.; in 1887, 17s. 9d.; and now it was 17s. 8d. This was very important to them; and the Directors would keep their eyes open, and see if they could not purchase it at a still cheaper rate. They obtained more gas from their coals last year than they did previously, and the leakage was less; so that there were several indications that they were progressing. Their desire was to bring down the price of their gas to please everybody, or at any rate the majority; and this they would do as soon as it was in their power. They had to contend with the electric light, though he did not think it was very important. It was a luxury indulged in by those to whom money was no object. But it happened that money was an object to most people; and therefore most people could not have the electric light. Then there was petroleum. This was a nice light, but it gave a good deal of trouble. When people took up petroleum they were generally pleased with it at first; but the trouble it necessitated soon caused an alteration in their feelings. Gas, on the other hand, was extremely convenient, and caused no trouble whatever to the consumer. Then they had to contend with their residuals. Their coke in 1885 realized £312; in 1886, £355; in 1887, £373; and in 1888, £370. He was rather surprised at the falling off; but they were in a difficulty at the present moment because there was a great quantity being sent over to the north side from the south side of London; the figures in respect of tar were: 1885, £131; 1886, £104; 1887, £38; and 1888, £53. All their tar was now used on the works; and by doing this they saved coke, for which they

received more money. For their ammonia they realized twice as much as they did in 1885. Taking the totals of all the residuals, they had £485 in 1885, £520 in 1886, £490 in 1887, and £510 in 1888. Therefore, viewing the balance-sheet critically, as he had endeavoured to do, he was more hopeful after examination than he was before. He was at first rather depressed, but when he looked at the several items he was cheered again. He afterwards asked himself, "Had they earned the dividend?" Yes. "Did they do it last year?" No; they had to draw on their undivided balance. This confirmed the hopeful view he took after examining the accounts carefully. Some cheering news had been given him that morning, when he was told by one of his brother Directors that six or seven of his large houses had recently been let in Harrow. This was what he wanted to see. If every house was taken in the place, there would be a greater demand for gas, and the Company's prospects would be improved. Though not prospering at the rate of similar undertakings, the Company had in it success; and he hoped before long the hope that had been indulged in for so many years would be realized.

The DEPUTY-CHAIRMAN (Mr. John Chapman) seconded the motion, remarking that he quite agreed with what Mr. Glaisher had said especially with the hopeful part of his speech, when he referred to the houses that had recently been let in Harrow. Certainly things began to look a little brighter. He agreed with their worthy Chairman that such a beautiful place as Harrow ought not to have so many empty houses. Notwithstanding the threatening circumstances around them, he trusted that they would yet see Harrow prosperous and happy. He was sorry the report did not show a more flourishing state of affairs; but he hoped it was a stepping-stone to something brighter in the future.

Mr. BROADBERRY referred to the differential prices charged by the Company, which he thought were likely to cause unpleasantness. As soon as the accounts would allow it, he hoped the Company would fix one general price for their gas.

The CHAIRMAN said the subject had been before the Directors several times; and as soon as they could clearly see their way to do it, it would be done. At present, however, they must "cut their coat according to their cloth."

The motion was then carried.

Subsequently dividends were declared as follows:—7½ per cent. on the original capital, 7 per cent. on the first additional capital, and 5½ per cent. on the second additional capital, all less income-tax.

On the motion of Mr. C. HORSLEY, J.P., seconded by Mr. A. H. BAYNES, F.R.A.S., a vote of thanks was unanimously passed to the Engineer and Secretary and to the Auditors.

Mr. J. L. CHAPMAN, in responding, said that he was extremely glad that the shareholders were pleased with the balance-sheet. With petroleum sold in the streets, it was not so easy as in the days gone by to carry on their works; but he believed with the Chairman that oil had only a passing popularity. The Chinese Government, he noticed, were striving at the present time to prevent the importation of kerosene into the country, as having a more deleterious effect than the opium traffic. He did not think it would suit the public taste long in this country. They had held their own better, he thought, than they could have expected. He trusted that with the reduced price of gas they would get more consumers, and so be enabled to go ahead more rapidly than they had done in the past.

Mr. J. RANDALL, in responding for the Auditors, said it was always a pleasure to go over the accounts; the only thing he regretted was that the figures were not larger. He could tell the shareholders that the price of oil was likely to go up; and that would be better for them, for they would have less to compete against. Let them reduce the price of gas as much and as soon as they could. Their progress was slow, but it was sure.

Mr. BROADBERRY then moved a vote of thanks to the Chairman and Directors for their able conduct of the business of the Company.

Mr. NOWAKOWSKI seconded the motion, and it was carried unanimously. The CHAIRMAN briefly acknowledged the compliment, and the proceedings terminated.

SHREWSBURY GAS COMPANY.

The Annual General Meeting of this Company was held last Thursday—Mr. A. G. BROOKES in the chair.

The SECRETARY and MANAGER (Mr. W. Belton, Assoc. M. Inst. C.E.) having read the notice convening the meeting, the report of the Directors was taken as read. It stated that the available balance of profit amounted to £5564 17s. 9d., out of which the Directors recommended that the authorized dividend should be declared. There was a small increase in the consumption of gas during the year, and also a slight improvement in the returns for residuals. The unaccounted-for gas was 4·38 per cent. The reserve fund now amounts to £6876 4s. 7d. and is invested in 2½ per cent. Consols. The Directors have deemed it advisable to revise the prices charged for the rental of meters, and have reduced them to about half the amount hitherto charged; the reduction to take effect from June last.

The CHAIRMAN, in moving the adoption of the report, said it was satisfactory that the Company would not have to raise more capital for some time, because they had a considerable balance in hand and the expenditure was very low. The shareholders would observe that there had been an increase of rather more than 2 per cent. in the sale of gas during the year; the total quantity consumed being 115½ million cubic feet. The unaccounted-for gas had only been 4·38 per cent.; and it spoke well for the admirable way in which the works were conducted that the loss should be so small. He had been in the habit of reading the JOURNAL OF GAS LIGHTING, and found that there were very few gas companies in England who could boast of so small a loss. The sale of residuals had improved; but the price had been low for some years. Notwithstanding this, they had managed to survive difficulties. With regard to the reductions they had made in the rental of meters, alluded to in the report, they amounted to about one-half the amount the Company had formerly charged; and the Directors believed that this concession, which gave the consumers about £250, would be a source of general satisfaction. They had the more pleasure in making these reductions because it greatly relieved the smaller consumers, whom he thought the Company would be always willing to help. It was of much consequence to them, as the shareholders would agree with him when he mentioned the fact that occasionally in a quarterly payment the charge for a meter was sometimes greater than for the gas itself. He was sure, therefore, that this concession would meet with their approbation quite as much as any action of the Directors on their behalf. He thought he could fairly congratulate them upon the excellent condition of their property, and the prospects of continued success. They had an increasing reserve, which at present amounted to more than £6876, and the balance of profit was increasing. Taking these matters into consideration, he thought the shareholders would agree that the position of the Company was most satisfactory.

Mr. HUMPHREYS, in seconding the motion, said it gave great pleasure to the Directors—and he was sure also to the shareholders—that they were able to render so satisfactory an account of their stewardship. As the

Chairman had remarked, it was stated in the report that they intended to make considerable reductions in the rental of meters, which was highly satisfactory. Whilst protecting their own interests, they were enabled at the same time to further the interests of the public in general, not only by the reduction in the charges for meters, but also by other prospective reductions in the price of gas itself.

The motion was carried unanimously.

A dividend at the rate of 7½ per cent. per annum was then declared.

The retiring Directors and Auditor having been re-elected,

A cordial vote of thanks was accorded to the Chairman and Directors for the able manner they had conducted the affairs of the Company.

The CHAIRMAN, in acknowledging the compliment, said he was not surprised at the success of the Company when he took into consideration the admirable management they had. In his candid opinion, he believed that as a Manager in every capacity Mr. Belton could not be surpassed. To him, therefore, was the credit due.

Mr. BENTLEY then proposed a vote of thanks to Mr. Belton; referring in flattering terms to the manner his duties had been discharged.

Mr. BOWEN seconded the motion, and it was cordially agreed to.

Mr. BELTON having returned thanks, the services of the Auditors were suitably acknowledged, and the proceedings closed.

THE RISE AND PROGRESS OF THE SOUTHAMPTON GAS COMPANY.

In a recent edition of the *Southern Echo* there appeared an article containing an interesting account of the rise and progress of the Southampton Gas Company, from which we take the following particulars:—The works were originally in the hands of Messrs. Barlow Bros., who disposed of the property to the Company in 1823, when the district could not boast of more than 14,000 or 15,000 inhabitants. As may well be supposed, the extent of the works and the character of the manufacturing processes employed were very different from what they are at the present day. The area was restricted, and the plant crude; and consequently the operations were costly. It appears that the supply to the consumers was regulated by the class of burner selected and the number of hours the gas was used. For an Argand burner the annual cost of gas ranged from £3 to £8; for a similar burner of larger size, the annual cost ranged from £4 to £10 10s.; for a small burner, used in a passage or fanlight, the charge was £3, £3 10s., or £6, according to the number of hours; for a batwing or "tulip" burner, out of doors, the price was £5 if used from dusk till eleven o'clock, £5 16s. 8d. if used till twelve o'clock, and £10 if kept alight till sunrise. Where the gas was consumed either on Sunday or in the morning, one-sixth was added to the price. Persons whose consumption was irregular were recommended by Messrs. Barlow to be supplied by measure, at the rate of 15s. per 1000 cubic feet. The terms of payment were very exacting; all consumers being required to engage a burner for twelve months, and to make their payments in advance. The proprietors would not supply gas unless the burners were fixed by themselves and paid for, together with the fittings and pipes running into the house. On Saturday night the lights were allowed to burn till eleven o'clock without additional charge to the consumer. "The regulations of Messrs. Barlow might," says the writer of the article, "have been practicable in the days of our forefathers, but they wear a ludicrous aspect when compared with our modern notions of the law of supply and demand. Under such conditions, it was natural that gas should not occupy a very prominent place in the regard of the public." When the undertaking passed into the hands of the Southampton Gas Company, economies were periodically introduced, until the Directors were able, in 1886, to reduce the price of gas to the limit of 4s. 6d. per 1000 cubic feet, and now 3s. is charged in the town. The population stands at about 70,000; and the Company own mains which, in the aggregate, are nearly 100 miles in length. Gas is not only supplied to Southampton proper, but to the outlying districts. In these the Company now charge 3s. 6d. per 1000 cubic feet, or 2s. below the maximum price allowed by Parliament. They served 1314 public lamps, and have a total of nearly 5500 consumers on their books. The Company became incorporated in the year 1848; additional powers being obtained in 1865 and 1876. The total authorized capital, share and loan, is £286,660, of which £189,858 of the share capital has been paid up. The Company have also availed themselves of their borrowing powers to the extent of £96,660, and have realized £19,424 in the shape of premiums on the sale of shares by public auction. There has of late years been an enormous increase in the quantity of gas sold. In December, 1849, the works were capable of producing in 24 hours 116,000 cubic feet of gas. In the corresponding month of 1887, 1½ million cubic feet of gas were produced. This great increase will represent the gradual progress made by the Company, especially in regard to their works. It cannot be said, however, that the income of the Company has augmented to an extent corresponding with the opening out of new districts. The writer then proceeds to give a description of the Company's works.

THE LUTON CORPORATION AND THE GAS AND WATER WORKS.—A special meeting of the Luton Town Council was held last Friday to receive the report of the Committee appointed to consider the advisability of the Corporation purchasing the water and gas works. The Committee were not in a position to make any recommendation with regard to the gas undertaking; but, after considering the figures placed before them concerning the water-works, the Council resolved to take the necessary steps to purchase the concern.

A QUESTION OF PUBLIC LIGHTING IN NORTH WALES.—The ratepayers of Rhoslanerchrugog, near Ruabon, had an exciting debate last Wednesday evening on the subject of lighting the streets with gas. The matter occupied the attention of the Vestry in June last year; but no decision was come to—the question being ordered to stand over for a year. There was a pretty general agreement among the assembled ratepayers on Wednesday as to the necessity of having lights in the main thoroughfares; and the Gas Company had expressed their willingness to act liberally with the parties. It was estimated that 40 lamps, in addition to those in front of some of the shops, and a large one promised by the Company, would be sufficient; and for these the charge would be £80 per annum. This, according to the rateable value, would entail a rate of 2½d. in the pound, or, with the cost of collection, perhaps 3d. This, it was considered, the ratepayers would not be able to bear in addition to the present taxation. It was contended by some speakers that the 40 lamps proposed would be altogether inadequate; while others maintained that they would be in excess of the requirements of the place. After much confused discussion, a motion was submitted to defer the matter for another year. To this an amendment was moved to adjourn it for a fortnight. The proceedings at this point became uproarious—conflicting resolutions of various kinds being made with bewildering haste, and the opposition party showing signs of great excitement. Eventually the motion was carried by a majority of 40; and thus the town will be left in darkness for another twelvemonth.

BIRMINGHAM CORPORATION GAS SUPPLY.

WORKMEN'S HOLIDAYS.—INCREASE OF SALARIES OF OFFICIALS.

At the Meeting of the Birmingham Town Council to-day, the Gas Committee will present the following report:—The Gas Committee report that the memorialists for holidays to workmen have been informed that holidays will in future be granted as follows:—A holiday of one week (equal to 6½ days) in each year, during the summer months, to the firemen, stokers, machinemens, coke wheelers, coal trimmers, coal wheelers, and odd men—such men being described as carbonizers, or men working in the retort-houses—who have been employed not less than ten months in the year ending June 30; it being understood that such holiday is to be an actual holiday or rest from work, and that no money compensation is to be paid in lieu thereof. A holiday on Christmas day, Whit Monday, and the first Monday in August, or other days in lieu thereof, to all workmen who have been in the direct employment of the department for three months continuously prior to each holiday, other than the carbonizers, to whom the previous regulation applies; it being understood that such holiday is to be an actual holiday or rest from work, and that no money compensation is to be paid in lieu thereof. The annual cost of these holidays is estimated at £580. In compliance with a minute of the Council, the Committee report the salaries of officials of the department which have been increased during the present year. [Among these are, Mr. E. Smith, Secretary, from £1000 to £1250; Mr. W. H. Powell, Assistant-Secretary, from £250 to £300; and Mr. Charles Hunt, Engineer, from £950 to £1200; the remainder being small advances to various clerks.] The cost of repair of meters for the half year ended June 30 last was £2870 8s. 9d., and the number repaired was 4514. The quantity of coke in stock on Sept. 20 was 1072 tons, as against 469 tons at the corresponding period of last year. The quantity of gas sold in the quarter ended June 30 was 618,980,900 cubic feet, as against 594,663,600 cubic feet in the corresponding quarter of 1887; being an increase of 24,317,300 cubic feet, or a little over 4 per cent. The number of new services laid during the quarter ended June 30 was 371, as against 344 in the corresponding quarter of 1887, being an increase of 27.

LEICESTER CORPORATION GAS SUPPLY.

HALF-YEARLY REPORT OF THE GAS COMMITTEE.—REDUCTION OF METER-RENTS.—INCREASE OF THE ENGINEER'S SALARY.

At the Meeting of the Leicester Town Council last Tuesday—the Mayor (Mr. T. Wright) in the chair—the half-yearly report of the Gas Committee was presented. The Committee reported that the net profit of the undertaking, after payment of interest on the capital, for the six months ending June 30 last, was £14,881 17s. 8d., of which £2520 had been paid as the amount of the sinking fund for the same period. The net amount realized by the manufacture of residual products was £6841 10s. 2d., and by the gas-fitting business £447 4s. 2d. During the half year, 43,099 tons of coal were carbonized; the quantity of gas made being 437,494,000 cubic feet, as against 425,050,000 cubic feet for the corresponding half of last year, or an increase of 2·92 per cent. The average illuminating power of the gas had been a little more than 3 sperm candles in excess of the parliamentary standard. The new chemical works in the Aylestone Road were working in a most satisfactory manner, having been in full operation for upwards of twelve months. The extension of the Aylestone Road works was progressing satisfactorily; and there was every probability of the new works being completed within three years from the commencement, as anticipated. The Committee have had under consideration the question of making some reduction in the scale of charges for the use of meters. Those chiefly used by consumers were 3-light; and the Committee recommended that the rents of these should be reduced from 1s. to 8d. per quarter, which would represent a reduction of about £1000 a year in the income of the department. They had received an application from Mr. A. Colson, Assoc. M. Inst. C.E., the Engineer and Manager, for an increase of salary; and, having regard to the satisfactory manner in which he had, during a service of nearly six years, discharged his duties, and considering the increased work and responsibilities, they recommended that his salary be increased by £150 per annum.

Alderman Wood, in moving the adoption of the financial portion of the report, said it was a matter of increasing gratification to the Council that the profits of the Gas Department showed such continued progress. The profit of the half year just closed was the largest ever realized, except in two cases, since the works had been under the control of the Corporation. If they considered the fact that the price of chemicals now was only something like half of what it was in 1881, when in no single year up to that were they able to announce for a whole year a profit equal to that of the past half year, it would be seen that the present result was exceptionally gratifying. The half-year's working showed a net profit of £12,361 17s. 8d., against £9759 10s. 10d. for the half year ending June 30, 1887, or an increase of £2602 6s. 10d. This had not been obtained by any great saving in the price of coal. The average price had been the same as in the corresponding period of last year; but they had spent £500 more on coal, and had produced from it £1900 more revenue. This was very satisfactory; and he thought it right to say it was due, in a measure, to the full working of the regenerative furnaces which had come into operation entirely during the half year, and which had enabled the Engineer to produce so much more gas from a given quantity of coal. They had spent during the half year £120 more in purification. One significant fact was that, although they had had this increased revenue and larger demand upon the department, the wages had been less by £95. The works had been fully maintained. They had spent £4394 in repairs and maintenance, against £3370 in the preceding half year; so that the Council could judge that the works were kept in a thoroughly efficient condition. One unfortunate item of expenditure was the increased charge for rates and taxes. The Council were aware that a few months ago the assessment was raised in St. Mary's parish; and this would become a burden on the department to the extent of £1200 a year. The total revenue during the half year was £64,201, against £58,901; showing an increase of £5300. After deducting the extra charges, they had a net increase of profit of £2602. The sources from which the profit was derived were as follows:—The consumption of gas had increased nearly 3 per cent.; and they had realized £1963 more for gas than last year. From the rental of meters and stoves they gained £49 more; and from the sale of coke and breeze, £514 more. But the chief item of increase had come from the chemical works; the advance there being £2578. He wished to impress upon the Council the fact that this was not due to any material rise in the value of the products, but simply to the better plant they had to manufacture with, and the careful supervision of Mr. Colson, the Engineer, who had had this department entirely under his control. The gas-fittings department had brought an increased profit of £134. They had spent on the extension works during the half year £12,555; upon new mains (which meant extensions of mains) £1480; and on new meters, £417—making a total expenditure on capital account of £14,461. Consequently their interest charges were growing every half year. But in spite of this the general result of the department was very gratifying. One item which would materially affect the balance submitted to the Council was the stock. He thought it was well that he

should assure the Council that the stock-taking was done in the most careful and generous manner; and he believed there was a very large reserve fund in that stock. They had now completed 10 years of the working of the Gas Department; and he said it was a tribute to those gentlemen who took a leading part in prevailing on the Council and the town to purchase the gas-works (Alderman Windley and Winterton, and the late Alderman Grimsley). During this period the Corporation had realized a net profit of £210,000, £5000 of which had been placed to a reserve fund, £15,000 to the gas renewal fund, £28,560 to a sinking fund, and £146,700 had been handed to the Borough Treasurer in reduction of the rates.

Mr. LENNARD seconded the motion. He said he was not sure it was the best thing for the town and Council that these enormous profits should be made, because perhaps they were not so carefully spent by other departments as they would be if the money came directly from the rates. But whilst the present policy was sanctioned by the Council, it was the duty of the management to make the best they could of it. He should like to see some reduction made very soon in the price of gas, which would to a certain extent curtail the profits. But during the next two or three years they would have to spend £80,000 or £90,000 of capital, which would cost upwards of £3000 a year for interest, and would not bring in a penny of revenue. After this expenditure had been incurred—say, in five years—they would begin to reap a very much larger profit than they were doing now, because they would be working on enlarged premises, which would cost them about a third of the capital of the present premises, and then he thought the question of price should again claim attention. He confirmed the Chairman's statement as to the liberal method of taking the stock, and said that the happy result of the half-year's working was arrived at through the new works, the skill and close attention of the Engineer, and to the loyalty and hearty co-operation of the whole staff.

Alderman BENNETT said the return for every ton of coal carbonized was greater in Leicester than anywhere else in the country; and the difference produced by working up the residuals and selling them had, owing to the skill in which it was done, resulted in a profit of £7000 during the year.

Mr. G. GREEN expressed his appreciation of the work of the Gas Committee and the management, but reminded the Council that when they took over the gas-works it was thought they would ease themselves of a great deal of what was then paid as dividend to the shareholders. But now they not only paid the premium they had, but also that upon the purchase of the lease and the interest on the capital, besides providing a sinking fund which would repay the capital in 50 years; and beyond this they earned a profit of something like 20 per cent. He protested that the profits were much too large; and if in five years' time they were going to increase the profits, it was indirect taxation. It fell heavily on the great bulk of the consumers. On every £1 they paid for gas, there was 4s. profit; and he submitted that some relief should be given in less than five years. The trifling relief of £1000 proposed to be allowed on meter-rents was not worth considering.

The MAYOR called attention to the fact that the greater part of the last speech had been devoted to a question which was not now before the Council. Unless there was some definite motion to alter the system of dividing the profits, the discussion of the subject was irregular.

Alderman KEMPSON pointed out that a great portion of the profits was devoted to reducing the rates, and therefore the ratepayers derived the benefit.

Alderman WINDLEY thought they should not find fault with the one department of the Corporation which was doing good to the town. The gas-works more than realized the expectation of those who took them over; and the desire of the Committee had always been to obtain the best plant and the most economical and skilful management. If the result of this was to produce large profits, it was a matter for congratulation. At the same time the subject of profits had engaged the attention of the Committee at their last meeting. The question of lighting all the courts of the town would not be overlooked; and it was also suggested that a considerably improved method of lighting many of the streets might be adopted, at a lower rate to the Corporation than the ordinary charge.

Alderman WOOD said the fact had been lost sight of that reductions had been made from time to time in the price of gas, on the recommendation of the Committee. Whilst £146,000 had been applied to the lowering of the borough rate, about an equal sum had been applied in the reduction of the price of gas. It was, however, a fair matter of consideration to see in what direction—and possibly in favour of the consumer—they could make some alteration; and this matter would not escape the attention of the Committee. He hoped also that the Committee would see their way to improving the lighting of the town by reducing the charge for the public lamps.

The motion was then adopted.

Alderman WOOD then moved that the rent of 3-light gas-meters be reduced from 1s. to 8d. per quarter; remarking that this would entail an annual cost to the Gas Department of about £1000. At various ward meetings in the town it had been repeatedly suggested that the meter question should receive attention; and, after considering it for five or six months, the Committee had arrived at a unanimous recommendation. They had 14,735 of these meters on hire, which cost the department about 6d. each per annum for repair, and about 2d. each for removal and re-removal. This was a cost of about 8d. per meter to the ratepayers; leaving a net revenue of about 3s. 4d. each per annum. By the proposed reduction the net rent for this class of meters would be 2s., which would compare favourably with the rents paid for the larger descriptions of meters. A great deal might be said in favour of retaining the rent at the old price; but the Council should consider that the consumers using 3-light meters were working men, who deserved whatever remission could possibly be made.

Mr. LENNARD seconded the motion.

Alderman BENNETT opposed the recommendation, observing that if the object were to secure the popularity of the masses at the expense of the remainder of the ratepayers generally, no simpler plan could have been adopted; but this was the last consideration which would actuate Alderman Wood and those co-operating with him. He feared, however, that they did not appreciate the actual facts of the case. Out of the 14,735 3-light meters, a large number were rented outside the borough; and the cost of fixing varied from 1s. 6d. to 5s., according to distance. Many of these consumers lived in small houses, at weekly rents. It was the duty of the Council to consider the interests of the ratepayers as a whole; but the suggestion now made seemed lacking in fairness. They proposed to reduce the rent of the 3-light meters to a little over 9 per cent. Whilst, during the past few years, they had reduced the price of gas 8d. per 1000 cubic feet, he thought it exceedingly unfair to limit the benefit now proposed to one section of the community, who would not appreciate it.

Mr. LENNARD denied that the Committee desired to obtain popularity in the manner suggested. They had been brought face to face with a gross anomaly as regards the charges for meters. Of the 19,000 odd meters out on hire, 14,735 were 3-light meters, which had paid them 19 per cent., as against 10 per cent. received from the 5-light meters; and what was

now proposed was to place both classes on the same basis. There were two or three alternative policies, one of which was not to charge anything for the meters, as was done at Birmingham and in Glasgow. But in this case the extra cost must be placed on the price of gas; and if they were to sink this revenue of £4300, and throw it on to the gas, the cost would thereby be increased 1d. per 1000 cubic feet. He regarded the course proposed as a wise one; seeing that meters were simply trade utensils used in the business of the department. So far from the smaller consumers being benefited at the expense of the larger ones, he contended that the smaller ones paid a portion of the expense which should fall on the latter. As, however, the Committee were not prepared to abolish the charges altogether, the next best thing was to charge a reasonable rate; and he, for one, regarded 10 per cent. as a good return. He pointed out that while the renters of the 3-light meters paid rates indirectly through their rents, they did not directly receive the benefits of the gas profits, seeing that at least 10,000 of the 14,000 houses of this class were compounded for. Consequently, as the landlords received the benefits and the tenants gained nothing, the reduction now proposed would go to those who most needed it. As to the statement that residents outside the borough would be put to greater expense and have to pay a large sum for fixing, it should be remembered that they also paid an additional 4d. per 1000 cubic feet for their gas. For all these reasons, he failed to see why the Council should any longer make an unfair use of the monopoly vested in them.

An amendment to the effect that the meter-rents should be reduced to 6d. each was proposed and seconded; but, on Alderman Wood stating that the question would probably be considered in Committee on a larger basis, it was withdrawn, and the motion carried unanimously.

Alderman WOOD next moved that the salary of Mr. A. Colson, the Engineer and Manager of the gas-works, be increased by £150 per annum. He said that in making this recommendation the Committee felt they were only proposing a simple act of justice to one who had devoted the whole of his ability and energy to the welfare of the Gas Department. Mr. Colson entered the service of the Corporation about six years since; and 2½ years ago he received an advance of £150 per annum in his salary. When he was appointed Gas Engineer in succession to Mr. Robinson, he simply took over the control of the gas manufacture. Before he had been with them very long, it was found necessary to make an extension of the retort-house and erect new chemical works, the responsibility of which he accepted; and he had carried out the work most satisfactorily, without a single accident, or an error in the estimates. Since that time they had embarked on further extensions, which would ultimately cost £150,000, and which had so far been solely superintended by Mr. Colson in a most satisfactory manner. It should also be mentioned that some 18 months ago Mr. Colson voluntarily took over the management of the Chemical Department in succession to Mr. Tunbridge, who resigned. This department also had been most satisfactorily managed; the results being greater than were ever before realized. In view of these responsibilities, the Committee felt that the application made for an increase of salary was a just one; and it received their unanimous recommendation. Having spoken further in testimony of the devotion to duty displayed by Mr. Colson, the speaker expressed a hope that the increase would be sanctioned with equal unanimity.

Mr. LENNARD, in seconding the motion, pointed out that the members of the Council were recently, on the occasion of their visit, afforded an opportunity of judging for themselves as to the success of the works and the ability of the Manager. It should also be remembered that in connection with the new works, which involved an expenditure of £150,000 or £160,000, he had saved £6000 or £7000 as architect and engineer. Under these circumstances, he trusted the recommendation would be adopted.

The motion was carried unanimously.

COVENTRY CORPORATION GAS SUPPLY.

REDUCTION IN THE PRICE OF GAS.

At the Meeting of the Coventry City Council last Tuesday—the DEPUTY-MAYOR (Alderman Maycock) presiding—a report was presented by the Gas Committee, recommending that, as from the 30th ult., the price of gas should be reduced within the municipal boundary from 3s. to 2s. 9d. per 1000 cubic feet, and outside the boundary from 3s., 3s. 6d., 4s., and 4s. 6d., to 3s., 3s. 3d., and 3s. 9d., according to the distance from the city. To large consumers consuming from 200,000 to 300,000 cubic feet per quarter, an abatement of 1d. per 1000 cubic feet to be allowed; to consumers of 300,000 to 400,000 feet, an abatement of 2d. per 1000; and to consumers of above 400,000 feet, 3d. per 1000.

Mr. ANDREWS, the Chairman of the Committee, in moving the adoption of the report, said he thought every member of the Council was aware that their investment in the purchase of the gas undertaking had turned out to be a great financial success; so much so, indeed, that the last report showed that, after meeting all the instalments of the sinking fund, there remained a surplus profit of no less than £5600 on fifteen months' trading. It was estimated that during the current year, if the amount of gas consumed in Coventry was the same as during the preceding twelve months, the surplus profit would be about £3000 after paying all expenses. The question arose as to the method they should adopt in dealing with the surplus. They could not do as they pleased with it, because they were bound by the Coventry Corporation Gas Act, which prescribed exactly what they were to do with it. They had the choice of three alternatives. They might reduce the price of gas; or increase the annual payments on account of the sinking fund, so as to complete the purchase of the works in a shorter period than the 60 years prescribed by the Act; or they might apply the profits in the relief of the general district rate. But there was this difference between the methods—that if they allowed the matter to go on until the end of the year, to be dealt with at that time, the Act compelled them to let the whole of the profits go to the district rate fund. So that if the Committee wished to reduce the price of gas, the matter must not be allowed to drift, but must be dealt with in advance. This was the reason of the present report. The Committee were of opinion that the gas consumers, who had provided them with so handsome a surplus, had the first claim upon their consideration. The new tariff was based upon the broad principle that those citizens who had taken upon themselves the responsibility of the purchase of the gas-works, and who had risked their finances and property in so doing, were entitled to have the gas at a cheaper rate than outsiders, who had taken no immediate, and would bear no share of future, responsibility. It was therefore proposed to make the price of gas rather lower in the city than outside. In other words, under the new tariff, no premises would be entitled to be supplied with gas at the lower rate, unless they were also charged with the district rate. The existing gas tariff was the result of growth during a long period, and was full of anomalies. The proposed tariff was a much simpler one; and, as far as possible, an attempt was made to remedy existing anomalies. It provided that the price of gas within the municipal boundary should for the future be 2s. 9d., and outside 3s. 3d. per 1000 cubic feet—a difference of 6d. There were, however, two exceptions to this rule, one being that three small outlying districts which used a small quantity of gas, and which required a long length of main to supply them, would under the new tariff pay an

additional 6d.; making 3s. 9d. per 1000 cubic feet. At present two of these districts paid 4s. 6d., and the other 4s.; so that there would be a reduction of 3d. in one case and 9d. in the other two. In the other there would be no reduction there; the inhabitants of the places concerned would pay the same price as at present—3s.—because the Committee believed it would be impolitic to advance the price anywhere. As to the concession to be allowed to large consumers, at present when a consumer burned more than 500,000 cubic feet in a quarter, a concession of 2d. per 1000 cubic feet was made. A very large quantity of gas was at present consumed in manufactories—to a much greater extent than most people were aware of. The Committee believed that, in a large manufacturing city like Coventry, cheap gas was a necessity to their manufacturers, in order to enable them to maintain their position against competition elsewhere—that, in fact, cheap gas was one of the necessities of modern civilization. Therefore an increased concession was proposed to be made to large manufacturers. Instead of granting them the old reduction of 2d. per 1000 cubic feet when in any single quarter they happened to consume more than 500,000 cubic feet, it was proposed when they consumed 200,000 cubic feet to make them an allowance of 1d. if they did not exceed 300,000 cubic feet; on between 300,000 and 400,000 cubic feet, 2d.; and on 400,000 cubic feet and upwards, 3d. Another object in these concessions was to hold their ground against the competition which had lately been introduced in the form of Dowson gas—a cheaper kind of gas which could be used by the Coventry manufacturers in the same way as coal gas. One firm had already introduced the new gas—manufacturing it themselves—with the result that there was an enormous decrease in the quantity they consumed from the gas-works. It was believed that by granting further concessions to the manufacturers who used large quantities of gas, they would succeed in throwing the balance in favour of coal gas against the Dowson gas. The Committee believed this recommendation to be a sound one, in view of the well-known fact that it was a universal experience that the cheaper gas was supplied the larger would be the consumption; and they had ever believed it would tend to increase the consumption in Coventry. Such being the case, it would react in this way—that as gas could be manufactured much more cheaply on a large than on a small scale, with increased consumption there would be a further tendency for the price to be lowered. Referring to the amount required to meet the proposed concessions, he said the reduction in price would absorb £2091; and the concessions to be made on large quantities, £378—making a total of £2469. This would leave at the end of the year between £500 and £600 to be dealt with as the Council might think fit. The question might arise with some members of the Council, as to whether this operation was not a rather hazardous or risky one. He would at once reply that there was no risk at all about it. So far as he could see, there were only two points upon which any risk was likely to be run. The first was that they might imagine that during the coming winter, through bad trade or some other cause, there might be a decreased consumption of gas in the city, which would probably throw out their finances a little. In reply to this he might remark that the consumption for the six months of the current year already passed showed an increase of 7 per cent. in the quantity consumed; so that at present there was no probability of a decreased consumption. But even if there were, the 7 per cent. would probably more than compensate for it. So that in any case they might take it for granted that the total consumption in the current year would not be less than for last year. The other point upon which they might imagine there would be risk, was the chance of a slight advance in the price of coal. But even if there was, there would be a corresponding increase in the selling price of the residuals. They would obtain more for their coke; so that there was very little fear on this point. But, further, in case of any mishap with their finances, they had their reserve fund to fall back upon, which had been built up to the full amount of £5000. Then there was the fact that they were getting 6s. more per ton for tar, and 1s. 3d. more for coke. Then they had also the fact that gas could be made cheaper in large than in small quantities; and that during the first six months of the present year the tariff had been the old instead of the new one. The Council would therefore see that there was nothing to fear in the proposed reduction, and that the move which the Gas Committee had made was a favourable one.

Mr. SUTTON seconded the motion.

Alderman DALTON said before the resolution was put to the Council he should like to congratulate Mr. Andrews on having drawn such a rosy picture, and, in the main, one with which he entirely agreed. Mr. Andrews had alluded to two or three reasons why they should not consider the step a risky one; but he had left out entirely—because, perhaps, it had not occurred to him—a very important reason why the proposals might be considered risky. This he should be happy to point out to Mr. Andrews privately, for he was quite sure there were risks in store that had not been alluded to.

The report was adopted.

ALFRETON WATER SUPPLY.—When it became necessary some years ago for the Sanitary Authority of Alfreton to construct water-works to supply the parish, it was decided to construct a reservoir and use the water from the Butterley pump, near Ashover. The original estimate was £20,000; but an expenditure of £40,000 has not yet resulted in obtaining a supply worthy of the name. The Lyndnay reservoir—the most costly part of the works—has proved comparatively worthless, having failed to hold any large quantity of water. The matter is at present under the consideration of the Alfreton Local Board.

THE ROCUDALE GAS COAL CONTRACTS.—A special meeting of the Rochdale Gas Committee was held last Wednesday, to consider the charge made by Mr. E. Evans at the town's meeting, as reported in last week's JOURNAL (p. 558). Mr. Evans's statement was to the effect that an exactly similar class of coal to that accepted by the Committee was offered at 1s. per ton less than the price paid to the Wigan Coal and Iron Company, who obtained the contract. The member of the Committee on whose authority Mr. Evans made his statement attended the meeting, and volunteered to send an explanatory letter to the papers; and this the Committee thought would be satisfactory. In his letter, the gentleman in question—a Mr. Parker—says: "In my statement I intended to convey to him (Mr. Evans) that in dealing with the tenders the Committee did not give them the attention which the importance of the subject demanded. My objection was to the position taken by a member of the Committee proposing that a deputation be appointed to wait upon the Wigan Coal and Iron Company 'to make the best terms they could' before any of the other tenders were considered. I protested against this proceeding, with the result that some slight consideration was given to a few of the other tenders, with the further result that the original motion was carried, and the contract entered into. My protest was made from a knowledge of the fact that some of the collieries offered a coal at 1s. per ton less which was of a similar quality, and in my opinion equal in every respect for gas-making purposes." It is anticipated that reference will be made to the subject at the Council meeting to-morrow, and an explanation given by the Chairman of the Committee (Alderman Petrie).

EDINBURGH AND LEITH GAS COMMISSION.

At the Meeting of the Edinburgh and Leith Gas Commission on Monday last week—Lord Provost CLARK presiding—various matters which came under consideration call for brief notice.

The Finance Committee reported that the assessable rental of the pipes of the Commission in Edinburgh had been fixed by the Assessor at £26,617; being an increase of £5966 on last year's rental. In Leith the rental was put at £4703; being the same as last year. In the county of Mid-Lothian it was put at £626; being an increase of £140. The total assessable valuation was thus £31,946, or an increase on last year of £6106. The Committee recommended the Commission to acquiesce in the valuation. The report was approved.

The minutes presented by the Finance Committee stated that the Clerk had been instructed to obtain delivery of Mr. G. Livesey's awards, and remit to his agents his fee of 250 guineas for acting as Arbitrer, and their own account of £24 10s. The Clerk read a summary of the awards as to the sums to be paid by the Commissioners for the coal, materials, &c., at present in possession of the two Gas Companies. The total to be paid to the Edinburgh Company was £15,808 0s. 8d., made up as follows:—For coal, £9202 1s. 10d.; materials, £3256 3s.; meters, £3159 8s. 4d.; and gas within holders, £190 7s. 6d. The amount to be paid to the Leith Company was £5875 15s. 11d. for stores, &c.; and for gas supplied to consumers between the 11th of May and the 31st of July, £5973 3s. 9d. These sums made together £27,657 0s. 4d. Authority was given to borrow the necessary amount on capital expenditure to pay the amounts named.

The Clerk also read a letter from Messrs. Davidson and Syme, W.S., requesting payment on behalf of the Edinburgh Company, of the above sum of £15,808 0s. 8d. It was pointed out that this amount was by the recent Act payable as at the date of transfer, and, therefore carried interest at 5 per cent. from the 1st of August until paid. The agents also desired payment, in the name of gas supplied to consumers and meter-rents from the spring quarter to the 31st of July, less 10 per cent., of £10,593 10s. 1d. This sum was payable, it was stated, subject to deduction of discount on the bank charge for advancing the money between the date of payment and the 11th of November. The Directors were desirous of having all matters immediately settled, as they considered it was their duty to the shareholders now to divide the funds, and, for various reasons, it was not desirable that they should be making interim divisions. Some conversation took place as to the liability of the Commissioners to pay the interest claimed; and eventually the whole matter was remitted to the Finance Committee, with powers.

The Clerk read a petition by *employés* at the Leith works, setting forth that in May, 1886, they had been apprised of a concurrent reduction of wages in all the principal gas-works throughout the kingdom, and they had agreed to a reduction, under the impression that it was necessary in the circumstances. The Edinburgh Company's workmen had, however, continued at the same rate of wages as at the date mentioned; and the petitioners therefore asked a readjustment of matters in keeping with their former position—"knowing," the petition stated, "that beneficence is accompanied with such an inward satisfaction that the duty is sufficiently rewarded by the performance." Bailie Garland (Leith) said the feeling seemed to be that the request was a reasonable one, and that the workmen in both places should be put on an equal footing; but ultimately the matter was sent to the Works Committee for consideration and report.

The Clerk submitted a certified statement of the expenses incurred by the burgh of Leith in connection with the parliamentary proceedings on the gas question, amounting to £1009 10s. 11d. The accounts were certified by the Provost and Town Clerk of Leith; and they were remitted to the Finance Committee, with power to authorize payment.

Mr. R. Mitchell, the Superintendent of the Edinburgh works, brought before the Commissioners a plan of proposed alterations in the carbonizing works in New Street. At present the carbonizing power is 239 tons per 24 hours; and it was proposed to increase the number of retorts, so as to have a carbonizing power of 480 tons per day. The result of the alterations would, it was stated, be a saving of £4000 per annum, arising from economy in labour. The matter was remitted to the Works Committee for consideration and report.

A few other matters of minor importance were then disposed of, and the business ended.

THE EXTENSION OF THE WILTON CORPORATION GAS-WORKS.

LOCAL GOVERNMENT BOARD INQUIRY.

Last Wednesday, Mr. S. H. TERRY, Assoc. M. Inst. C.E., attended at the Municipal Offices, Wilton, to hold an inquiry, on behalf of the Local Government Board, respecting an application made to them by the Wilton Corporation for sanction to borrow £7000 for the purposes of their gas undertaking. It may be remembered that the condition of the gas-works was reported upon about four months ago by Mr. Norton H. Humphrys, Assoc. M. Inst. C.E., of Salisbury, who had been called in by the Corporation for the purpose; and he was present at the inquiry, together with the Town Clerk (Mr. H. J. King), several members of the Town Council, and others interested in the matter.

The TOWN CLERK having read the notice of the application, and explained the action taken by the Council up to the date of the inquiry, proceeded to state that the Corporation had already obtained parliamentary powers to purchase the gas-works, and simply wanted money to complete it, and to improve the works. The total of £7000 was made up of various items; that for the estimated cost of the probable expenditure on additional new mains and for mortgages being for actual work. They did not anticipate that they would require all the money asked for; but they might do so. There were no estimates prepared of the proposed works.

The INSPECTOR remarked that he did not think the Local Government Board would allow the Corporation to borrow money on probable expenditure, even if he sanctioned it.

The TOWN CLERK said he purposed calling the Engineer to describe the present condition of the works, and what the Corporation proposed to do. The assessable value of the borough in 1877 was £3144 19s. 6d.; and there would be no debt in 1892, except the gas-works loan. The rates averaged 3s. 3d. in the pound; but in 1892 they would be largely reduced.

Mr. Humphrys then explained at great length the work intended to be carried out. He said the present maximum demand for gas was 25,000 cubic feet per day; but it was not possible to make more than 20,000 feet. They had no exhauster, and this made a great difference in the cost of production; but they proposed to have one—having described the state of the retort-house and the retorts, he said that the present arrangements in regard to the residual products were very unsatisfactory. After going into further technical matters he condemned various parts of the works.

The INSPECTOR: Then what you have bought is practically the goodwill of the business and the mains in the streets only.

Witness: Well, we are using in the things as well as we can. One of the holders is very good; it is 31 ft. 6 in. in diameter and 16 feet high, and will contain about 10,000 cubic feet. The maximum demand is 25,000 cubic feet per diem.

The INSPECTOR: Then at present you have not a proper quantity

of storage space. There must be some very extensive leakages in the town, I should think.

The TOWN CLERK: There have been no end of leakages reported at the works.

The INSPECTOR referred to the other holder, which was condemned, and asked what was the size of it.

Witness: Its diameter is about 30 feet; and it will hold about 6000 cubic feet of gas. It is thoroughly rusted, and was leaking considerably when I examined it.

The INSPECTOR: You want more storage capacity. I understand the present works will make 25,000 cubic feet of gas per day.

Witness said he did not so state. The 25,000 feet was the maximum demand; but in the condition in which he found the works, they could not make more than 20,000 cubic feet per day. He then proceeded further to explain the proposed alterations; saying that there would be three benches of five, two, and three retorts, which was the best arrangement under the circumstances, as they would be able to give a small, a medium, or a large supply, as might be needed.

The INSPECTOR, having examined the plans, inquired if anyone desired to address him in opposition to the application.

Various questions were then put; and from the replies and the conversation which followed, it was ascertained that a very small proportion of the inhabitants were consumers, and that the price of gas was rather high.

The INSPECTOR pointed out that the Corporation would probably be able to reduce the price considerably; and, having the works in their hands, be in a position to make more gas for the same money, or the same quantity of gas for less money. They would also be able to induce people to use more gas for cooking purposes in the summer. There would be no charge upon the ratepayers for the gas-works. They would be self-supporting; and any profit which might accrue would be applied to the reduction of the price of gas, maintenance of the plant, &c., and the balance would be devoted to the district rating fund. Under their Provisional Order, the Corporation could reduce the price of the gas, but were not obliged to go lower than 4s. per 1000 cubic feet.

The TOWN CLERK, in answer to questions, stated that the Corporation hoped to reduce the rates by the profits on the gas supply; and that they expected to be able to do the public lighting for nothing.

After some further conversation, in the course of which the Inspector expressed the opinion that the money spent in increasing the holder capacity was well laid out, the inquiry closed.

The Inspector, the Town Clerk, Mr. Humphrys, and others, then went to the gas-works and examined the extensions as in progress; Mr. Terry being favourably impressed with what he saw. It is understood that he will make the usual report, and will recommend that the sum granted be £6200; holding that the Local Government Board will not be able to sanction the item for probable expenditure.

THE SALFORD GAS COMMITTEE AND THE STOKERS.

The Gas Committee of the Salford Corporation held a special meeting on Monday last week to consider the disaffection which exists among the stokers employed at the gas-works, to which allusion has been already made. The Mayor (Mr. Alderman Dickens) presided, and there was a large attendance. The new arrangement to which the men object requires that each stoker shall carbonize 72 cwt. of coal per day; but he is not called upon to wheel his coal from the yard to the retort-house. The Committee were informed that in Manchester the stokers had only to carbonize 40½ cwt. per man per day; and they have not to wheel their own coke, as the Salford men are required to do under the new regulation. A deputation from the stokers, in the course of their interview with the Committee, affirmed that the work sought to be imposed upon them was too laborious, and that the new system would not confer any advantage on the Corporation. What they wished was to revert to the old plan which had worked well for two years—viz., that each man should carbonize 45 cwt. of coal per day, and wheel his own coal and coke. After the deputation had withdrawn, the Committee had a long discussion, and eventually a resolution was passed supporting the action of Mr. Shoubridge, the Gas Engineer and Manager, and deciding that the new system should be maintained—at any rate until its suitability or non-suitability had been properly tested.

Later in the day the following statement was issued by the Gas Committee:—"The General Gas Committee of the Salford Corporation, having held a meeting this morning, at the Town Hall, the Mayor (Mr. Alderman Dickens) in the chair, when a deputation from the retort-house workmen employed at the Regent Road Gas-Works attended to represent to the Committee that the modified system which was arranged between the Committee and the men on Monday last (Sept. 17), and accepted by them as in every way satisfactory, was found on trial to be impracticable. The Committee further ascertained from the deputation the grounds upon which the men declined to continue working on such modified system as arranged; and in reply to questions put by the Mayor, elicited the fact that the men were determined to resist the introduction of any change whatever, and that they would either revert to the old plan of working or send in their notices. The Committee, therefore, are desirous that the facts of the case should now be placed before the public. Under the old system each stoker loaded up and wheeled from the coal-shed to the retort-house 2 tons 5 cwt. of coal or cannel, which he then lifted into the retorts; he had also to withdraw and quench the coke, wheeling 19 cwt. of it into the yard, and to attend to two of the furnaces that heat the retorts, and remove 2 cwt. of refuse therefrom—handling in all 5 tons 11 cwt.—for which he received weekly wages at the rate of 5s. per shift (a day's work). Under the modified system, the coal is brought from the coal-store by a separate class of men called coal wheelers, who place it in the retort-houses ready for the stokers. The stoker's work consists in charging 12 retorts with a total of 3 tons 12 cwt. of coal, and withdrawing, quenching, and wheeling out the coke, amounting to about 1 ton 6 cwt.; thus handling a total of 4 tons 18 cwt., for which he is paid at the same rate as on the old system—viz., 5s. per day. This work affords the men every alternate hour for rest. The furnaces which heat the retorts are attended to by a separate set of men. It is obvious, therefore, that under the new or modified system the manual labour of the stokers is considerably less than formerly. After the most careful consideration of all the circumstances of the case, the Committee are satisfied that the complaints of physical hardship which the modified plan is said to impose have no real foundation; and upon inquiries being made from other towns, they have ascertained that the system proposed has been in operation (in one place for upwards of 15 years) without the slightest complaint. The Committee, having had from the commencement several communications with the men, and having endeavoured, by conceding the modifications referred to, to arrive at an amicable settlement of the dispute, they confidently appeal to the burgesses and gas consumers to support them during the present difficulty."

The Directors of the Wakefield Gas Company have decided in future to fix gas-meters free of charge to consumers.

BIRMINGHAM CORPORATION WATER SUPPLY.

THE PROPOSED ADDITIONAL WORKS.

At the Meeting of the Birmingham Town Council to-day, the Water Committee will present a report, in the course of which they make the following reference to the proposal (already alluded to in the JOURNAL) to raise further money for carrying out permanent works in connection with the water undertaking:—"Application was made to the Local Government Board for their sanction to borrow the final £100,000 authorized by the Act of 1875. In consequence of this application, Mr. John Thornhill Harrison, M. Inst. C.E., an Inspector of the Board, held an inquiry at the Council House, on Thursday, the 31st of May last. The reply of the Local Government Board was contained in a letter addressed to the Town Clerk, and dated July 10, 1888. The letter, so far as it related to the application of the Water Department, was as follows:—"The Board understand that the works of water supply in respect of which sanction is sought to a loan of £100,000 are not all to be undertaken at once, but will be carried out during the next five years, and that the Town Council contemplate raising the proposed loan by such instalments as may from time to time be found necessary for defraying the cost of the works executed. Under these circumstances, the Board are not prepared to sanction at once the borrowing of the whole amount of £100,000. If, however, the Town Council will amend their application by limiting it to the sum which they will require to defray the cost of works to be undertaken immediately, or in the course of the current year, and will at the same time furnish the Board with detailed estimates, and with such plans as may be necessary to explain the character and situation of the works, the Board will give the matter their consideration. The Board observe that section 26 of the Birmingham (Water) Act, 1875, provides that money borrowed under that Act after the expiration of five years from the date of its passing shall be repaid within 90 years after the borrowing is effected. The Board would not be disposed to authorize a loan for so long a period in respect of such works as appear to be contemplated in the present instance; and their sanction to any borrowing under the Local Act would only be given on an undertaking from the Town Council to repay the money within such period as the Board should determine." This reply was very unsatisfactory to the Committee, both because it seemed to imply that at every stage, before any part of the contemplated works could be undertaken, a separate application to the Local Government Board would be necessary, and also because the shortening of the period for repayment of the loan would cause an increased burden on the annual revenue of the department. It was therefore thought desirable to make an attempt to induce the Board to reconsider their decision; and communications were thereupon opened with their officers with this view. The result of these communications has been that the Committee have been informed that, having regard to the nature of the contemplated works, the Board decline to consent to a loan the repayment of which is to extend over a period longer than 30 years; but that on the understanding that the period will be thus restricted, the Board will be prepared to sanction the borrowing of a sum of £50,000 to cover the cost of those works the necessity for which is most pressing. The Committee have further considered the new works it will be necessary to undertake shortly, all of which were included in the statement submitted to the Council on the 7th of February last. It will be remembered that an extension of mains to Acoc's Green and Solihull was among the objects enumerated. It has been found desirable to deal with the supply of both these important districts without delay. In the case of Acoc's Green, the Committee have authorized such extension to be made from Coventry Road by a 6-inch main, at an estimated cost of £720. It being necessary to carry the main across the Great Western Railway, the Committee have entered into an agreement with the Railway Company for enabling them to use the bridge close to Acoc's Green Station for this purpose. With reference to the case of Solihull, the Committee received a memorial signed by 52 occupiers of houses in and adjoining that town, asking for the mains to be carried there; and, after full consideration, the Committee have decided, subject to the approval of the Council, to continue a 9-inch main from Acoc's Green to Solihull, at an estimated cost of £3451. The Committee have every reason to anticipate that a remunerative rental will be received in consequence of the inclusion of these districts within the area of supply.

LEICESTER CORPORATION WATER SUPPLY.

HALF-YEARLY REPORT OF THE WATER COMMITTEE.

At the Meeting of the Leicester Town Council last Tuesday—the Mayor (Mr. T. Wright) in the chair—the report of the Water Committee for the six months ending June 30 last was presented. It showed that the net profit on the water undertaking of the Corporation for this period was £5620 5s. 8d., out of which £1961 had been paid to the sinking fund; leaving a net balance of £3659 5s. 8d.

Alderman WINTERTON, in moving the adoption of the report, remarked that, though it did not contain anything of a very striking character, he was pleased to state that during the last 15 months they had reduced the waste of water from 24 to 17 gallons per head per day; and he hoped further improvement would be effected in the same direction, seeing that they would thereby be enabled to postpone for a considerable period the large expense of providing an additional supply. Having called attention to the fact that the Thornton reservoir had been cleaned out during the year, he stated that at the commencement of the year the reservoirs were extremely low, consequent on the drought of the previous summer and the lack of rain in winter; and thus some persons were well-nigh panic-stricken lest the water supply should fall short. After paying for the clearing out of the Thornton reservoir, the Committee were able to show a balance in hand of £3659 on the half year. They could not make any concession in price, seeing that theirs was not a continuous profit like that of the gas undertaking; and, moreover, when they incurred the cost of providing an extra supply, these profits would cease, and they would have to come to the Council for assistance. Notwithstanding that they were sending out many hundred millions of gallons of water in excess of the corresponding period of last year, he was pleased to say they now had a supply which would last until next April; so they were "out of the wood" as far as any danger of running short in the future was concerned.

Mr. G. GREEN seconded the motion, and congratulated the Committee on the reduction of the waste of water to the extent mentioned by Alderman Winterton. He claimed, however, that this reduction must be extended over the last five years, and not confined simply to 15 months, as mentioned by the Chairman of the Committee.

Alderman WINTERTON pointed out that when the last application was made to Parliament for additional powers, it was based on a calculation that 24 gallons per head per day were necessary; so that the assertion just made by Mr. Green was, to say the least, very mysterious. He (Alderman Winterton) was the first to advocate in the Council the purchase of the water-works; and he had every confidence that the time and attention which he had bestowed on the undertaking would meet with reasonable recognition by the Council.

The report was adopted.

THE FINDING OF WATER AND METALS BY DIVINATION.

The publication of the particulars of the experiments recently conducted at Hastings with the view of finding water by means of the "divining-rod," to which reference was made in the *JOURNAL* last week, in connection with our own personal experience of the power of the "rod" to indicate the presence of metals beneath the soil, has aroused considerable interest as to this extraordinary property of the hazel twig. As the matter is one in which our readers are concerned, we reproduce a leading article which appeared on the subject in the *Morning Post* on Monday last week, and notice briefly some correspondence which ensued. The article was as follows:—

The use of the divining-rod has been supposed to rank among the quaint superstitions by which the credulity of the middle ages was distinguished. It will, therefore, be a surprise to the majority to find it employed for the discovery of water on the site of the new workhouse at Hastings, under the sanction, as reported, of the Committee of Guardians, who are believed also to be highly satisfied with the result of the experiments. So far, it must be admitted that these results are entirely potential, and consist merely in the confident assertion that water is to be found in several places at depths varying from 30 to 80 feet below the earth. The "diviner" came fully armed with a hazel twig, and fortified by letters of recommendation from several landowners to whom he has apparently rendered substantial service in discovering wells. The hazel twig was duly agitated at intervals; and unless it prove to be a false prophet, the inmates of the new workhouse are not likely to suffer from any lack of water.

It does not seem that this is by any means an isolated experiment, although it is seldom heard of in the south-east of England. The divining rod is still employed in Wiltshire for the purpose of detecting water. In Vol. XXII. of the *Quarterly Review*, there is an account of a well-authenticated case which was communicated to the writer of an article on "Popular Mythology." A lady of undoubted integrity is there related to have convinced Dr. Hulton that she really possessed this strange gift by the practical method of indicating the existence of a spring in a field belonging to him, the value of which was largely increased in consequence. De Quincey, as his readers will remember, affirms that he had often seen the experiment practised with success; and says that in a vale of North Somerset most of the tea-kettles are filled with rhabdomaney, whatever science may have to say to the contrary. The Guardians of Hastings, then, can claim some amount of respectable precedent for their curious proceeding, although De Quincey somewhat weakens his own advocacy by the subsequent admissions that the professors of the divining-rod were locally known as "jousers"—a word which he thinks is indisputably connected with the slang verb "to chouse." It may, of course, be that any doubt of the genuine nature of the practice did not refer to its efficacy in detecting water, but to the extravagant and palpably absurd notions which connected the divining-rod with the discovery of crime. In the middle ages, and particularly, as it would appear, in France, the "diviner" was a favourite species of police agent, and was employed by Government for the purpose of tracking criminals. The hideous injustice resulting from such a method scarcely needs to be dwelt upon. Even those people who really believed that the rod would in their hands point out a murderer were no more sure of their own powers than is the spiritualistic "medium" of to-day; and they seem to have been equally ready in feigning knowledge which they did not possess, as the preservation of more than one celebrated case clearly proves. It is true, that, once embarked on this precarious career, they could scarcely withdraw from it, and were prompted by imperious fear for their own safety to risk the lives of others. But the general consequence to society of these baneful superstitions was incalculably bad, and may have suggested the ironical advice of Montesquieu, that if a man was accused of stealing the towers of Notre Dame his best course was to fly at once.

The more enlightened people of the sixteenth and seventeenth centuries strenuously denied the possession of these inquisitorial powers to the divining-rod. Many of them were equally incredulous as to its having the relatively harmless faculty of detecting metals beneath the earth's surface. Indeed, from classical times there has been a decided disposition to laugh at this pretension, which, in the absence of any witness who has attained a fortune by its means, is not wholly unaccountable. In the days of Ennius, the art could be thoroughly acquired at the moderate cost of one drachm, although, *ex hypothesi*, it would have been infinitely more lucrative to keep such knowledge secret. The same thing, however, might obviously be said concerning the "tipster" of to-day's racing world, who appears gifted with the power of making everyone's fortune but his own. In the famous treatise on metals, Agricola is very severe on the workmen who used divining-rods, declaring that it was an old magical practice only to be tolerated by the "irreligious." The Cornish miners are still often accused of using the hazel twig to discover metals; but all the patient research of Mr. Baring-Gould, whose familiarity with the West is well known, failed to discover any really authenticated instance of this usage, all knowledge of which was repudiated by the mining captains who were questioned. In fact, the fallacious character of this use of the divining-rod is much more easy of detection than the others. There was a sort of glamour attaching itself to the criminal investigations, which appears to have blinded even worthy and intelligent people to their demoralizing character. On the other hand, men do not by any means invariably dig for water because a hazel twig showed symptoms of agitation at a certain point. At any rate, if the good folk at Hastings are going to dig a well in every part of their plentifully watered field indicated by the "diviner," the occupants of the future workhouse will run a distinct risk of getting drowned. It may be doubted, however, whether anyone who believed in the attraction of the precious metals for the divining-rod did not make some furtive attempt to pry below the surface literally as well as metaphorically. In that case, repeated disappointments have brought wisdom; and the efficacy of the rod is now held to apply chiefly to cases where it is desired to discover a well. The results at Hastings will be somewhat curiously watched by a generation which is disposed to regard the entire proceeding with a languid amusement rather than with any stronger feeling.

To the student of comparative history, however, the survival of such a practice in a flourishing English town at the end of the nineteenth century cannot fail to be a matter of keen interest. The rod has in all religions and in all mythologies alike been the symbol of strength and authority. Its Biblical use in the hands of Moses and Aaron, and its subsequent profanation by the chosen people, need not be commented on. It seems that rhabdomaney was a familiar form of divination among the Greeks; while Cicero speaks of it as equally practised by the Romans, and Tacitus found traces of its use even among the ancient Germans. With the solitary exception of its supposed efficacy in indicating water, the superstitions which attached to it have been swept away. Whether there is some grain of truth in this magnetic connection between wood and water in the hands of certain ultra-sensitive persons, is likely to be a disputed question. Science may detect impostures by the score; but experience has an awkward trick of confounding it with instances where every desired condition seems fulfilled. At a levity, if the latest "diviner"

proves to be entirely correct, a certain amount of interest will be raised in the question. This will take the form of elaborate disquisitions and scientific refutations well calculated to make the Hastings Guardians doubt whether life is worth living—at least as a rhabdomicist. If some "diviner" had arisen in time to let building contractors and architects into the secret of the watery condition of the subsoil in more than one lately opened-out part of London, a good deal of labour and capital would have been saved. If rhabdomaney is again to become one of the learned professions, it will at least be desirable that its exponents have a correct estimate of the value of mixing the useful with the phenomenal.

Referring to some of the statements contained in the preceding article, a lady wrote as follows:—"I have studied many writers on chiromancy, astrology, &c., for some years, and have found references to what you term 'rhabdomaney' (also called corilimancy), explaining that to be successful in discovering treasures in the earth the branch of hazel must be gathered astrologically, and be chosen of a forked shape, either like a γ or a Greek *upsilon*, and that this mark should be likewise found in the hands of the person using it. Should the result of a modern test be satisfactory, I should esteem it a favour if Mr. Mullins (or anyone interested at Hastings) would give further details of the rod, and examine his hands minutely." Mr. E. Hales, who about two years employed Mr. Mullins to exercise his powers on an estate near Tonbridge, states that he was successful in finding water in several places. Mr. Hales says: "My daughter, who accompanied us, was very suspicious. Mullins, therefore, invited her and one of my servants each to grasp the two ends of the hazel twig, which was forked and about 2 feet long, and which he held dear the fork with his thumbs and fingers, and when he passed over the spots where the water ran, the twig was so violently agitated that it bent until it broke in their hands; and this I saw myself. Mullins is a working man without any pretensions; and he says that very few persons possess this faculty, and that after a few hours' exploring it takes a good deal out of him. Mr. Hales adds that Mr. Mullins's power only extends to running water. The Rev. H. P. Gurney, Vicar of Uffington, in Berkshire, states that he remembers, when a boy, accompanying a number of adventurers over several fields on his father's estate in Cornwall, and seeing them use the divining-rod for the purpose of discovering metals. The result was that a company was formed and the mineral rights on the estate bought of his father and a mine commenced. It was worked for two or three years, but was then abandoned. He adds: "I think several people might still be found in Cornwall ready to venture their money on the indications of the divining-rod." Mr. J. Stears, of Hull, whose power as a "diviner" of metals we recently witnessed at Lisburn, as recorded last week, says: "Those who have not seen the rod in use laugh at the idea. After using the rod for 19 years successfully in finding both iron pipes and underground streams of water, I may venture to reply to your article. It seems that only a few persons are able to use the rod; and with most of those who have the power, it only turns for water, and not for metals. I can find both. For water, the rod, which is Y-shaped, turns from me until the point of the twig which was downward turns; but when over metal, such as gas-pipes, the rod turns towards the body, and then rises up when exactly over the pipe. If I stand upon two china dishes, all power is lost; thus showing the power to be electrical, and must have an earth connection. Much has been written on the subject, but always by those who cannot use the rod."

THE NEW WATER SUPPLY AT SALTASH.—A quarter of a century having elapsed since the Saltash Town Council first took up the question of providing the town with a pure and constant water supply, it is satisfactory to find that in less than six months the inhabitants will have their wishes in this respect gratified. It was left to the present Council to push the matter forward; and a supply having been secured, an engineer has been appointed to carry out the work. At a meeting of the Town Council last Thursday, it was reported by the Mayor (Mr. G. Adams), as Chairman of the Water Committee, that provisional terms had been arranged with the owners of the land at the source of the supply. The Engineer (Mr. B. Nicholls, C.E., of Birmingham) has just been to Saltash, and is preparing plans, which will be ready in three weeks to submit to the Local Government Board. The works are expected to take about six months to carry out; so that, under favourable circumstances, the water should be flowing into the town by June next.

THE PROPOSED EXTENSION OF THE BURNLEY GAS-WORKS.—Mr. A. Taylor, one of the Local Government Board Inspectors, opened an inquiry at Burnley last Wednesday in regard to an application made by the Town Council of the borough to borrow £8500 for the extension of the gas-works. Mr. Jas. Emmett (a ratepayer) intimated at the opening of the proceedings that he opposed the application. The Town Clerk (Mr. W. Southern) stated that he had sent to the Local Government Board a statement showing the purposes for which the money was wanted. The Gas Engineer and Manager (Mr. S. P. Leather) spoke as to the development of the gas-works. He said that ten years ago the quantity of gas made was 167 million cubic feet, and that last year it had risen to 310 millions. He also submitted a plan of the new works. Mr. Emmett pointed out that upwards of £3000 had been handed over from the Gas Department to the borough fund during the past twelve months, and still they were going on borrowing. The Inspector said he had nothing to do with that. He always understood that the Corporation could not make extensions out of the gas profits, but that these must be carried to the credit of the general district rate. Mr. Emmett desired to draw attention to the rating of the borough, but was ruled out of order, and after some further discussion the inquiry closed.

SALES OF SHARES.—At a recent sale, by Messrs. G. Tinker and Son, at the Rose and Crown Inn, Longwood, 18 fully-paid £10 shares in the *Longwood Gas Company* (offered in four lots) realized £19 and £19 1s. per share respectively. Subsequently, 20 similar shares were put up in four lots, and realized £19 and £18 17s. 6d. per share.—On Monday last week, Mr. J. C. Towner sold by auction, at the Gildridge Hotel, Eastbourne, 50 original £10 shares, 39 "B" £10 shares, and 28 "C" £10 shares in the *Eastbourne Gas Company*. The first-named shares were sold at prices ranging from £26 2s. 6d. to £26 10s. each; the "B" shares fetched £19 10s. and £19 17s. 6d. each; and the "C" shares, £25 and £26 2s. 6d.—On the same day, Mr. H. C. Walton sold £1960 of stock in the *Preston Gas Company*, bearing a maximum 10 per cent. dividend, in lots of £100 each. The stock realized an average of £222 per lot.—Messrs. Nicholson, Greaves, and Barber sold last Tuesday at Sheffield, £30 consolidated "B" stock in the *Sheffield Gas Company*, for £91; being at the rate of 303 per cent.—Last Wednesday, Messrs. Renton and Renton sold by auction, at Harrogate, £2000 of "B" stock in the *Harrogate Gas Company*. It was offered in £100 lots, and included the dividend (at the rate of 1½ per cent.) accrued since July 1 last. The 20 lots were knocked down at the following prices:—Four at £241; four at £242; ten at £243; and two at £244—total, £4850, being an average of £242 10s. per lot. The stock was eagerly sought for—the attendance of buyers being large; and the whole was disposed of in about half an hour. The purchasers will receive £4 12s. 9d. per cent. on their investments.

NOTES FROM SCOTLAND.
(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

The Edinburgh and Leith Gas Commissioners had before them on Monday the heaviest item of business which they have yet encountered since they took over the gas supply, in the shape of a proposal by Mr. Mitchell, the Engineer of the Edinburgh works, to improve the carbonizing department, at a cost of £20,000. I suppose I am safe in saying that the disparity of the cost of production in the two works of the Commissioners has forced them to the conclusion that something must be done to modernize the Edinburgh works, in order to get better results from them. The Company were fully aware of the necessity for a step in this direction. Their Bill of two years ago, empowering them to remove their works to Niddrie, is sufficient testimony to that being the case; and the prescience of the Directors would by this time have been bearing fruit, had not the negotiations for a transfer supervened. If the Company's Bill had passed, the erection of the new works was to have been begun at once; and for that everything was in preparation—Mr. Mitchell, in particular, having ready a set of plans for a most complete works on a scale of magnificence that would have been worthy of the position which the Company held among the gas undertakings in the United Kingdom. Mr. Mitchell's aspirations were not then realized; the old works must suffice in the meantime, and accordingly he comes forward with a proposal to improve them by a judicious outlay. The Commissioners sent the matter to the Works Committee for consideration; and this body had it under discussion yesterday. No decision has been arrived at yet. I cannot tell why; but I should not wonder if some of the Commissioners find it a bitter pill, after all the fine things that were said of the Edinburgh Company, to have it even hinted so soon that a large outlay like that contemplated would be desirable.

The work of winding up the two Gas Companies in Edinburgh and Leith has been proceeding apace under the direction of the officials of the Companies, who, though in the employ of the Commissioners, have remained also in their former situations with the Companies for the purpose of carrying out the winding up. The process of "settling up" has included the recovery of rental from many consumers by summons in the Small Debts Courts. These and other processes of a more pleasant nature have been so far completed that a meeting of the shareholders of the Edinburgh Company to receive a statement of the funds of the Company, and give instructions as to their distribution, has been called.

The movement which I mentioned last week as being on foot in the direction of transferring the St. Andrews Gas Company's undertaking to the Corporation took definite shape at a meeting of the Town Council on Tuesday. One is inclined, after what was said, to cherish the wish that, before seeking to assume control of the gas supply, the members of the Council should have a clearer conception of what their future duties would be, than they seem to have. For instance, Provost Paterson, in proposing a motion that it was expedient to adopt the Burghs Gas Supply Act, instead of showing how St. Andrews would be affected by the transfer, must needs wander away to Manchester, with which, in passing, I may say, there could be no comparison whatever; and from there began to dangle before the community that most questionable of all practices in Corporation gas management—the plundering of the gas profits to save the rates. Of course, he displayed his bait more cunningly than I have just expressed it. The words he used were: "The results would be such as to astonish the ratepayers. In Manchester, for example, they had been able to pay a large proportion of the rates out of the unestimated profits of the gas-works." A day may come when public men will be found managing the gas industry in its own interest; but it is manifest that before then a good deal of education will have to be undertaken in high places. The Provost thought that the gas undertaking could be purchased for £10,000. Another member of the Council was afraid that, looking to the large dividends which had been paid by the Company, the price could not be less than £20,000. These and one or two other remarks were quite legitimate; and there was a prospect of the discussion closing before the speakers descended to foolish talking. But that was not to be. The inevitable nonsense about the electric light was duly "trotted out." Mr. G. Bruce, who was responsible for its introduction, I am afraid does not read the "Electric Lighting Memoranda" in the JOURNAL, or he would not have inflicted on the Council his gabble about the electric light making "rapid progress." "Were they," he asked, "to be condemned to burn gas for the next 40 years, when they might have a better and cheaper light within a very few years?" Judging from the experience of other towns in electric lighting, one is tempted to say that the condemnation which Mr. Bruce so much dreads is likely to be the opposite of the very terrible affair which he contemplates it will be. Apart from every other consideration, there is one test by which, as much as by anything else, the prospective stability of gas supply may be gauged, and that is that there is not yet, to my knowledge, a single instance on record in which a gas company took the initiative in the matter of having its property transferred to a local authority. From this it would appear that inside the gas industry there is not so much fear of loss as there is outside it. The St. Andrew's Town Council seemed to be a good deal affected by the arguments of the opposition, as, though the motion was but a preliminary one, they only adopted it by 12 votes to 9.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

The Dumbarton Corporation have lately agreed to take £300 from the gas profits of the past year, for the purpose of meeting the expenditure involved in connection with the Public Parks. From year to year the deficiency in the income derived from the Clyde Pier has been met out of the gas profits; but this is the first time that it has been necessary to subsidize the Public Parks from the same source. The past year's working of the gas undertaking was very successful. There was a considerable increase in the consumption of gas; but the returns show that it was still very much behind that of the last year of good trade—1884-85.

It has been resolved by the Gas Committee of the Ardrossan Police Commission to continue the price of gas unchanged for the present year, notwithstanding the fact that there was a surplus of income over expenditure for the past year quite sufficient to warrant a reduction. It has been editorially suggested in one of the local newspapers that the ratepayers will in their own interest take the matter up, and that if they are unable to bring about a reduction in the gas-rate, should at least insist on knowing the reason why. It is urged that there has been a reduction in the price of coal, and that there is an advance in the value of the residuals; and consequently the Gas Committee must have in view a much larger surplus at the close of the current year. The increase to the Commissioners from the residuals is said to be fully 50 per cent.; and when the gas supply was in the hands of the private Company, the value of the residuals was about one-fourteenth part of the cost of production, whereas it is now about one-tenth. The writer affirms that, without any risk of lessening the benefit to posterity, the price of gas in Ardrossan might have been fixed at 3s. 11d. per 1000 cubic feet for the year 1888-9. The question of

the perpetual meter-rent, which is said to be very unfair, is also engaging attention; and it is suggested that this burden should be removed.

The Glasgow Corporation Gas Committee have lately had under consideration an offer from Messrs. C. McNaught and Co. for the purchase of the whole of the output of coke at their various gas-works; but it has been resolved to decline to entertain the offer, there being a marked unwillingness on the part of the Committee to disregard the claims of local consumers generally, and especially the claims of the poor people near the works, who use the coke as their ordinary fuel. While speaking of Glasgow gas affairs, it may be worth while to mention that already there has been recovered fully £4000 more than the amount estimated of the outstanding gas-rents referred to in the last annual balance-sheet. The estimate was £43,688; the amount recovered is well nigh £48,000.

At the recent sitting of the Argyllshire Valuation Appeal Court, the Dunoon Police Commissioners appealed against the valuation of the burgh water-works, which had been increased from £400 to £800. The question was argued at some length on behalf of the appellants and by the Assessor; and eventually the sum fixed was £700. At the same Court, the Assessor's valuation of the Sandbank Water-Works, which had been increased from £126 to £220 was appealed against; it was reduced to £200.

The Glasgow pig iron market was somewhat unsettled during most of this week. In consequence of "bears" operating, considerable reductions in price took place. The volume of trade, however, continues to be exceedingly satisfactory; and on this account, it is not anticipated that there can be any extensive fall in price in the meantime. Scotch warrants were sold on Monday at 42s. 0½d. cash per ton; and yesterday 41s. 4½d. cash was accepted. The fall in the price of Cleveland warrants was from 34s. 11d. to 34s. 3d. per ton; and the prices of hematite iron declined from 45s. 3d. to 44s. 1½d. per ton.

Freight rates being somewhat easier, the local coal trade has been less firm this week; but a good business has been done, and the trade looks very promising. Prices are advancing in most departments; indeed, household coal is about to be increased in price 1s. per ton. It is not unlikely that the miners' wages will be generally raised within the next week or two.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Sept. 29.

Sulphate of Ammonia.—The week closes with a strong tone, due mainly to the large French orders which are unexpectedly coming in; and while requirements in that country remain to be filled, it may be taken for granted that prices on this side will not suffer, although it is anticipated by dealers that values will be easier next week. To-day £11 10s., f.o.b. Hull, is being readily paid for shipment; but meanwhile buyers decline to pay the same price for early October delivery. In consequence of the very firm tone of nitrate, there is considerable inquiry for spring delivery, and buyers are willing to pay full rates. Producers have, however, meanwhile assumed a passive attitude.

LONDON, Sept. 29.

Tar Products.—The prices current last week are those ruling at present. The feeling in anthracene, pitch, and carbolic has, if anything, a firmer tendency. Prices: Tar, according to position, 17s. 6d. to 22s. 6d. per ton. Benzol, 90 per cent., 3s. per gallon; 50 per cent., 2s. 4½d. Toluol, 1s. 9d. per gallon. Solvent naphtha, 1s. 2d. per gallon. Creosote naphtha, 30 per cent., 1s. per gallon. Light oil, 3d. per gallon. Creosote, 2d. per gallon. Pitch, 12s. to 13s. 6d. per ton. Carbolic acid (crude), 3s. 4d. per gallon. Cresylic acid, 9d. per gallon. Tar salts, 15s. per ton. Anthracene, 30 per cent., "A" quality, 1s. 6d. per unit; "B" quality, 1s. 3d.

Ammonia Products.—Sulphate of ammonia is steady, at a slightly improved price. Prices may be taken as follows:—Sulphate of ammonia, £11 10s. to £11 12s. 6d., less discount. Gas liquor (5° Twaddell), 7s. 6d. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 1½d. per lb. Carbonate of ammonia, 3½d. per lb. Muriate of ammonia, brown, £18 per ton; white, £27. Sal-ammoniac, £30 per ton.

[From the Chemical Trade Journal, Sept. 29.]

Sulphate of Ammonia.—The sulphate market is firm for prompt delivery, in consequence of a good demand from France; and prices at Hull have advanced from £11 7s. 6d. and £11 8s. 9d. to £11 10s. to-day. These prices can, however, only be realized for parcels that can be shipped this week. The dealers seem to be all more or less short, and apparently have much difficulty in completing their deliveries this month. Liverpool is quoted at £11 7s. 6d. to £11 10s.; Leith, at £11 8s. 9d.; Beekton, £11 10s.; while London outside makes are fetching from £11 10s. to £11 11s. 3d.

Tar Products.—Benzoles remain without sensible alteration in price; and even the short production of the past few months does not seem to have improved the situation. 90's and 50/90's may be stated as having the same value as described in last week's circular; and all other tar products remain *in statu quo*. The unfinished products, as we may term them, keep up their price; and there is still a very fair business doing in medium soft pitch. Benzole from coke-ovens is the latest information which comes to our ears, as from properly constructed ovens as much as 2 gallons per ton of coal has been obtained on the large scale.

ANTWERP WATER COMPANY, LIMITED.—The Directors of this Company, in their half-yearly report to June 30 last, state that the income from all sources amounted to £10,036, and the net revenue to £4248. Should the profit arising from the second half-year's working be equal to the present, there will, it is stated, be sufficient to pay an increased dividend on last year. The 5 per cent. debentures, amounting to £13,000, falling due on Dec. 31 last, will be renewed at 4 per cent.

BARNET IN DARKNESS AGAIN.—At ten o'clock last Friday night the electric lamps at Barnet suddenly went out, and the streets were left in darkness; the only light to be seen being that coming from the windows of hotels and private houses. The night was very dark and somewhat foggy; and the inconvenience caused to pedestrians by the sudden deprivation of light was severely felt. The origin of the mishap was not known outside the electric light works, beyond the scanty information vouchsafed by one of the contractor's employees that something was wrong with the engine. It was not until midnight the light was again available.

THE GAS AND WATER UNDERTAKINGS OF THE BIRKENHEAD CORPORATION.—The Birkenhead Corporation propose applying to Parliament next session for additional powers, and the opportunity will be taken to obtain authority for the purchase of land for the extension of the gas-works. As the attention of the Gas and Water Committee has been called to the fact that the period within which the new water-works authorized to be constructed by the Birkenhead Corporation (Gas and Water) Act, 1881, will expire on Jan. 1, 1892, the Committee have resolved that it will be desirable that an extension of time for the construction of the works shall also be obtained.

REDUCTION IN PRICE.—The Directors of the *Biddulph, Bradley Green, and Black Bull Gas Company* have reduced the price of gas from 5s. to 4s. 6d. per 1000 cubic feet, and will allow a discount of 5 per cent. on all accounts paid within a month.

CORSHAM (WILTS.) WATER SUPPLY.—A Company has just been formed to provide the town of Corsham, in Wiltshire, with a constant supply of water. The capital is £4000, in £5 shares. It is proposed to bring the water from Ash Hill and Ash Grove, near Bowood, on the estate of the Marquis of Lansdowne; and, owing to the elevated springs, the water will be carried through the pipes by gravitation alone.

SCARCITY OF WATER AT CHESHUNT.—Complaints are being made of the scarcity of water at Cheshunt, High Beech, and Waltham. At a meeting of the Waltham Local Board last week, it was stated that, owing to the East London Water Company having sunk wells in the neighbourhood, to meet the requirements of part of their district, the supply of East Herts had diminished. It was resolved to communicate with the Company on the subject.

THE LIVERSEDGE LOCAL BOARD AND THE WATER QUESTION.—The Local Government Board have intimated that they will not at present sanction the payment of the costs incurred by the Liversedge Local Board in connection with their proposal to apply to Parliament last November for independent powers of water supply. The head authority says that the accounts must go before the auditor in due course, and that any further communication that may be received will then be considered. An application was made by the Clerk to the Board some time ago; and it is understood that the refusal is in consequence of letters addressed to the Local Government Board by representatives of opponents of the scheme.

THE PROPOSED PUBLIC LIGHTING OF GRAVESEND WITH OIL.—At a meeting of the Gravesend Town Council held last Wednesday, the Town Clerk reported that a difficulty had arisen in arranging the terms of the contract with the firm who had tendered for lighting the public lamps of Gravesend with oil. The Corporation considered that the contractors should remove the present burners and plug the pipes so as to prepare the lanterns for the reception of the oil lamps. The other parties took an opposite view; contending that they had only to make the lanterns wind proof. From this view they declined to give way; and, after some discussion, the Corporation decided not to execute the contract.

WEST GLOUCESTERSHIRE WATER COMPANY.—At the half-yearly meeting of this Company held at Bristol last Saturday, the Chairman (Mr. A. Brogden) stated that since the previous meeting 350 additional houses had been supplied with the Company's water, and that there was every prospect of a steady increase in the number of customers. Nine miles of additional mains had been laid in the half year, for supplying populous places within the Company's district, including Warmley and Keynsham. The number of houses now within reach of the Company's mains was 2300, one-fourth of which the Company were supplying. The revenue had overtaken the working expenses, and for a new Company their position was very encouraging. At no distant date the shareholders might expect a dividend. The Directors' report was unanimously adopted.

THE WELL AT THE CLAPHAM WORKHOUSE.—The Guardians of the Wandsworth and Clapham Union appear to be somewhat out of conceit with their attempt to provide their own water supply. At their fortnightly meeting last Thursday, the Chairman announced that there was no water that morning for domestic use in the house. He believed there was water in the well, but it appeared the action of the pumps was so violent that it exhausted the well too quickly. As to the Water Company's mains, the pressure was so small that the supply from this source was intermittent. He thought that if they had an engine to pump at a reduced speed, they could get a supply day and night. A discussion arose upon these statements. Mr. Plumridge protested that it was nonsense to attribute a short supply to want of pressure in the Company's main. The pressure was enough to burst the pipes; but the water was shut off in the house. The fact was the well was a failure, and would not yield the 24,000 gallons a day which it was stated it would do. He submitted that it would be cheaper to obtain the whole supply from the Water Company, and do away with the well. Mr. Grey concurred with this view, and declared he would not vote for any more expenditure on the well. A motion was submitted to refer the matter to a Special Committee; but in the end it was sent to the Workhouse Committee for consideration.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.
(For Stock Market Intelligence, see ante, p. 584.)

Issue.	Share.	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share.	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.					£ s. d.
GAS COMPANIES.								
590,000	10	12 Apr.	10½	Alliance & Dublin 10 p. c.	10	183-194	..	5 7 8
100,000	10		7½	Do. 7 p. c.	10	13-14	..	5 7 1
800,000	100	2 July	5	Anstralian (Sydney) 5½ p. c. Deb.	100	110-112	..	4 9 3
100,000	20	30 May	10	Bahia, Limited	20	23-25	..	8 0 0
200,000	5	11 May	7½	Bombay, Limited	5	74-75	..	4 16 8
40,000	5		7½	Do. New	4	52-53	..	5 4 2
380,000	Stock.	29 Aug.	11½	Brentford Consolidated	100	220-225	..	5 4 5
110,000			8½	Do. New	100	161-166	..	5 5 5
220,000	20	13 Sept.	10½	Brighton & Hove, Original	20	43-45	..	4 13 4
320,000	20	28 Sept.	11½	British	20	45-47	..	4 15 9
50,000	10	13 Sept.	11	Bromley, Ordinary 10 p. c.	10	19-21	..	5 4 9
39,000	10		8	Do.	10	13-14	..	5 14 3
328,750	10	30 May	8	Buenos Ayres (New) Limited	10	144-154	..	5 3 2
200,000	100	2 July	6	Do. 6 p. c. Deb.	100	110-112	..	5 7 1
150,000	20	10 Aug.	7	Cagliari, Limited	20	25-27	..	5 3 8
550,000	Stock.	12 Apr.	13½	Commercial, Old Stock	100	278-278	..	4 18 11
130,000			10½	Do. New do.	100	214-219	..	4 18 2
121,234		28 June	4½	Do. 4½ p. c. Deb. do.	100	123-128	..	3 10 3
557,320	20	14 June	12	Continental Union, Limited	20	45-46	..	5 4 4
242,680	20		12	Do. New '69 & '72	14	30-31	..	5 8 1
200,000	20		9	Do. 7 p. c. Pref.	20	36-38	..	4 14 8
75,000	Stock.	28 Sept.	10	Crystal Palace District	100	205-215	..	4 13 0
234,060	10	27 July	13	European, Limited	10	254-264	..	4 13 1
120,000	10		13	Do. New.	7½	184-194	..	5 0 0
354,060	10		13	Do. do.	5	124-134	..	4 16 3
5,468,600	Stock.	29 Aug.	13	Gaslight & Coke, A, Ordinary	100	249-253	..	5 2 9
100,000			4	Do. B, 4 p. c. max.	100	100-105	..	3 16 3
665,000			10	Do. C, D, & E, 10 p. c. Pf.	100	260-265	..	3 15 6
30,000			6	Do. F, 5 p. c. Pf.	100	125-130	..	3 16 11
60,000			7½	Do. G, 7½ p. c. do.	100	182-187	..	4 0 2
1,300,000			7	Do. H, 7 p. c. max.	100	167-172	..	4 1 4
463,000			10	Do. J, 10 p. c. Pf.	100	258-263	..	3 16 1
1,061,150		14 June	4	Do. 4 p. c. Deb. Stk.	100	120-123	..	3 5 0
294,850			4½	Do. 4½ p. c. do.	100	125-130	..	3 9 3
650,000			6	Do. 6 p. c. do.	100	175-178	..	3 7 5
8,600,000	Stock.	11 May.	10	Imperial Continental	100	210-213	..	4 13 10
75,000	5	14 June	6	Malta & Mediterranean, Ltd	5	5-5½	..	5 9 1
560,000	100	3 Apr.	5	Met. of Melbourne, 5 p. c. Deb.	100	114-116	..	4 6 2
541,920	20	14 June	6	Monte Video, Limited	20	20-21	..	6 14 8
150,000	5	30 May	-0	Oriental, Limited	5	92-94	..	5 2 7
60,000	5	28 Sept.	7	Ottoman, Limited	5	6-7	..	5 0 0
People's Gas of Chicago—								
420,000	100	2 May	6	1st Mtg. Bds.	100	107-110	..	5 9 1
500,000	100	1 June	6	2nd Do.	100	95-100	..	6 0 0
100,000	10	26 Apr.	10	San Paulo, Limited	10	16-17	..	5 17 8
500,000	Stock.	29 Aug.	15½	South Metropolitan, A Stock	100	306-311	..	4 19 8
1,350,000			12	Do. B do.	100	241-245	..	4 17 11
141,500			13	Do. C do.	100	245-255	..	5 1 11
650,000		28 June	5	Do. 5 p. c. Deb. Stk.	100	135-140	..	3 11 5
60,000	5	29 Aug.	11	Tottenham & Edm'tn, Orig.	5	11-13	..	4 4 0
WATER COMPANIES.								
717,467	Stock.	28 June	9	Chelsea, Ordinary	100	260-265	..	3 7 11
1,720,560	Stock.	12 Apr.	7	East London, Ordinary	100	197-202	..	3 9 4
700,000	50	14 June	9	Grand Junction.	50	124-128	..	3 10 4
708,000	Stock.	10 Aug.	10½	Kent	100	270-275	..	3 16 4
1,043,800	100	28 June	9	Lambeth, 10 p. o. max.	100	261-266	..	3 7 8
406,200	100		7½	Do. 7½ p. c. max.	100	304-309	..	3 11 9
200,000	Stock.	28 Sept.	4	Do. 4 p. c. Deb. Stk.	100	116-120	..	3 6 8
500,000	100	27 July	12½	New River, New Shares	100	349-354	..	3 8 6
1,000,000	Stock.		4	Do. 4 p. c. Deb. Stk.	100	124-128	..	3 2 6
902,300	Stock.	14 June	6	S'th'wk & V'x'hall, 10 p. o. max.	100	166-171	..	3 10 2
126,500	100		6	Do. 7½ p. c. do.	100	157-162	..	3 14 1
1,155,066	Stock.	14 June	10	West Middlesex	100	265-270	..	3 14 1

† Next dividend will be at this rate.

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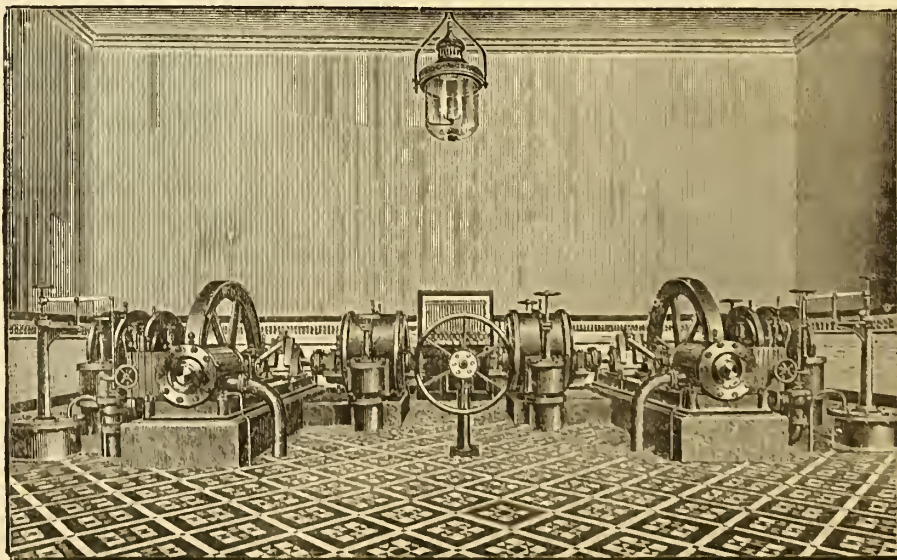
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THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 9, 1888.

GAS LIGHTING AND PUBLIC SECURITY.

THE connection between gas lighting and the progress of civilization is a subject worthy of the closest study of the sociologist. Most readers of Herbert Spencer's interesting "Introduction to the Study of Sociology" will remember what magnificent use the writer makes of one of the great facts of modern civilization—the printing of *The Times*—the full significance of which we are apt to overlook because the phenomenon is so common and familiar. If a similar book were to be written by the same philosopher (which is too much to expect), what splendid service he might evoke in the way of exposition from the common spectacle of a street gas-lamp! It is remarkable that one of the earliest popular notices of gas lighting that has come down to us, is in the form of a coloured print, of the kind whereby the caricaturists

and pictorial satirists of the early part of the century used to register the public sentiment of their day, in which the artist anticipates in the clearest fashion the probable purifying effect of improved lighting upon the morals of the streets. The footpad and the strange woman are in this picture represented as fleeing from the new light into regions of obscurity more favourable to their proceedings. Wherever gas lighting has penetrated, the authorities responsible for the preservation of order and the prevention of crime in cities have recognized that a gas-lamp is as good as a policeman—and sometimes considerably better. It is not too much to say that the striking difference in the condition of the streets of our towns, as regards the safety of wayfarers, which marks the present as compared with the age whose manners are described by Fielding and caricatured by Rowlandson, is due quite as much to gas lighting as to the institution of the modern police force. There is at least as close a connection between the two agencies for promoting order as between the originator of the penny postage and the railways which rendered this reform practicable. If Stephenson had not gone before, Rowland Hill could not have carried out his great scheme; and, similarly, if Murdoch had not preceded him, Sir Robert Peel would have organized his police force with infinitely greater difficulty and much less success. The gas-lamp and the policeman are twin forces that have worked in harmony to redeem the streets of our towns from the riot and savagery which we can hardly realize when we read about them in old story-books, and should not endure for a week if the condition could be repeated in a truly realistic revival of an "Old London" or an "Ancient Glasgow." It is interesting to see the picturesque street architecture of those times reproduced for our amusement at national exhibitions; but we are rightly content with the revival as a mere piece of scene painting. We fall back from contemplating the past with a sense of satisfaction (not less deep or real for being unexpressed and almost unconscious), upon the reflection that we can walk through our modern streets without requiring the attendance of link boys and armed servants, thanks to the unpicturesque gas-lamp and prosaic police officer.

These reflections spring naturally from events that are passing round us to-day. During the last few weeks London, and through London the whole country, has been thrilled by the recurrence, in a ghastly series, of horrible street outrages that have revealed the gulf of savagery over which our boasted civilization has been thinly stretched. Decent people, while perusing with the fascination of utter horror and disgust the published accounts of the recent Whitechapel murders, have shrunk appalled from the revelation of this survival into their midst of passions and practices which they have believed to belong to a past age and a barbarous society. It would be near the truth to say that, having regard to the peculiar circumstances of these crimes, the general sentiment of the mass of the people respecting them has not been fear so much as shame and horror. The least thoughtful among us must have allowed his mind to dwell for an instant, with heart-shaking doubt respecting the soundness of our civilization, upon the reflection that in walking through the streets one may rub shoulders with beings whom the very Goths that sacked Rome would have condemned as inhuman. It comes as a shock—and in one sense not perhaps an unnecessary or undesirable one—to the somewhat "namby-pamby" humanitarianism of the day, which is often theoretically disposed to side with the mob against the forces of law, when it is shown, by such examples as these slaughterings in the streets of London, that primeval savagery remains among us still, and would break out if it had the chance. Why is it, however, that this sentiment of horror is so little mixed with fear? For the simple reason that the exemplar of the horrible propensities of men who are untouched by ordinary human feelings has shown a reassuring respect for the arm of law and the light of civilization. He has kept out of sight of the policeman, and beyond the radius lighted by the street-lamp. The Chief Commissioner of Police for the Metropolis has replied to the Whitechapel Vestry, who tried to bring him and his men into blame for permitting this outbreak of crime in their district, to the effect that the Vestry themselves are in a measure responsible for creating the conditions by which the crimes have been rendered possible, through neglecting to light the bye-streets and no-thoroughfares of the parish. This modern instance places in the strongest possible light the efficacy of the street-lamp as a preventive of crime; and it is to be hoped that Sir Charles Warren's reproof will be taken to heart by other highway

authorities who, like the Whitechapel Vestry, have neglected this part of their duty to the public, but have not yet received so lurid an illustration of the dangers of such neglect.

We have never lost a fitting opportunity for reminding local authorities that the responsibility thrown upon them for lighting their towns is not discharged by making a brilliant promenade or two in the best parts, and starving the back quarters. Yet who does not know that this is a general failing of local authorities? Hear the average town councillor talk about the necessity for well lighting the town, in order that it may appear to good advantage in the eyes of residents and visitors, and ask him what he means. It will be found that his mind is set upon brightening up the High Street, or the Parade, or the neighbourhood of the Council Chamber, and that he never thinks about the back slums where crime lurks beyond the reach of the policeman's lantern. The enterprising and public-spirited gentleman who moves heaven and earth to introduce electric lighting into his native town, is usually quite content that the contractor should string his staring lamps along the main thoroughfares; and that the lighting—save the mark!—of the smaller streets should, by way of balance, be entrusted to miserable oil-lamps. We do not hesitate to declare that one outrage of the Whitechapel stamp in any town so mismanaged in the matter of lighting would form a wonderful stimulus to the local appreciation of the rights and wrongs of public street lighting. Take the recent example of Birmingham, where the lighting of the courts and blind alleys of the town has been so long under discussion. Would not the question have received a speedier solution if the Whitechapel fiend had commenced operations in these obscure localities? Yet what was there to prevent him?

One is quite justified in trying to extract good from the worst evils; and therefore we insist upon the importance of these Whitechapel outrages as illustrating an aspect of public lighting which is too apt to be overlooked. Many people have come to regard street-lamps as ornaments to a town, or at least as very much in the nature of a luxury. While admitting that the matter has this luxurious aspect, and going even further for the purpose of conceding that handsome streets in a prosperous modern town ought to be lit in a style befitting their daylight appearance, we must contend for the police use of lamps. Highway authorities may beautify the chief street promenades of their town to their hearts' content, whether their motive be municipal vanity, solicitude for shopkeepers' interests, or the honest desire to see their town look well by night as by day. There is no danger of British towns authorities being too extravagant in this way, seeing how far the majority of them fall below the practice of Continental municipalities, who, with poorer and dearer gas, manage to keep up an air of brilliancy in their boulevards which few English towns can rival. Beyond this solicitude for appearance and profit, however, comes the interest of public safety, morality, and order. Is that town the worthier that has the more gorgeous boulevards, or hides the fewer slums? This is one of the great questions of the age. London is a vast Metropolis, and to it flow the best and the worst that humanity can show. All towns in their degree possess the same power of attraction. What responsibility, therefore, falls upon the authorities charged with the surveillance of these places, to see that the ever-present criminal shall not find any facility in his designs from the parsimony and neglect of the powers constituted in the interest of the well-disposed population!

THE COMMERCIAL GAS COMPANY'S MEETING—MR. H. E. JONES'S HINTS FROM AMERICA.

THE half-yearly general meeting of the Commercial Gas Company was held last Friday, when the report and accounts were received and adopted, and the very noteworthy dividends of 13 $\frac{3}{4}$ and 10 $\frac{3}{4}$ per cent. declared. As the Chairman (Mr. R. Bradshaw) remarked, the accounts in question were among the most satisfactory ever presented to the proprietors, who have the best of all reasons to be pleased with their investment, and to be gratified at the progress of the undertaking. Mr. Bradshaw was in fairly good health; but his strength was not such as to permit him to indulge in a long speech. The Commercial shareholders are not exacting in this respect, however; while the Board continues to return such handsome dividends, the proprietors will not demand oratory at the ordinary meetings. It is only chairmen of unprosperous concerns that need be eloquent. An interesting feature of the meeting was the reference made by the Company's Engineer (Mr. H. E. Jones) to his recent tour in the United States, and his subsequent remarks respecting his impressions. As soon as

Mr. Jones stated where he had been, there was a request preferred from the body of the hall that he would tell what he thought about electric lighting in America; and this he did in a few memorable words. We shall not spoil the effect of Mr. Jones's remarks by paraphrasing them here, as they may be perused in full in our report of the proceedings of the meeting. He succeeded in convincing his hearers that even in the United States gas has nothing to fear from the electric light, but should rather be grateful to it for creating and spreading a demand for abundance of light. Gas engineers will be interested to hear what Mr. Jones had to say about the oil-gas processes in vogue across the Atlantic, especially as he arouses curiosity by his way of referring to some of these systems of gas making, without allaying it. We have some reason to believe, however, that Mr. Jones was greatly struck by the capacity exhibited by certain of these processes for producing great volumes of gas, in a very short time, from generators which, while they occupy very little space, are cheap to construct and maintain. We understand that he is rather inclined to think—but upon this point we should prefer to have further and more definite information—that, by the use of generators of this class, gasifying coke, and carburetting the product either with tar-oils or low-priced mineral oils, the present disproportion between the winter and summer gas-making plant in most British gas-works might be reduced. For winter reserves everywhere generators of this order might render valuable service. It is a novel and striking idea, which it is to be hoped may be enlarged upon by Mr. Jones on some future occasion. Altogether, the Commercial Gas Company's meeting was well worth attending.

A CASE FOR SYMPATHY.

ONE regrettable result of recent scandals, and the attempts made in certain quarters to trade upon them, has been the creation of a very widespread feeling of suspicion and distrust. In theory, every man is innocent until proved guilty. In practice, the reverse of this is the accepted doctrine of the day; and any story impugning the honesty of those concerned in gas-works administration—however ridiculous it may appear to those who know the real facts of the case—is sure to be eagerly swallowed, and readily believed, by those less well informed. As a proof of this it is only necessary to call attention to what has been taking place at Rochdale within the past few weeks. In that borough, as elsewhere, the stormy period of agitation which precedes the annual municipal elections has just begun, and a number of eager spirits who know, or think they know, of a short cut to a local millennium, have been inveighing against the powers that be, in order to prove how much better they could themselves manage if only they had the opportunity. One of the points of attack was the Gas Committee—who have given mortal offence by presuming to increase one or two salaries—and one of the charges against them was that they negligently, if not fraudulently, accepted a tender for coal at 1s. per ton more than they need have paid for the same article. The statement was made with some circumstance at a public meeting; and "a member of the Gas Committee" was cited as the authority for it. So serious a charge naturally caused considerable sensation, especially amongst those who saw in it, as they see in every act of a Gas Committee, the possibility of another scandal. A meeting of the Committee seems to have been at once called; and the member who had been in some sense responsible for the statement offered an explanation, which is reported to have satisfied the Committee, and which he volunteered to make public in a letter to the newspapers. On being published, however, the letter proved to be, in effect, a reiteration of the original statement. Even those usually friendly to the Committee seem then to have thought there must really be something in it, and a demand was naturally made for a full explanation. This explanation is now forthcoming. It was made at the Council meeting last week, and is reported in another column. As might have been anticipated, it shows that great onterry was made about very little; and the Committee are neither the rogues nor the fools their detractors imagine. What really happened was that out of a considerable number of tenders three were selected as offering most nearly the kind of article the Committee required; and that in the long run, for reasons hereafter explained, one of the tenders at 9s. 3d. per ton was accepted, rather than one at 8s. 4d. per ton, or another whose price has not been publicly mentioned. As is well known, no canal is used at Rochdale. Gas of 18-candle power is manufactured from a mixture of two-thirds of high-

class coal, such as the Committee have now bought at 9s. 3d., and one-third nuts, which cost 7s. 6d.—the net price of the coal being, therefore, 8s. 8d. per ton. The coal at 8s. 4d. was thus apparently 4d. per ton cheaper than the material in use; but as it was found that it would yield only 17-candle gas, as against the 18-candle gas required, it was not bought. The other low-priced tender was also rejected after 100 tons of the material had been used in a working test; and the Committee practised the truest economy by buying the better, if apparently dearer, article. Another count in this tremendous indictment was that the Committee decided to send a deputation to the firm whose tender they accepted, with instructions "to do the best they could with them." The meaning of this apparently simple procedure was, of course, that an attempt should be made to get a modification of the terms of the tender, if possible; but it was sought to invest it in the public mind with some suspicion of jobbery or wrong-doing. The explanation of the Chairman of the Gas Committee, that the deputation succeeded in squeezing out of the contractors concessions to the value of £1000 in favour of the Corporation, should surely be sufficient to dispose of this latest and most flimsy of so-called "scandals." The case is, however, a fair sample of the kind of trouble which events have conspired to bring upon the heads of provincial Gas Managers and Committees. These gentlemen have to suffer for the sins of others, and so are deserving of much sympathy among their brother Managers.

THE HALIFAX GAS SCANDAL.

THE Halifax affair has developed very rapidly during the past week. At the Town Council meeting on Wednesday, the Mayor (Mr. Alderman Booth) signed the indemnity that was required by Mr. T. K. Fox, and made a very remarkable speech, the substance of which appears elsewhere. After the indemnity was signed, a sealed envelope, understood to contain Mr. Fox's allegations in set form, was opened; and a campaign of which we can scarcely yet see the beginning, to say nothing of the end, was thus begun. Mr. Fox's statement charged Mr. Alderman Riley, the Chairman of the Gas Committee, with "malpractices;" it accused Mr. Emor G. Wrigley, J.P., contractor for supplying coal to the Gas Committee, of fraud; and Mr. William Carr, the late Gas Manager, of corruption. It should scarcely be necessary to remark that the greatest caution is required in commenting upon these matters at this juncture, yet several newspapers have referred to them as though the whole case were proved by the Mayor's speech. There is some excuse for such rashness, in the reflection that any prudent man in the Mayor's position would have referred to the subject in more guarded language if the case had not been clear as daylight in his own mind. The responsibility for this strong speaking, however, rests with the Mayor. It is due to him that we should publish his observations, and treat them with all gravity. We are ready to admit, moreover, that the affair now looks different, as against the parties implicated, from what it did before this speech was made; but with this we must stop. It is reported that Mr. Wrigley has placed the matters personal to himself in the hands of his solicitors; and Mr. Alderman Riley has done the same. It is understood that Mr. Wrigley contemplates taking proceedings against the Mayor, while Mr. Alderman Riley's attention is directed to Mr. Fox. It is a question of commercial life and death with Mr. Wrigley; and Mr. Alderman Riley's personal and official reputation is at stake. Mr. Carr has not made any sign up to the present, save that his solicitors have again written to the local newspapers to beg for suspension of judgment. Meanwhile, it is announced that Mr. Carr's successor at the gas-works is to be chosen to-morrow. There is nothing more to be said upon the subject, now that the lawyers have been set to work.

GAS AFFAIRS IN SWANSEA.

THERE is a good deal of what diplomatists call "tension" in the relations between the Corporation of Swansea and the Gas Company, growing out of certain matters that were mentioned in these columns a few weeks ago. The worst of it is that as time goes on the bad feeling between the parties, who, for the good of all concerned, had better be friends, seems to intensify. It is not for us to assign the blame for this deplorable state of things; but if we had to do so, we should not heap it all upon one side. The Corporation opposed the Company in Parliament last session, as they had a right to do; and, as the Company allege, in consequence of this opposition and its results they are compelled to raise the price of gas. Always an unpopular step, this action of

the Company at the particular juncture has greatly incensed the Corporation, acting both in their capacity as the street-lighting authority and as representing the ratepayers and the gas consumers of the town. The Corporation inherit ancient statutory powers for establishing gas-works; and Counsel's opinion has been taken upon the question whether these powers remain in force, so that the Corporation could set up competing works. The case was laid before Mr. R. S. Wright, who has replied generally to the effect that the Corporation may set up gas-works if they like. Not content with this, the Corporation Committee who have had this matter in hand, have had a report prepared by the Town Clerk upon the question of electric lighting for the town, and have decided to recommend the Town Council to at once apply for a Provisional Order under the Electric Lighting Act. It will be seen from this meagre statement of the present aspect of gas affairs in Swansea that these might be upon a more comfortable footing. It is not to be supposed for a moment that there is any meaning in this flourishing of old statutes in the face of the Company; and there is a long way between applying for a Provisional Order for electric lighting and getting the lights to work. Not by these means can the Corporation inflict injury upon the Gas Company, if even they wish to do so. That the desire for reprisals exists, although it is to be hoped only for the time, seems tolerably clear. Local opinion accuses the Company of acting arbitrarily upon their powers, and "exhibiting feeling," which has culminated latterly in neglecting to invite the Mayor and Corporation to the luncheon which customarily follows the shareholders' meeting. Now to an outsider it would appear that when there is risk of a little misunderstanding between bodies situated like the Swansea Gas Company and the Corporation, mutual invitations to luncheon should be more frequent than usual, rather than the reverse. We do not suppose that the Corporation want the Company's luncheons; but if the Company have deliberately withheld the customary courtesy in consequence of any disagreement, all we can say is that they have not acted in a politic manner. If oil will not lubricate tight-running machinery, vinegar will never answer. We do not assign blame to anybody; but if the local newspapers are right in asserting that what is essentially a business difficulty is complicated and aggravated by displays of feeling on either side, then that side is in the wrong. We do not share the opinion of a local newspaper that the policy of reprisals between the Company and the Corporation is sure to benefit the ratepayers. It is rather the reverse. If the Corporation venture upon electric lighting, or any such retaliatory measure, they will repent it, and the ratepayers will suffer. The Company might then have reason for crowing over a discomfited adversary; but, between parties who have to live together, the less there is of triumphing over each other's blunders the better for both.

THE MANAGEMENT OF THE SALFORD CORPORATION GAS-WORKS.—Our readers will see, from the report which appears elsewhere, that, just on the eve of the recent strike of stokers at the Regent Road works of the Salford Corporation, Mr. J. F. Halligan resigned his appointment as Manager of that station. We understand that no successor to Mr. Halligan has yet been appointed, and that Mr. J. T. Sheard, F.C.S., who has had charge of the works all through the strike, is still superintending them.

THE ELECTRIC LIGHTING EXPERIMENT AT LEAMINGTON.—Our Leamington Correspondent, telegraphing last night, said: "The Leamington Town Council, at their meeting to-day, accepted an offer from Messrs. Chamberlain and Hookham, of Birmingham, to erect four arc lamps, five 300-candle incandescent lamps, and twenty-five 50-candle power lamps on the Parade, at a cost of £33, one-third of which the contractors will pay, and supply the electric current without extra charge. These changes are in consequence of the incandescent lamps of lower candle power having proved unsatisfactory."

OIL v. GAS FOR SMALL CONSUMERS.—We desire to call our readers' attention to the letter of Mr. J. S. Cranmer, Gas Engineer to the Stratford-upon-Avon Corporation, which appears in our "Correspondence" columns, in which he asks for information on the very important question of the competition of oil with gas among the smaller consumers. It is with this class that the paraffin lamp, with all its attendant dangers, is preferred to the gas-burner—possibly on the ground of initial cost solely; and it is in this direction that the efforts of gas managers are being put forth to extend the use of their illuminant. It will therefore be for the general good, as well as for the special benefit of our correspondent, if those of our readers who are in possession of information bearing upon the subject referred to in his letter, will respond to his invitation to communicate it to him through our columns.

Water and Sanitary Affairs.

AN increase of £2373 in the revenue of the East London Water-Works Company for the half year to Midsummer has been described in the Directors' report as "moderately satisfactory." At the shareholders' meeting last week, the Chairman (Mr. A. W. Gadesden) explained that this modest form of expression was due to the Secretary, who was desirous of seeing something more in the shape of an advance. Mr. Crooken-den may be supposed to look back to the three years immediately preceding 1884, when the annual increase ranged from £7000 to £11,000. A check was put on this growth, as intimated in the Chairman's speech, by the intervention of Mr. Archibald Dobbs and Mr. Torrens. In 1884 there was an actual decrease; but since that date the revenue has been rising, so that the former condition of things is nearly restored. But there was "a time before the flood"—not altogether to be forgotten—when the fortunes of the Company were especially low. Starting in 1807, the average dividend for the next fourteen years was only at the rate of $2\frac{1}{4}$ per cent. per annum. Prior to 1822, there were four years in which no dividend was paid. In those days very little was said about transferring the Metropolitan Water Supply to a public authority. Certainly the progress made has been remarkable. In 1809, the income of the East London Company was only a little over £10,000. Now the single half year brings in £127,000. In the ten years succeeding 1809, the gross revenue of the Company was trebled. It is also a notable fact that the average receipt per house is now somewhat less than it was in 1819; whereas the supply of water has been augmented. The varied character of the circumstances which affect a Water Company is shown by one of Mr. Gadesden's statements, in which he refers to the fact that the closing of two sugar refineries within the last twelve months has deprived the Company's revenue of between £4000 and £5000 per annum. The collapse of the sugar-refining industry in East London tells severely against the Company, owing to the reduced demand for water. But the domestic demand is good, and accounts for £2000 out of the £2300 by which the recent half year transcends the corresponding period in 1887. This source of income is happily free from violent fluctuations. The finances of the Company have been further assisted by the exercise of economy, and the occurrence of several favourable circumstances, in respect to the working expenses; the decrease of the current expenditure being almost equal to the increase of the revenue. Hence so good a surplus remains in hand, that one of the shareholders considers that the present dividend ought to have been $\frac{1}{2}$ per cent. higher. The desired dividend of $7\frac{1}{2}$ per cent. per annum is probably not far off; and a revival of the sugar industry would render material help in this direction. Among the existing difficulties of the Metropolitan Water Companies, we may mention the strange decisions occasionally given by the Magistrates in the Police Courts. The magisterial decrees often wear a very *ad captandum* aspect. The Chairman of the East London Company adverted to a case of this description, on which we recently offered some remarks. That houses should be left without proper cisterns to receive and store the water, is certainly a monstrous perversion of what is intended by the constant supply. If such an arrangement receives the sanction of the law, the consumer had far better revert to a supply on the intermittent system, with its accompanying reserve under his own control. Without this provision, the outbreak of a fire, or the execution of necessary repairs, may occasion serious inconvenience, by the sudden cessation of a supply otherwise constant, and relied upon as such.

LAST Thursday the Prince of Wales accompanied King Charles of Roumania to the ceremony of inaugurating the new works which have been constructed for supplying Bucharest with water.

WE have received from Bell's Asbestos Company, Limited, of Southwark Street, S.E., a copy of their new illustrated catalogue of asbestos manufactures. Although it is not ten years since the art of spinning this valuable mineral fibre by machinery was discovered by Mr. John Bell, the present Chairman of the Company, it is astonishing to find, from a glance at the pamphlet before us, how extensively its unique qualities of incombustibility and imperishability have caused it to be applied in the manufacture of materials used in various branches of engineering. There are several forms in which asbestos comes under the notice of our readers; for instance, in engine packings, paint, putty, and cement. But its many uses are fully explained and illustrated in the catalogue, which has been compiled with considerable care, and will be found serviceable in every engineer's office.

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(FOR STOCK AND SHARE LIST, see p. 651.)

THE event of the past week was the raising of the Bank of England rate of discount to 5 per cent., from the 4 per cent. rate which had lasted only three weeks. It is nearly two years since the rate was last raised to 5 per cent.—viz., on the 16th of December, 1886; and then it lasted until the 4th of February, 1887. The present advance, though not altogether unexpected, powerfully affected the Stock Exchange markets; and nearly all descriptions have suffered an abatement in price. Apart from this, there has been no disquieting influence in action either at home or abroad. The condition of the Gas market has been very similar to that of the week before. Slight modifications of quotation have taken place, and the reductions are confined to the stock of the Metropolitan Companies; while what little upward movement has been made is all in the Foreign category. Gaslight "A" furnishes the chief interest. It had closed weak, the week before; and it opened rather weaker on Monday. Not much business was done in it; but it fell $1\frac{1}{2}$. The next day it was rather worse; but from that point the decline was checked, and signs of rallying were evident, with brisk business. The drop was not recovered by the end of the week; but the stock had a rather better appearance at the close, though it is not quite clear what the next move may be. South Metropolitan have been almost dead; a solitary transaction in the "B" being all the business of the week. The flat tendency has extended to Commercial; and the old stock has fallen 3. The reason for this is not obvious, as the Company have been doing better business this year than for several years past. They had a highly gratifying general meeting on Friday; and everything was pleasant all round—a prosperous balance-sheet, a handsome dividend, and the welcome sight of the Chairman in his place again, looking as well as ever. Among the Foreign Companies, Imperial Continental continues to creep up, and marks a further rise of 1. Malta and Mediterranean has been unusually brisk; and a scent of better things to come is palpable in the air. Other undertakings offer nothing whatever of interest. There is more activity in Water; and, for the first time for a considerable period past, there is a drop in the quotations, though very slight.

The daily operations were: Restricted business in Gas on Monday. Gaslight "A" was weak, and fell $1\frac{1}{2}$; but Imperial Continental was 1 higher. Metropolitan of Melbourne was fractionally better on *ex div.* quotation. Water quiet and unchanged. On Tuesday, Gas was quiet again, without variation. Water was active, and several issues changed hands at excellent figures. On Wednesday, there was considerable dealing in Gaslight "A," with a better tendency; but the quotation did not move. Commercial old was marked at 271—falling 3. Water was less active; and prices were about the average. There was increased activity in Gaslight "A" on Thursday, at about the same prices as the day before. Imperial Continental was firm and active. Very little business in Water, and prices showed a marked tendency to droop. Friday's business in Gas was much the same as the day before—all issues dealt in being steady. Business in Water was all in Southwark, and at moderate figures. New River fell $1\frac{1}{2}$, and Lambeths fell 1 each. On Saturday, Gas was quiet; but prices for the most part were good. Water was not dealt in.

ELECTRIC LIGHTING MEMORANDA.

THE AFFAIRS OF THE MAXIM-WESTON COMPANY—THE LESSON OF BARNET—THE APPLICATION OF ELECTRICITY TO MINERS' SAFETY-LAMPS—MR. H. E. JONES UPON ELECTRIC LIGHTING AND GAS IN AMERICA.

THE sensation of the week in business circles interested in electric lighting was the publication of the recent history of the Maxim-Weston Company. An extraordinary general meeting of the shareholders was held on Wednesday—the new Chairman (Mr. John Marks) presiding—to consider a resolution for reducing the capital of the Company from £125,000 in shares of 5s. each, to £62,500 in shares of 2s. 6d. each, by cancelling lost capital. In moving the resolution, the Chairman made a general statement referring to the condition of the concern, and reflecting in strong terms upon the conduct of the late Chairman, Mr. Hugh Watt, M.P. It is notorious that the present Board were appointed in opposition to Mr. Watt; and he seems, in consequence, to have made himself as disagreeable as he could. The new Directors were for some time unable to procure access to the Company's books; and the Secretary, who was one of Mr. Watt's own clerks, refused to carry out their instructions. A deadlock of some months' duration ensued, which was terminated by the resignation of the old Chairman and the dismissal of the Secretary. As soon as the new Directors obtained possession of the books and other property of the Company, they had a valuation made, with the result that the picture of the Company's state as presented by Mr. Watt was found to be altogether illusory. The cancellation of capital in question on Wednesday was the first step considered necessary by the Directors to put the affairs of the Company upon a proper basis. Although the shareholders must have been bitterly disappointed at the condition of the concern as revealed by the Board, they fell into the proposed arrangement; and the lost capital was accordingly written off. The next thing they will have to do, if the Company is to be saved, is to find £23,500 for working capital. Meanwhile Mr. Watt has issued a circular stating his own view of the circumstances attending his retirement from the control of the Company's affairs, and has presented a petition to the Court for the winding-up of the Company,

which will come before the Vacation Judge to-morrow. In all probability there will be some more "washing of dirty linen in public" before the Maxim-Weston undertaking is extricated from its present straits.

It was mentioned in the JOURNAL last week (p. 603) that the enterprising town of Barnet had had another experience of the shady side of electric lighting; the whole of the street lamps having gone out one foggy evening and remained unlit for hours, owing, as it was stated, to a breakdown of the steam-engine. We observe that the newspapers that were loudest in applauding the little suburban town for its "public spirit in adopting the light of the future, while London lagged hopelessly behind," &c., make no mention of these little inconveniences. They must not be overlooked, however, by the best friends of electric lighting. We are not so ignorant of what can be done with electric lighting machinery, as to argue that because the Barnet lamps occasionally go out and leave the streets in darkness, therefore no better can be done elsewhere. The temptation to exhibit the black side of the Barnet experiment is hard to resist, seeing how ridiculously it has been vaunted in some newspapers, the conductors of which should have known better. In reality, however, we refer to these troubles chiefly to show that the electric lighting of a town, in order to be satisfactory, must be deliberately entered upon, and conducted upon a properly worked-out plan. It is all very well for a local board who have fallen out with the local gas company to send for a contractor for electric lighting, and after parleying with him for a week or two, to entrust him with the lighting of the streets by means of a "scratch" installation. That sort of thing is very smart, as some people understand smartness, but it has the disadvantage of not standing wear and tear. The true lesson of Barnet is only the lesson of half-a-hundred other towns in the kingdom that have dabbled in electric lighting to their loss and disappointment. If good electric lighting is wanted anywhere, the plant must be properly laid down. Bradford, for example, is going the right way to work to get a satisfactory result; and if disappointment should be experienced there also, it will not be due to haste and want of sufficient consideration on the part of the designers of the lighting plant.

There was an exhibition of miners' electrical safety-lamps in the Mechanical Science Section of the British Association meeting this year, to illustrate a paper presented by Mr. Nicholas Watts. Among others were shown and described the Swan lamp, which is maintained by a four-cell secondary battery grouped together in a block of gutta-percha, which is enclosed in a wooden case. The luminosity is from 1 to $1\frac{1}{2}$ candles for ten hours; and the lamp weighs 7 lbs. It is said to be in extensive use in South Wales. Then the Schanschieff lamp was shown; this being maintained by a single liquid primary battery. The luminosity is (with reflector) 2 to 3 candles for nine hours. Other lamps named were the Pitkin, the Portable Electric Syndicate, and the Vaughton, with secondary batteries, and the Walker with a simple primary battery. All these lamps cost from 21s. to 30s. each, and the working expenses average about 1d. per lamp per day. Mr. Watts seemed to think well of the prospects of lamps of this order for coal miners' use; but did not settle the question whether primary or secondary batteries are to be preferred. Also he did not think the position of the lamp on the stand was finally settled.

The interesting question of the position of electric and gas lighting in the United States has been discussed by many authorities; but the latest, and not by any means the least valuable, is the brief statement volunteered by Mr. H. E. Jones, the Engineer of the Commercial Gas Company, at the meeting of the proprietors last Friday, a report of which will be found in another column. Mr. Jones went about with his eyes open; and he had the advantage of being able to complete his own observations by information obtained from gas engineers in all parts of the great continent, who were able to supplement his passing opinions by permanent records. There can be no doubt that Mr. Jones is a witness of truth when he says he saw everywhere in the States electric lighting and gas and oil in full use side by side. This report rounds off what peripatetic electricians say of the electric light in America. They have habituated us to hear of the popularity of the electric lamps in American towns, small and great; but they have omitted to say that fashionable electric lighting is contemporaneous with a lively business in gas and oil. That is what Mr. Jones tells us; and the message is worth carrying across the Atlantic. The utmost that our British electricians seem to hope for is that they may in time realize the good fortune of their American compeers. If this aspiration is to be granted, it is to be hoped that British gas companies may likewise emulate the growth of the American undertakings referred to by Mr. Jones as increasing their gas production at the rate of 20 per cent. per annum. It is rather to be regretted that Mr. Jones did not return in time to give his view of the matters dealt with by Professor Forbes before the recent British Association meeting. Possibly, however, Mr. Jones may be induced to say a little more upon the subject than he could find time for last Friday.

THE next ordinary general meeting of the Institution of Mechanical Engineers will be held on the 24th and 25th inst., at 25, Great George Street, Westminster. The business to be transacted includes the election of new members and associates, and the nomination of officers for election at the next annual meeting. Discussion will be resumed on two papers read at the last meeting; and two new papers will be read and discussed—one on "The Rathmines and Rathgar Township Water-Works," by Mr. A. W. N. Tyrrell.

THE PRESERVATION OF GASHOLDERS FROM RUST.

THE attention of gas engineers has been much drawn by recent discussions to the fact that gasholders are unstable structures. They are also perishable erections, which is a further consideration that engineers cannot afford to lose sight of. Sooner or later the best constructed holder requires re-sheeting; and long before it arrives at this extremity, it has demanded periodical attention and occasional patching. Time was when this tendency to decay was almost wholly confined to the holder itself; the guide-framing, being mostly of cast iron, was to all intents and purposes everlasting. Since guide-framing has been made chiefly of wrought iron and steel, however, this condition has changed; and the care of the engineer for the preservation of his work has extended to the fixed as well as to its moving portions. The fact has been generally recognized, although the understood tendency of wrought iron and steel to rust, unless thoroughly protected by painting or otherwise, has not been allowed to stand in the way of their employment in these structures. The utmost regard that has been paid to this consideration is in respect of discouraging forms of construction which would prevent periodical painting. It has been a particular rule with designers of gasholders for which wrought iron or steel-guide framing has been chosen, that the pieces of the latter should never be so disposed that a paint brush could not be applied to every part. Notwithstanding all this care, however, the protection of the material of gasholders from rust is a serious trouble; and holders often cost large sums annually for scraping and painting, which nevertheless does not long preserve them from decay. At a time when the subject of gasholder construction is attracting general notice, it may be well to devote a little space to the discussion of this part of the question, which must always be important whether external guide-framing is modified or abolished; for if the columns and stays are done away with, the sheeting will remain, and this is the most perishable part of the work.

Gasholders wear out or decay sooner or later, as everybody knows; but it is not always easy to state the real causes of the observed effects. Old holders last a very long time in some places and under certain conditions; and, in fact, commonly fall to be removed rather because their room is required for the provision of larger storage than because of their own unfitness for work. On the other hand, quite new and apparently well-made holders may require extensive repairs and re-sheeting, although worked under precisely similar conditions. Some holders are racked almost in pieces by strains acting on the side and top sheeting, as is shown by distortions of their shape and incurable leaking. This may be due to bad design in the first place, the material being wrongly disposed; or, of course, leaking may be simply owing to bad workmanship in the erection and rivetting. In some cases, however—and it is these we especially desire to discuss—the sheeting and guide-framing (particularly the former) rust out under the engineer's eyes; the progress of decay commencing with local blistering and pitting, and ending only with the ruin of the whole structure. What are the causes and cure of this deplorable decay?

In the first place, regard must be had to the quality of the materials used. Most engineers can recall instances of old holders that have never had much attention except an occasional tarring outside—the latter sometimes repeated until the semi-plastic coating hangs upon the iron in dirty creases, looking like the hide of a rhinoceros—and are yet, so far as the metal is concerned, in perfect preservation. Against these may be set the examples of new holders decaying as already mentioned. Here the quality of the iron becomes the first subject of inquiry. In all probability the iron in the old holders was of the finest brand procurable at the time, and cost perhaps £25 and upwards per ton before any work was done to it. It is unnecessary to ask what the new iron may have cost. The old holder was made of sheets as fine in texture as copper, and as ductile and free from cinder. The modern article may be as scaly as a piece of slate; so that it contains all the elements necessary for rapidly disintegrating as soon as the skin is pierced and oxygen can get at the interior. We do not hesitate to declare that many modern holders are made of sheets of rubbish that can only be called iron by misplaced courtesy. Even when care is taken to specify a material possessing a certain tensile strength, and the requirement is insisted upon, the iron that satisfies the mechanical test may be utterly unfit for use in a structure intended to possess endurance rather than strength. A hard dirty iron, coarsely laminated, may withstand a considerable pull along the grain when new; yet it will rot like paper as soon as the skin is broken and it is exposed to alternations of wet and dry in a sulphurous atmosphere. Competition in price is, of course, the origin of the practice of putting iron of this character upon the market. It is idle to blame the gasholder builder for all of the failing. He must cut down his tender in order to obtain work; and he is compelled to buy the cheapest material that will satisfy the specification. It is no concern of his how long the structure will last after he has received his last payment on the contract.

In point of fact, the treatment which the sheets of iron composing a gasholder receive is very severe. They are flattened and punched, and the seams are sometimes heavily strained in course of the rivetting; then the metal is painted or tarred, and immersed in dirty water, from which it rises to be dried in air, or, as it may be, to be drenched by rain, day after day and year after year. It is expanded by heat or shrunk by cold. If the paint dries hard, it cracks when the iron expands; and the water attacks the iron beneath. It is no wonder that under such treatment the poor

laminated iron which the gasholder builder is driven to buy gives way, and blisters and gets into holes under its coverings. If gasholder sheeting is wanted to last any length of time, therefore, the first thing to insist upon is that the metal shall be of good quality—not merely strong in the mechanical sense, but pure also. There is no difficulty about this. Good iron is made now, as it always has been; and although there is no necessity for making gasholders of charcoal sheets, a reasonable degree of purity will always favour the life of the material when exposed to deteriorating influences. Gasholder sheets require to be fairly hard, to preserve rigidity of form; but the hardness need not mean scaliness. It is customary for the sheets to be specified to be oiled or painted at the maker's works before delivery. Anyone who has walked through a gasholder yard, and noticed the sort of stuff that is frequently so treated, may well entertain doubts respecting the utility of the process. Dirt and rust are not always carefully removed before the imaginary preservative is applied; whereas, to be effectual, this process requires even the removal of the scale. What is wanted, therefore, is a pickling process in weak acid, and subsequent brushing, before the plates and bars are oiled or coated. Without this it is better to let the iron rust, and throw off the scale, if it will, before attempting to paint it. Half the mischief with iron is traceable to this one cause—scale. Even after having become pitted with rust, iron may be saved by drying and painting; but not if corrosion goes on untouched under a delusive hard coating of scale. Steel should always be cleaned from scale before painting; for, as it is much more easily corroded than iron, it needs more careful treatment from the first.

Supposing, now, that a gasholder has been well made, of good and tough materials, properly cleaned at the works, and coated with a skin of boiled oil before being dispatched for erection, what is the best thing to do with it after the erection is finished? We are not going to advertise anybody's paint or process. As for paint, practical men who have used much pigment upon ironwork know pretty well what to expect from it, and are not over-much impressed with all that is advanced by different makers in recommendation of their wares. A good deal has been published of late respecting the advantages of soapstone as the solid basis of paints intended for the preservation of ironwork; but experience of this compound with gasholders is wanting. The great desideratum with ironwork paints is that, while they should dry thoroughly in a comparatively quick time, seeing that many holders must be painted while in use, they should not dry so much as to lose their nature, or become scaly or powdery with time. There is the main difficulty. Notwithstanding all that is advanced on behalf of the claims of some paints to special "anti-corrosive" qualities, we hold to the opinion that the value of a paint is a question entirely of its tenacity, adhesiveness, and the preservation of its body after drying. The "anti-corrosive" influence of the solid part of the constituents of a paint upon the material which it covers must be chiefly imaginary. If the paint will only *preserve itself*, and stick to the iron, it does all that paint can do. No matter what may be the chemical composition of a paint, the obligation to scrape it off if it blisters and leaves the iron is imperative; and the same may be said if it shows a tendency to crumble to powder. Hence it may be deduced that what French engineers call the "agglomerant" is after all the mainstay of any paint.

The cost and temporary character of painting for preserving ironwork have induced some engineers to fall back upon coal tar as a preservative for their gasholders. The most artificial preparation of tar for this purpose is the well-known "black varnish;" and excellent stuff it is, when properly made and well laid on. It is all that can be desired for the inside of holders; its powers of adhesion and preservation being perfect. Unfortunately, it shares with other preparations of tar the unpleasant tendency to turn a dirty sage-green when exposed to the air. A remarkable instance of this once came under the writer's notice. The cast-iron columns of a large new holder had just been finished with a coat of the varnish when there came a heavy thunderstorm, which burst right over the works with frequent lightning and sheets of rain, lasting perhaps an hour. When the rain ceased, the glossy black columns were seen to be all turned this dirty light sage-green tint, which lay like a skin on the surface of the varnish; and the appearance of the work was spoiled. Tar simply boiled to expel the water, hardened by the addition of a little lime, and made drying with naphtha, is commonly used for gasholders, and is very good for its kind. It leaves a holder black, however, which is not an advantage for the summer; and so the surface is sometimes lightened by a wash of Portland cement mixed very thin with water and simply laid on with a whitewash brush. The different capacities of the iron, tar, and cement for expansion with heat are apt to cause cracks, however, which require attention. Still, the preparation is a very useful one.

The subject of the preservation of gasholders from corrosion is, however, a matter that can only be fairly treated by the examination of recorded experiments and observations, and investigation of details, which cannot be compressed into the space of an article. Many engineers possess data referring to the covering power and durability of paints and varnishes, upon which their practice in this regard is based. It would be interesting if some of this information could be collected, and made generally available by means of a communication to one of the technical societies.

At the first meeting of the Council of the Sanitary Institute last Friday, at the Parkes Museum, Sir Douglas Galton, K.C.B., F.R.S., was unanimously appointed Chairman.

FINDING WATER AND METALS BY DIVINATION.

THE remarkable experiments in the art of rhabdomancy, to which reference was made in a recent number of the JOURNAL, justify some further examination. If modern times furnished but a single example of this mysterious power, it would scarcely be worth while to turn to past records for additional illustrations. But investigation is excused, if not demanded, when we find that in the course of a few months rhabdomancy has been successfully practised by different adepts in widely-separated parts of the kingdom. In the previous article on this subject we quoted what had occurred (1) in Suffolk, (2) in Sussex, and (3) in the North of Ireland.* And, moreover, the London newspapers have quoted the names of a number of noblemen and gentlemen on whose estates it is said Mr. Mullins has been no less successful than in his experiments at Hastings. Thus there are at the present time at least three men in England who claim to be possessed of a power which, viewed from an ordinary standpoint, and by the light of everyday experience, must be regarded as inexplicable. But facts are always stubborn things; and facts must be admitted by those who have witnessed the extraordinary performances in question, even though they are unable to put forward any acceptable explanation of what has been demonstrated in the face of a "cloud of witnesses." Having had these modern instances forced on our notice, let us glance at what has happened in the past.

But, first of all, the question arises, what is the meaning of the term "Rhabdomancy"? The answer is that we are to understand by the use of this word the power—partly natural and partly acquired—claimed by some individuals of discovering things concealed beneath the surface of the earth, more particularly metals and running waters. This art is said to be exercised through the agency of certain instruments, of which the best known is the divining-rod. There are, beside, the sidereal pendulum and the bi-polar cylinder; but of these latter we do not now propose to speak. According to an Italian work, which was translated into German in the early part of the present century, persons who possess the peculiar gift under discussion are liable, when in the vicinity of subterranean channels of waters or of bodies of ore, to a marked alteration of the pulse, a rapid change in temperature, and sometimes to convulsive symptoms which are scarcely distinguishable from those produced by ordinary electric shocks. From the most remote period, remarks a German writer, indications are found of an art of discovering veins of ore and water concealed in the bowels of the earth by direct perception of their existence unaided by ocular demonstration. In France and in Switzerland resort to this art has been far more common than in our own country, and has been subdivided into metalloscope, or the art of discovering metals, and hydroscope, or the art of discovering water. It was in the middle ages that the practice of rhabdomancy attained the most remarkable development; but, although many of the feats which were then recorded may be held to have been accomplished in a fraudulent manner, there are other examples which it is impossible to put aside as entirely undeserving of credence. Mr. Baring-Gould, in whose interesting work on "Curious Myths of the Middle Ages," many of the Jesuit and other works on this subject are carefully cited, quotes at some length the experiments made by one Bleton, whose powers as a detector of unseen watercourses attracted the widest possible attention. A number of medical men set themselves to subject this expert to a series of tests, which, in their judgment, precluded the possibility of fraud. Bleton, although sometimes using a hazel-branch, did not consider it indispensable to the success of his experiments. He was content to employ a stick picked up from the road, provided it had not come from an elder tree. It was not requisite that the rod should be fork-shaped. If the rod used were straight, it was customary for it, when held by the operator, to rise slightly at the extremities, but not to turn. If bent, it revolved on its axis with more or less rapidity, in accordance with the volume of the detected water and the force of its current. A further phenomenon in regard to this man's performance was that he was able to make the rod turn between another person's fingers, even without touching or seeing it, by merely approaching or leaning his body in the direction of the stick, provided he was at the time standing over a subterranean watercourse. But if the operator were insulated on glass, silk, or wax, his sensations were less vivid, and the stick ceased to rotate. It appears to be certain, however, that in some instances Bleton's powers absolutely failed him. Concerning another human hydroscope, who was born near Marseilles in the year 1760, Mr. Baring-Gould mentions some singular circumstances. He was said to experience sensations of horror when near water, the existence of which other persons had not the slightest reason to suspect. Vincent Amoretti, an Italian, also was reported to undergo peculiar sensations when brought into proximity to water, coal, and salt, and was skilful in the use of the divining-rod. But, to come nearer home, reference is made to Vol. XXII. of the *Quarterly Review*, in which the astonishing performances of an English lady are circumstantially set forth. This lady, it is said, indicated to a Dr. Hutton the existence of a spring of water in one of his fields adjoining Woolwich College, which, in consequence of this discovery, he was enabled to sell to the College at an enhanced price. The lady in question exhibited her powers not once but on many occasions, and in the presence of witnesses whose statements the

* A correspondent has written to the *Morning Post* mentioning the names of two young men at Abergele who are said to be very successful in "divining" both for water and minerals.

Quarterly Reviewer of that day (1820) held it to be impossible to disbelieve.

Many somewhat similar instances might be cited from the pages of certain other writers, but for the need of confining our remarks within certain limits. Enough, however, has been said to show that there is a far-stretching and continuous chain of evidence which tends to prove that in all ages rhabdomancy has had its representatives. The claim to exercise this mysterious power is no new thing. Precedents are abundant. It would then be well if, once for all, the doubts and difficulties surrounding the question could be set at rest by systematic and practical tests, to which there is reason to believe every one of the three rhabdomatists whose names have been mentioned in connection with recent experiments would be perfectly willing to submit. One of them in particular—Mr. John Stears, of Hull, whose remarkable feats at Lisburn we described in our previous article—has, in his letter to a contemporary from which we quoted last week, challenged anyone and everyone who may be disposed to investigate the phenomena of which he is so successful an exponent. This challenge ought not to be disregarded. Mr. Stears plainly says that he possesses the power of finding both metals and water, when, to ordinary humanity, they are out of sight and imperceptible. Is this true, or is it false? If the former, the fact should be placed beyond all doubt. If it is false, the deception ought to be established; and the sooner the better. Mr. Stears claims to have used the divining-rod successfully for a period of nineteen years. Certainly, no one has come forward to dispute the accuracy of his representations; while, on the other hand, there are plenty of persons who would feel constrained to bear witness to what was accomplished by him at Lisburn, as set forth in these columns. One circumstance which Mr. Stears mentions in his letter deserves to be borne in mind in connection with the tests formerly applied to Bleton—viz., that if the rhabdomantist stands upon two china dishes all his power is lost. Mr. Stears views this as a conclusive indication that the gift he possesses is attributable to electricity. Herein may be the key to the whole matter, or at least a clue, which, in so highly cultivated an age as ours, should help to guide to a true and rational conclusion, those who set themselves to probe the subject. The impartial observer, though naturally averse to admit the existence of magnetic forces which he does not understand, will nevertheless pause before he scorns all theories and explanations which are not to be summed up in the one word "fraud." The history of scientific progress should at least teach us to approach such questions with open mind. Mesmer, in his day, was jeered at, and his professions scornfully pooched. But the man who would now-a-days deny the existence of mesmeric force would be set down as an ignoramus. Mesmer adopted the part of a charlatan, and perhaps deserved to be discredited. In like manner some of the professors of rhabdomancy may have played tricks in their day and generation; and yet it is conceivable that rhabdomancy is not, from beginning to end, a false pretence or a delusion. We hold that, in the interests of truth, the subject deserves thorough investigation.

Communicated Articles.

THE GUIDE-FRAMING OF GASHOLDERS.

FOURTH ARTICLE (continued).

We will now apply the rules for the strength of guide-framing to a few actual examples, commencing with gasholders of the

CANTILEVER TYPE.*

Example I.—South Metropolitan Gasholder, Old Kent Road. Designed by Mr. George Livesey (I shape, web-plate Standard, see Fig. 37 c.)

D (the diameter of gasholder)	= 214 feet.
H or d. (the total height of holder)	= 160 "
N (the number of standards)	= 24 "
B (the distance centre to centre of standards)	= 28½ "
A (the effective sectional area of back flange)	= 10 sq. inches.

Now applying formula for bending moment, due to distorting influences,

$$\frac{B \cdot H \cdot A}{270} = \frac{28\frac{1}{2} \times 160 \times 160}{270} = 2702 \text{ (inch-tons).}$$

The standard being in effect a plate girder, and the front flange having so much more material in it than the back flange, the neutral axis will not pass midway between the flanges, but through the centre of gravity of the cross section of the standard. Therefore in determining the moment of resistance of the standard, we must take the sectional area of either flange, and multiply it by its distance from the neutral axis. Twice the product into the resistance of the material (per square inch) will give the moment of resistance (R) very nearly.†

In this particular example the centre of gravity of the cross section of the standard is easily determined to be 19·3 inches from the back flange. The effective sectional area of the back flange is about 10 square inches. This multiplied by twice the distance from the neutral axis = $10 \times 19\frac{1}{2} \times 2 = 386$. The bending moment we found to be 2702; which, divided by the above, will give the actual strain upon the iron per square inch, or 7 tons per square inch, due

to distorting strains set up in the holder by the one-sided application of the wind pressure, and through it communicated to the standards.

Now, applying the rule for *dead thrust*, we have

$$\frac{24d^2 + D^3}{5040 N} = \frac{(24 \times 160 \times 160) + (214 \times 214)}{5040 \times 24}$$

= 5½ square inches required. The spare section about the neutral axis of the web plate in the standard is competent to meet this dead thrust; the total section of web being equal to 10 square inches fully.

Strain on Ties and Struts.—Referring to the third article, we find S_1 , the vertical shear =

$$\frac{24d^2 + D^3}{10,000} = \frac{24 \times 160 \times 160 + 214 \times 214}{10,000} = 66 \text{ tons.}$$

which, resolved in the direction of tie = $66 \times 2\cdot05 = 135$ tons.

" " " " strut = $66 \times 1\cdot75 = 115$ tons.

There are five bays of double bracing =

$$1 + 2 + 3 + 4 + 5 = 15.$$

Strain in— Effective Section allowed.

First or top set	= $\frac{1}{15} \times 135 = 9$ tons	2 bars	$4 \times \frac{1}{4} = 4$ sq. ins.
Second "	= $\frac{2}{15} \times 135 = 18$ "	"	$5 \times \frac{1}{4} = 5$ "
Third "	= $\frac{3}{15} \times 135 = 27$ "	"	$6 \times \frac{1}{4} = 6$ "
Fourth "	= $\frac{4}{15} \times 135 = 36$ "	"	$7 \times \frac{1}{4} = 7$ "
Fifth or bottom	= $\frac{5}{15} \times 135 = 45$ "	"	$8 \times \frac{1}{4} = 8$ "

The strain per square inch is, therefore, 2½ tons on the top set; and increasing to fully 5½ tons per square inch on the lowermost set, which is quite safe.

Strains on the struts:—

First or top ring	= $\frac{1}{5} \times 115 =$ (say) 8 tons.
Second "	= $\frac{2}{5} \times 115 =$ " 16 "
Third "	= $\frac{3}{5} \times 115 =$ " 23 "
Fourth "	= $\frac{4}{5} \times 115 =$ " 30 "
Fifth "	= $\frac{5}{5} \times 115 =$ " 38 "

The effective sectional area of each strut is something like 15 square inches; so that in the lowermost one, it is only about 2½ tons compression per square inch, whereas in the top ring it is only about ½ a ton. (See Note P.)

Example II.—Large Gasholder at Birmingham. Designed by Mr. Charles Hunt.

D = 233 feet. d or H = 150 feet. N = 26. B = 29 ft.

K = 60 ins. A = 16 square inches (effective).

Applying the formula $\frac{B H^2}{180 K}$ we have $\frac{29 \times 150 \times 150}{180 \times 60} = 60\frac{1}{2}$ tons.

Allowing a strain on the iron of 5 tons per square inch, we require say 12 square inches in each flange. The actual effective area is 16; so that we have a margin of 4 square inches in each, or a total of 8 square inches to meet the thrust and lift strains. These

by the formula, $\frac{24 d^2 + D^3}{5040 N} = \frac{24 \times 150 \times 150 + 233 \times 233}{5040 \times 26}$

= 4½ square inches required. One boom only is therefore sufficient to meet these strains. The ties in this case attach to the back flange or boom of the standard; so that the strains they induce are chiefly carried or transmitted by that flange.

As regards the bracing between the standards, the number of panels or sets of struts and ties are the same as in the last example—viz., five—and on applying the formulæ, it will be found that the strains are almost precisely the same, bar for bar, as for the previous example; but the sections of iron allowed are a little stronger. We need not repeat the method, as it would practically agree with the above.

In both these examples, we note that the ties and strut in the upper part appear much stronger than needful to meet the estimated strains; but this is correct for the following reasons:—

(1.) The excess of strength in the upper struts, together with the wind ties (sometimes called Paddon's ties), help to resist the tendency of the framing to distort out of shape horizontally, as they act like so many stiff rings or curbs. This help is most needed at the top, because the lower portion of the cylinder of the guide-framing is fixed to the solid tank, and cannot therefore distort out of the circle; but the upper part depends upon the stiff rings not only in the holder, but in the framing itself, quite as much as upon the stiffness of the standards acting as independent posts or cantilevers.

(2.) The wind pressure and other overturning forces act upon the standards through the roller carriages, which, of course, are at points up the standard; and therefore, properly speaking, the forces are not uniformly distributed. A great deal of the force is given out by the top rollers at the top of the framing, making the upper part of the standard like a beam loaded at one end only; and therefore increasing the strain on the top bays. These are good reasons for the apparent excess of strength.

NOTE.—It is, of course, an easy matter to determine the strains due to the forces acting at points up the front of the standards, instead of being distributed as we have taken them; but for all practical purposes, we may take as a reliable rule that the top ties should not be less than half the sectional area of the bottom set—the others being proportionally treated. The struts should be of equal strength and stiffness throughout, so as to resist distortion.

Example III.

The largest gasholder in the world is the four-lift one erected at the East Greenwich works from the designs of Mr. George Livesey. The guide-framing is carried to the full height of the gasholder, and consists of 28 wrought-iron web-plate standards of

* See Third Article (Vol. LI., p. 189) for method of treatment.

† This is not strictly correct; but it is very near the truth.

I section (see fig. 37D), braced together into one huge cylinder by six tiers of struts and systems of diagonal bracing.

D (the diameter of gasholder) = (say) 250 feet.

H or d (the total effective depth) = — 180 „

N (number of standards) = — 28 „

B (centre to centre of standard) = (say) 28 „

Assuming that the top curb is able to offer resistance to distortion at the top, aided by the Padden's ties, we have—

$$M = \frac{BH^2}{270} = \frac{28 \times 180 \times 180}{270} = 3360 \text{ inch tons} = \text{the bending moment on each standard.}$$

The cross section of the standard displays a great deal more material in the front than in the back flange; and, being a web-plate girder, the neutral axis will fall nearer to the front flange, or about 20 inches from the back flange. The sectional area of the back flange is fully 11 square inches effective. $11 \times 20 \times 2 = 440$.

$$\frac{M}{440} = \frac{3360}{440} = 7.6 \text{ tons per square inch.}$$

This is the strain on the flanges of the standard, due to the *distorting* influence of the maximum wind pressure on the whole gasholder.

The dead thrust on one standard, due to the overturning action of the wind, requires by the formula—

$$\frac{(24 \times 180 \times 180) + (250 \times 250)}{5040 \times 28} = \text{nearly 6 square inches.}$$

The sectional area of the web is 9 square inches. The metal about the neutral axis, together with the concrete filling in the front guide, will therefore fully meet this strain of dead thrust on the standard, due to the *overturning* action of the wind.

We still have the bracing to treat of. Applying the formula for vertical shear—

$$S_1 = \frac{24d^2 + D^2}{10,000} = \frac{(24 \times 180 \times 180) + (250 \times 250)}{10,000} = 84 \text{ tons.}$$

The bracing between the standards consists of six tiers of horizontal struts and two distinct series of cross ties; one set being of steel (represented in fig. 39 by the thick lines), and the other of wrought iron (indicated in the illustration by thin lines).

We will deal with each series separately, and as resisting the whole vertical shear (84 tons). Taking the main steel ties first, the 84 tons resolved in the direction of these main ties = 116 tons. As there are six panels of ties in the height, we have :

$$1 + 2 + 3 + 4 + 5 + 6 = 21.$$

Strain in—	Square Inches.
Top tier = $\frac{1}{6}$ of 116 = 5.5 tons.	2
Second „ = $\frac{2}{6}$ of 116 = 11.0 „	3
Third „ = $\frac{3}{6}$ of 116 = 16.6 „	3½
Fourth „ = $\frac{4}{6}$ of 116 = 22.2 „	4
Fifth „ = $\frac{5}{6}$ of 116 = 27.6 „	4½
Bottom „ = $\frac{6}{6}$ of 116 = 33.2 „	5

The lowermost ties are 10 in. by $\frac{5}{8}$ inch. The effective sectional area, after allowing for the riveted junction, equals (say) 5 square inches, which is therefore less than 7 tons per square inch—a very safe working strain for steel. The ties decrease an inch in width every bay; the topmost being 5 in. by $\frac{5}{8}$ in. There is therefore but little more than 2 tons per square inch on the top ties; the balance of strength going towards preservation of form, &c., as already explained.

We see from the above that, providing the standards are stiff enough in themselves, the main steel ties are all that would be

required; but in this case they would lack lateral stiffness, unless braced intermediately—the pitch of the main steel ties being about 30 feet; and we must remember that the formula applied to the standards assumes that they (the standards) are thoroughly lashed together into one complete cylinder.

We will now consider the whole shear (84 tons) as coming upon the secondary ties only. Resolving it into the required direction, we have 156 tons, and halving it, because there are two pairs of ties in each panel, we get 78 tons as the inclined pull, to be split up amongst the six panels, or strain on

Top tiers = $\frac{1}{6} \times 78 = 3.7$ sectional area allowed = $2\frac{1}{2}$ sq. ins.
Second „ = $\frac{2}{6} \times 78 = 7.4$ „ „ = 3 „ „
Third „ = $\frac{3}{6} \times 78 = 11.1$ „ „ = 3½ „ „
Fourth „ = $\frac{4}{6} \times 78 = 14.9$ „ „ = 4 „ „
Fifth „ = $\frac{5}{6} \times 78 = 18.5$ „ „ = 4½ „ „
Sixth „ = $\frac{6}{6} \times 78 = 22.2$ „ „ = 5 „ „

The strain on the most severely strained tie is thus barely $4\frac{1}{2}$ tons per square inch—a very safe strain for wrought iron in tension.

We see, therefore, that we have two distinct series of ties, each capable of standing the entire strain. No doubt the object has been, not only to give the standards greater support laterally, but likewise to provide against the possibility of a tie snapping; because if one tie snaps, it might upset the whole structure—like the snapping of one link in a chain. In the cantilever form of construction, so much depends upon the ties being taut, and not giving way, unless the parts are duplicated as in this instance.

As regards the struts, by applying the process already described, we find the strain on the bottom one = 22 tons compression. The section of the strut is ample and well adapted by its form to resist this thrust; so we need not enter further into details.

The foregoing are examples of holders having the guide-framing carried to the full height, and with wrought-iron framed standards. The next example will be one where the guide-framing stops at the middle lift, and having cast-iron columns braced into one cylinder.

Example IV.—Rotherhithe Gasholder.

D = 153. d. or H = 75. N = 18. B = 30. d_1 (diameter of column) = 36 inches. Thickness (say) 1 inch. Two tiers of girders to act as struts, with strong flat-iron ties between.

Applying the formula, we find that the sectional area of one column required to meet the distorting strains only equals—

$$\frac{1.6 B H^2}{130 d_1} = \frac{1.6 \times 30 \times 75 \times 75}{130 \times 36} = 58 \text{ square inches.}$$

Sectional area required to meet direct thrust and lift-strains for one column=

$$\frac{24 d^2 + D^2}{3360 \times N} = \frac{24 \times 75 \times 75 + 153 \times 153}{3360 \times 18} = 2\frac{1}{2}.$$

Making a total sectional area of at least $60\frac{1}{2}$ square inches required when the columns are braced together so as to form one complete cylinder cantilever. Actual sectional area of the column is about 137 square inches, which is, therefore, more than sufficient.

In working the strains on the bracing, we must, for convenience, assume the guide-framing as reaching the full height of the holder, which would make it three bays. The reason for this being that the strain on the bottom set of diagonal ties is the same as if the guide-frame ran to the full height.

$$S_1 = \frac{24 d^2 + D^2}{10,000} = \frac{24 \times 75 \times 75 + 153 \times 153}{10,000} = 15\frac{3}{4} \text{ tons.}$$

This, increased in the proportion that the tie bears to the pitch, equals for the ties (or X) 25 tons, and for the struts (or Y) 19 tons.

$$1 + 2 + 3 = 6.$$

Upper ties = $\frac{2}{3}$ of 25 = $8\frac{1}{3}$ tons or (say) 2 sq. in. required.

Bottom ties = $\frac{3}{3}$ of 25 = 25 „ „ 3 „ „

Section allowed *upper tie* = $5 \times \frac{5}{8}$ flat „ $2\frac{1}{2}$ sq. in. effective.

„ „ *bottom* „ = $6 \times \frac{5}{8}$ „ „ 3 „ „

Thrust on struts = $6\frac{1}{2}$ and $9\frac{1}{2}$ tons respectively. The girders are amply strong to meet this.

NOTE P.

In gasholders of the cantilever type, which depend so much upon the efficiency of the bracing between the standards, the ties should, if they cannot take hold of both flanges of the standards (*i.e.*, front and back) attach to the *heavier* flange, if possible; otherwise the weaker flange has to transmit the force through the web to the strong one. It should be the reverse—*viz.*, what the strong flange cannot resist itself, it should pass on to the light.

WATER BY MEASURE.

By METER.

This is a question which is constantly being agitated in London, but nowhere else in the United Kingdom. Why this should be so, is not easily understood; seeing that the rates are now regulated by assessment, defined by the Water-Rate Definition Act, 1885, and backed by the Regulation of Powers Act, 1887. Surely the accumulated ignorance of our present legislators cannot be allowed to go farther in harassing Companies which have acquired parliamentary powers. The rates charged by the eight London Water Companies are now less than those of the Provincial Water Companies, and should satisfy even the most unprincipled and unscrupulous ratepayer.

Those who clamour for water by measure, can advance no reasonable argument in favour of the scheme, other than confiscation of the water companies' property, or, as stated by themselves, the acquisition of these valuable works by local authorities on behalf of the people. There is something more than money value in dispensing an ample supply of pure water. No money can determine its value in its relation to the prosperity of a town. The benefit to the population lies in the benefit conferred. It is true the majority of people find it hard to understand that water has a commercial value; but there is a far higher value attached to water than is usually understood when we say it is vended at (say) 1s. per 1000 gallons. It is not only a necessity, but a luxury; and must be paid for accordingly. Circumstances are so varied in different water-works, that it is difficult to make a rule to apply to every town; although it may be conceded that most water companies could supply large consumers by meter. The cost of the water is of secondary consideration; and we should rather encourage its use, and reduce the charge to a minimum, in order to promote its extended utilization for motors and other trade purposes. Many large consumers would prefer to pay a fixed price for all the water they use or waste; and I see no reason why this could not be allowed in numerous instances. An inspector of experience will not be much in error in his calculation of the quantity of water used in most of the stereotyped businesses requiring a meter; and it is gratifying to find how readily an arrangement may be made with men of business habits desiring such a supply. There is no doubt that the universal adoption of meters to every service would reduce the quantity of water supplied; but it is equally certain that it would reduce the revenue. Then the question arises, Why should water companies be compelled to adopt a measure calculated to cripple the value of the supply not only for domestic use, but for protection against fire? for if the company is obliged to lose 5 per cent. on its domestic supplies, it must be recouped in some other form, and a charge made for fire protection and sanitary uses.

There is another section of the community who insist on the

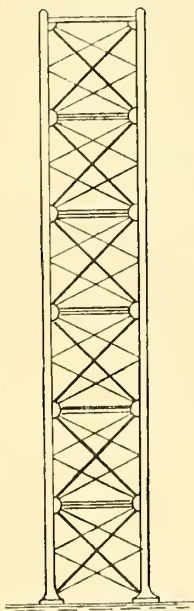


Fig. 39.

use of meters; their avowed object being to check the enormous waste of water. This, however, can be accomplished effectively, speedily, and economically by present methods, and is not a factor in the argument. The consumption may be brought down to 20 gallons per head per day by house-to-house inspection; employing night inspectors who are appointed to separate districts. This is no new system, but was carried out thirty years ago, precisely in the same manner as described by "Inspector" in the JOURNAL for March 20 last; and so it need not be again explained here. There is much misunderstanding in the term "house-to-house inspection." It does not mean visiting each house in the day-time; that would simply be waste of time and money, as well as an annoyance to ratepayers whose fittings are in good order. It means a night inspection, and taking a record of all leaks discovered after midnight, when it may reasonably be conjectured that all use of water is at a standstill. Then during the day the only houses visited are those where waste has previously been suspected. Of course, where water is pumped, every gallon has a certain value; and waste must be restricted in the most efficient manner. Take a town of 30,000 inhabitants, and divide it into five districts, each commanded by any kind of meter; the whole of the houses can be visited by two inspectors during a fortnight, and then the round commences anew. It may be done even quicker than this; for by finding one or other of the districts consuming only two or three gallons per head, these may be left, and the inspector may proceed to investigate other districts where the greater waste is taking place.

It is stated that checking waste prevents the necessity of laying out large sums of money for extension of works; but this assertion is always made in the interest of some new meter or system of checking undue consumption. Plymouth has required an increased quantity of water for some time past; and the meter advocates claim that a supply by meter would be the remedy. But if we take the population at 100,000, and supply meters to each service at a cost of £50,000, added to which there must still be meters for checking waste, *plus* also the interest on first cost, the cost for repairs, maintenance, inspection, and extra collection, &c., it will then be seen that the additional storage reservoir contemplated will necessitate a smaller outlay. Which is the preferable plan? The Council have wisely decided to adopt the latter; for if it costs a greater sum to effect a saving of a few gallons per head than to procure an efficient supply for an important town, there can be no two opinions as to the desirability of procuring an adequate supply, which will not only meet the present difficulty, but give an ample supply for the future. Check waste by all means, but do it in the cheapest and most efficient manner as previously described; at the same time provide an ample supply for many years to come, and before the inhabitants are restricted to an intermittent service. Water is not unlimited in its supply; and this fact will be realized sooner perhaps than many people anticipate. There is therefore the greater necessity for checking waste and increasing storage, and keeping well abreast of the demands. Then, if waste can be so easily discovered and checked efficiently and economically, it cannot be advanced as an argument in favour of a supply by meter; for it is evident that meters cannot be applied universally and indiscriminately. There cannot be hard-and-fast lines laid down for the guidance of all companies. Each must be allowed to arrange its own business, to adopt the charges and use of meters where required, and to meet the peculiarities of the supply after extended tests and experiments.

The meter-rents at present charged are mostly too low. If a minimum rate is to be made, it must be in excess of the maximum quantity used by each class of houses proposed to be metered; and then there will be a profit earned from those who do not use the maximum quantity. If meters should be universally applied, water companies should be protected by a minimum charge to pay for the wear and tear of the instrument, its first cost and necessary inspection, reading, account-keeping, and incidental expenses, as well as the cost of conveying the water to the consumer's premises. It is reasonable to suppose that if a minimum rate for water, and a minimum rate for the instrument is to be imposed on the companies, that the amount of such rating would be submitted to competent judges, engineers of experience in water-works management and construction, and not placed in the hands of the Board of Trade. Each town should be considered apart; and its expenses, capabilities, and requirements weighed by those capable of discerning the merits of the case. One-half of the supply may be obtained from gravitation works, the first cost being the whole amount to be considered; whilst pumping from deep wells will be a continuous expense.

The meter that would be suitable for a town with a high-pressure supply would not be so for a town with a low-pressure supply, and carrying different ingredients in the water. The meter must be owned by the company, and kept in proper repair by them; the consumer being charged a reasonable rate for repairs, inspection, &c. The consumer, as a matter of course, would purchase, if allowed, the cheapest instrument in the market, regardless of quality or adaptability for the work; and after it is fixed a short time it would become useless and worn out. There should be a duplicate meter in stock to fix, whilst the old one is away for repairs, as the supply must of necessity be stopped until it is returned. But if in the wisdom of Parliament the consumer may be allowed to own the meter, it should be kept in repair by the company; the owner paying the charge. The company then would be in a position to fix another meter during the time the old one is being repaired and tested. The cost of the meter and its durability is a serious item in the calculation. Many meters

now in the market will not run more than six months without repairs, and are often rendered useless after two years continuous work. Take, for instance, a water containing a quantity of iron. In less than the time stated, the meter is corroded and set fast.

Again, the charges for rent of the meters will be fixed by the authorities; and the companies must abide by the decision of men who have had no experience. Five shillings per quarter is said to be the rent for a 2-inch meter—an instrument costing £24—which should be cleaned and repaired every year, and the life of which may be ten years. This payment for the hire of meters working under high pressure will not nearly compensate for the first outlay and maintenance. The question of payment for the use of the meters will give rise to further litigation in the Dobbs line; and that class of consumer will contend that the company have no right to charge for the use of the measure, it being a part of the works. We may just as well ask the consumer to assist in paying off the portion of the debentures that was raised to provide apparatus for pumping an efficient domestic supply. Again, you cannot claim to charge a minimum rate, as in some cases that would be charging for water the consumer had not used; and although Parliament granted a scale of charges to provincial water companies, they will be found only too willing to violate the enactment which should be held as sacred, and to introduce a fair "Bill" under which consumers will be charged only for the water they consume. This looks very well to the uninitiated.

The perfect meter, suitable for all situations, and capable of working under all conditions, has yet to be found. I often have brought under my notice "the most reliable meter ever invented." The patentee says he will leave it to the consumer to test it; and he is always sure it will stand anything in the way of ordinary work. I have generally found that these meters give out during the first day's trial; showing clearly that the inventor has no experience of actual water-works requirements. I had expected ere this that a report of the valuable tests of meters recently made at Manchester would have been published in the JOURNAL. It is understood that the "Uniform" meter came out the best for all purposes, and has been accepted. The chief tests were to work at 50 lbs. pressure; at full flow the meter to pass 10 gallons per hour; and the error to be within 2 per cent. The best meter is not that which measures water by drops, neither do I think it necessary that extreme accuracy should be sought, as against other requirements. In this connection, I may draw attention to the article on "The Testing of Meters" which appeared in the JOURNAL for Jan. 24 last.

(To be continued.)

GAS SUPPLY IN JAPAN.—We learn from Mr. Watson Smith, Lecturer in Chemical Technology at the Owens College, Manchester, that he has recently heard from his friend Mr. W. Newbigging (son of Mr. T. Newbigging, of Manchester), the Manager of the Tokio Gas Company, that the President of the Company—Mr. Shibusawa—has recently been enabled to announce that a substantial reduction in the price of gas will take place on the 1st prox. The President, in fact, states that the rate per 1000 cubic feet, which has hitherto been yen 3, will be reduced to yen 2.70, and that a discount of 5 per cent. will be allowed to consumers who pay over yen 30, 10 per cent. to those over yen 50, 12 per cent. to those over yen 100, and 15 per cent. to those over yen 150 per month. A "yen" is equal to about 2s. 9d. of English money. This surely points to good management; and, though an indirect compliment, is none the less a very practical and solid one to the care and skill of the Manager.

PRESENTATION TO MR. WALTER FIDDES, M. INST. C.E.—On the evening of Saturday, the 29th ult., a large deputation, representing the *employés* of the Bristol Gas Company waited upon Mr. Walter Fiddes, at his residence, for the purpose of presenting him with an address and a testimonial, on the occasion of his retirement from the Company's service. The address set forth the regret of the workmen at parting with their old chief, their appreciation of his character, and their best wishes for his future welfare. The testimonial was in the form of an elegantly wrought massive silver salver, bearing the following inscription:—"Presented to Walter Fiddes, Esq., C.E., M. Inst. C.E., M.I.M.E., by 512 workmen in the employ of the Bristol United Gaslight Company, as a token of their respect and esteem on his retirement from the post of Engineer after 44 years of service. September, 1888." Mr. Fiddes replied in a few kindly and well-chosen words, thanking all who had contributed to do him this unexpected honour. There was a slight error he went on to say, in the inscription on the salver, as he had been 48 instead of 44 years in the service of the Company. He acknowledged with pride and pleasure that in his work he always had the hearty co-operation of the *employés*, without which the best engineer would be valueless. The work had not been slight. When he "went into harness" the gasholders at the Company's works held but a few thousand cubic feet of gas; their aggregate storage power now, on his retirement, had reached several million cubic feet. He had seen introduced nearly all the great improvements that had been made in gas manufacture; and during his time the price of gas had been reduced to the extent of 6s. per 1000 cubic feet. In conclusion, he advised the deputation, and through them all the *employés*, to discharge their duties with the same fidelity, thoroughness, and union with those now over them as they had done in the past, and so build up and establish securely the interests of the great Company with which they were connected,

Technical Record.

GAS AT FIRES.

A short time since a congress of firemen was held at Fontainebleau, for the discussion of matters of special interest to members of this important branch of the public service. The proceedings were made interesting to the gas profession from the fact that a paper was read by M. Gustave Lefebvre, the officer in command of the brigade at Pontpoint (Oise), on "Gas at Fires," in which the author pointed out certain errors and absurdities contained in the code of rules compiled for the use of firemen. In so doing he gave his colleagues some sound advice as to how to deal with gas on the outbreak of fire; and although much that he told them has been put forward from time to time in this country by authorities on the subject—Captain Shaw and others—it may not be out of place to emphasize in our columns the statements of these gentlemen, by bringing to their support the opinions of a co-worker of a different nationality.

In the code of rules already referred to, it is very carefully explained in one of them that the medium usually employed for the production of light is coal gas; that this gas is conveyed from the place of manufacture to the point of consumption first by means of subterranean pipes of sheet iron coated with bituminous mastic, and subsequently by exterior pipes of lead; and that prior to being consumed it is measured by an appliance called a meter. All of these details were doubtless considered to be of vast importance by the compilers of the rules; but M. Lefebvre questioned—and very properly—their utility to a fireman, seeing that no particulars are given as to the appliances which are capable of producing accidents with which he might on some occasion find himself mixed up. This omission the author proceeded to supply; explaining the manner in which the pipes are laid in the streets, and the kinds of joints employed for mains and services, and indicating the places where leakages are likely to occur. The search for escapes in the trenches, he went on to remark, might cause accidents of which it was advisable that firemen should be forewarned. He pointed out that the escaping gas might be ignited by a main-layer's fire standing in the vicinity, by a lighted match carelessly thrown into the trench by a smoker, or by a gas-jet which happened to be burning; and he explained how the flame could be extinguished—viz., by means of earth or clay thrown upon it. In the open air, there was not, he said, much to fear from explosions; for a pipe charged with gas under pressure could not explode, nor could a gas-meter or a gasholder. Accidents, however, did happen; and although it was the duty of the gas company's servants to take all necessary precautions to ensure safety during their operations, and to deal with any outburst of fire that might occur, it was customary to call in the assistance of the fire brigade whenever the disaster assumed serious proportions, and it was therefore advisable for the men to be made acquainted with the dangers to which they were exposed. But he went on to say that the inflammable property of gas was not the only thing to be feared. Firemen should avoid breathing coal gas in large quantities; and therefore they could not with impunity remain at the bottom of a trench 6 or 7 feet deep where gas was escaping in sufficiently large quantities to immediately vitiate the whole of the surrounding atmosphere.

Having described the construction of a gas-meter, and the method of connecting it with the street main, the author remarked that a meter had been very erroneously regarded by many as a dangerous appliance—something liable to explode; but he assured his colleagues that there was no more danger in a meter while in use than there was in a gas-pipe or in a kitchen stove. The gas contained in a meter in operation is under a pressure ranging from 8-10ths to about 3 inches; and supposing anyone were to punch a hole in the case, and apply a light, no explosion would result. The gas would simply burn as at an ordinary jet, the meter would continue to act, and the gas consumed would be registered by the index in the usual way. But he reminded his colleagues that, in speaking of a meter as non-explosive, he had referred to a meter which was "in use." Of course, if the instrument was out of use for several days, or perhaps months, air might possibly find its way in, and, mingling with the gas, produce an explosive mixture, which, on the approach of a light, would ignite, and entail serious results. But was it under such exceptional conditions as these that a fireman would find himself in proximity to a gas-meter, supposing him to be called to a fire which had occurred in a building lighted by gas? Assuredly not. Consequently, if the fire were to break out during the daytime, and gas was not employed for lighting the cellars and underground portions of the building, the meter-tap might be turned off. If, on the contrary, the outbreak were to occur at night, the first thing to be done would be to have the meter-tap open, and profit by the light afforded by the gas to find the direction of the underground passages, the sources of water supply, and suitable spots for the location of the engines and the laying of the hose. In a fire, gas was an auxiliary, not an enemy. What a number of victims resulted from the cry raised "Turn off the gas!" on the occasion of the disastrous fire at the Opéra Comique! In the resulting darkness, how greatly intensified was the confusion, and how difficult it became to rescue the sufferers! What harm, asked the author, would the gas escaping from a few small pipes have done in the midst of such a fiery furnace as the body of the theatre presented? What good might it not have done in the passages, behind the doors, in the refreshment-room, on the staircases! But, unhappily, thanks to popular prejudice, as soon

as the cry of "Fire!" was heard, there was an almost simultaneous shout of "Turn off the gas!" and on the following morning the meters were actually found uninjured in their places. M. Lefebvre related an incident which had occurred to himself, to show the folly of extinguishing the gas at a fire. He was engaged with a number of firemen in the cellars of a building in which a fire had broken out. The men were working in the midst of dense acrid smoke, produced from smouldering rags, leather, and the fumes of various kinds of fat. A few gas-jets, scarcely visible through the smoke, afforded the men a certain amount of help; but suddenly the lights were extinguished. An over-zealous workman had succeeded in making his way, through the smoke and the streams of water issuing from the hose, to the gas-meter, which he had triumphantly shut off; returning from the feat thoroughly drenched, but proud of his achievement, and fully confident that he had saved the building. As a matter of fact, he had simply embarrassed the firemen in the discharge of their very heavy duties.

The author closed the portion of his paper of which the foregoing is an abstract by asking his audience whether the knowledge of such facts as those which he had just placed before them was not of far more practical value to them than being told, as they were in certain of their rules, all about the construction and working of a gas-meter—as to its internal mechanism, the action of its constituent parts, the necessity for its being fixed quite level, and so forth—all matters which would perhaps be interesting enough to a gas inspector, but certainly not to a fireman. He said he thought his colleagues would agree with him that such details might well be omitted, and the space occupied by more useful information.

Passing on to consider the subject of the extinction of ignited explosive mixtures, the author remarked that the instructions given to firemen as to the best method of dealing with escapes of gas were, to his mind, not altogether satisfactory. For example, they were told that whenever a fire is fed by means of an escape of gas, the service-pipe should be flattened by a blow, and the tap on the inlet-pipe closed. If the flow of gas cannot be prevented in this way, the burning gas must be extinguished with wet sponges, rags, putty, or earth. The author considered that it would be sufficient to flatten the pipe simply, without turning off the gas at the meter, if the fire occurred at night, and the staircases, passages, &c., were lighted by gas, inasmuch as the men, as already explained, would be assisted in their work by the light afforded. But the fireman of 1888, he went on to remark, needed information as to other illuminants than gas, seeing that petroleum and its derivatives are now largely used for lighting purposes. Beyond this, they should be acquainted to a certain extent with the nature of explosive mixtures, so as to be in a position to give satisfactory answers to any questions put to them by experts called in to investigate the circumstances attending some calamity caused by an outbreak of fire. Having dealt with this portion of his subject at great length, and given a number of formulæ (based on data furnished by Bunsen, Regnault, Favre and Silbermann, and others), the author stated, with regard to explosive mixtures of air and gas, that when the gas is present in the proportion of 8-75 per cent., a dangerous mixture is produced; but that air very highly charged with gas would lose its explosive property. Practically, therefore, there would be less danger when an escape of gas produced such an odour as to frighten everybody, than when there was merely a slight smell. Firemen, and other people besides, ought therefore to be on their guard against entering with a naked light any rooms where the odour of gas is distinctly perceptible, even though it may not be particularly strong. But while escapes of gas are attended with danger, the liability to explosion is infinitely greater wherever petroleum or similar vapours are present in considerable quantities. These vapours, being heavier than air, make their way towards the ground. Coal gas, on the other hand, is much lighter than air, and consequently rises towards the ceiling; and it would be there that the explosive mixture would be produced. Ignorance of these facts has occasionally caused the loss of a fireman's life; and therefore the author thought they should be more widely disseminated among his colleagues than hitherto.

THE ASSESSMENT OF GAS-WORKS.—As a proof of the value of resistance to excessive assessments, it may be mentioned that at Stockton-on-Tees the gas-works of the Corporation were proposed to be rated at £6175. Representatives of the Corporation recently attended before the Assessment Committee, when the latter offered to bring down the amount to £5500. Notice of appeal was given, when the Committee further offered to reduce the amount to £5250; and eventually it was fixed at £5100, or £1075 below the sum originally proposed. This result was achieved through the labours of Mr. T. Newbigging, C.E., of Manchester, who acted for the Corporation.

DEATH OF MR. J. H. SMITH, OF SUTTON-IN-ASHFIELD.—We regret to learn that Mr. James H. Smith, Manager of the gas and water undertakings of Sutton-in-Ashfield Local Board, died somewhat suddenly on Monday last week. He had not been in good health for some time; but had latterly been rather better than usual. On the day in question, he visited Mansfield on business, and, not feeling well, called on Mr. Williams, the Master of the Mansfield Workhouse; but almost immediately on his arrival, he ruptured a blood vessel, and died the same evening. Mr. Smith was about 40 years of age, and had held his position at Sutton for upwards of nine years. The sad event was referred to at the meeting of the Local Board last Friday, and a vote of condolence with his mother and friends was unanimously passed.

THE WATER-GAS PLANT AT THE LEEDS FORGE.

In the JOURNAL for July 17 last, when noticing the presentation of a testimonial to Mr. Samson Fox, C.E., the founder and Managing Director of the Leeds Forge Company, Limited, on attaining his fiftieth birthday, we mentioned that the room in which the event took place was lighted by water gas manufactured on the premises. As the Company claim to have been the first to introduce this kind of gas into this country from America, it may be interesting to give a few particulars as to the appliances employed, as contained in a description of the plant which has recently been issued by the Company.

It should be mentioned at the outset that the use of water gas for lighting purposes was not the primary object in view in installing the new plant at the Leeds Forge. Towards the close of last year, the exigencies of the metallurgical operations carried on there in connection with the manufacture of the corrugated boiler-plates, with which Mr. Fox's name is associated all over the world, demanded fuel of a higher calorific intensity than could be found in the generator gas obtained from the Siemens producer, or in the ordinary coal gas as supplied by the Corporation. Beyond this, the varying pressures at which the latter gas issued from the mains interfered seriously with the operations of the forge. Mr. Fox thereupon determined to have gas-works of his own, to be so arranged that the most suitable pressure for the work to be done should be constantly maintained, and that the supply should be bountiful. Water-gas plant, with which, we believe, Mr. Fox was very favourably impressed when on a recent visit to America, was therefore decided upon, and instructions given for its immediate erection. The works were commenced on Sept. 29, 1887; and on March 29, 1888, the plant, capable of producing 35,000 cubic feet of gas per hour, was started, and has been in constant operation since that date with perfect success. No alteration has been necessary to the then existing plant, beyond connecting the gas-pipes from the water-gas works to the several furnaces and machines. The plant consists of a generator, with means of producing an air-blast, and provided with the necessary valves; a scrubber to cool and cleanse the gas of dust; a small gasholder and purifiers in proportion to the amount of gas to be passed, and controlled by a centre-valve. A steam-boiler has to be added to the plant if there is not sufficient steam power already on the works.

It is scarcely necessary to describe the process of generating water gas, which, as is well known, consists simply in passing steam through incandescent carbonaceous matter. In the generator the water is decomposed into its elementary gases; the oxygen combining with the carbon to form carbonic oxide, while the hydrogen remains free. The combustible percentage of water gas is claimed to be about 95. In the apparatus for the production of the gas the principal part is the generator, in which, as already stated, fuel is raised to a high temperature by the aid of an air-blast. During this process, a gas commonly known as producer-gas—containing about 28 per cent. of combustible gas, mixed with the nitrogen of the atmosphere in the air-blast—is generated. When the fuel has become sufficiently hot, the air-blast is stopped, the outlet by which the producer gas has escaped is closed, the communication between the generator and the scrubber opened, and steam allowed to enter the generator. This, passing through the incandescent fuel, becomes decomposed, and a fixed gas, of the composition above stated, results. All these operations are easily effected; and there is no possibility of mistake on the part of the operator. The process lasts about four minutes, during which time something like 4500 cubic feet of gas are produced. From the generator the gas passes to the scrubber, and thence to the gas-holder, whence it is taken to the purifiers, which are of the ordinary type. The fuel employed may be the cheapest kind of coke, either mixed with coal or used alone; the consumption per hour per generator, when in full work, being about 10 cwt. The production of water gas per ton of fuel is 30,000 cubic feet; and each generator is capable of producing between 17,000 and 18,000 cubic feet per hour. The cost of the gas will depend upon the make, price of fuel, and of labour. With fuel at 8s. per ton, labour at 3s. 6d. per man per day, and the generator fully employed, the gas is stated to cost about 4·4d. per 1000 cubic feet.

As already mentioned, the water gas is used for lighting purposes on the works; the medium employed being the now well-known Fahnejelm "comb," which has been fully described in our columns. It is claimed that a saving to the extent of 50 per cent. has been effected in the cost of lighting by the adoption of the new gas; while, there being less heat, the atmosphere of the works is much more agreeable than under the arrangements previously existing.

The salary of Mr. Charles Nickson, Superintendent of the Gas Department of the Manchester Corporation, has just been increased by £50 per annum.

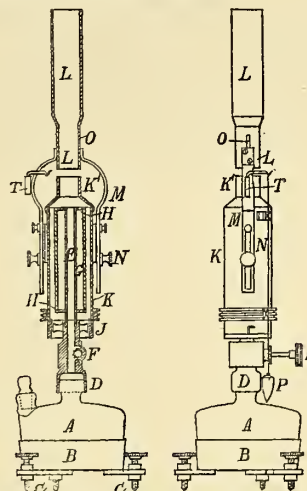
The Vienna correspondent of *Industries* has stated that for the electric light installations in the city—other than that of the Imperial Continental Gas Association for the Opera House, &c.—steam-engines of 1982-horse power and gas-engines of 393-horse power are employed. About 40 per cent. of the installations use gas-engines.

At the Salford County Court on Monday last week, the affairs of Mr. J. Graves, the absconding Town Clerk, to which reference has already been made, were again brought forward. The debtor was called, but did not answer. The Assistant Official Receiver thereupon applied for an adjournment of the matter *sine die*; and this was granted—a warrant being issued for the debtor's arrest.

Register of Patents.

PENTANE STANDARD LAMP.—Harcourt, A. G. V., of Oxford. No. 11,985; Sept. 3, 1887. [8d.]

In the JOURNAL for Feb. 28 last, we gave a general account of the construction of this lamp and the mode of its use; but by the publication of the patent specification, more specific particulars are available, and these we purpose giving to-day, illustrating them by means of two views of the lamp—sectional front and side views.



The lamp consists of a glass vessel A, mounted upon a stand B, provided with levelling screws C. To the vessel is fitted a cap D surmounted by a tube E, in which a wick is wound up and down by any ordinary arrangement of a double-spiked wheel F, turned by a handle. Around the upper part of this tube, whose diameter may be about $\frac{1}{4}$ inch and its length 6 or 7 inches, is a second tube G, about 1 inch in diameter and 4 inches in length, which serves as a jacket to keep more constant the temperature of the inner tube, and to guide the air current, upon which the steadiness and brightness of the flame depend. The two tubes are joined by flat plates H above and below, and constitute the burner of the lamp. Attached to the inner tube by branches, is a gallery J carrying a metal chimney K, which surrounds both the burner and the lower part of the flame. Above the burner, the part K1 of the chimney is reduced to a diameter intermediate between that of the outer tube G and the inner tube E of the burner; and it terminates at a short distance above the burner. The upper part of the flame is again enclosed by a continuation L of this metal chimney, which is of the same diameter as the lower part, but enlarged in diameter towards its upper end. This upper portion of the chimney is connected with the lower chimney by curved metal bands M—conveniently two in number, and sufficiently removed from the flame on either side as not to affect it. Through the space thus left between the upper and lower metal chimneys, the central part of the long flame which the burner produces is alone visible. The attachment of these bands connecting the upper to the lower chimney is adjustable by set-screws N, so that the opening through which the central part of the flame is seen may be made longer or smaller, as desired. By simple means (such as an adjustment screw, or preferably by means of cylindrical gauges of the same diameter as the tubes which they separate), this opening can be set quickly and accurately to such sizes as will give exactly the light of half-a-candle, one candle, one-and-a-half candles, or values intermediate between these, as required. At opposite sides of the lower part of the upper chimney are two narrow slots O, through either of which the tip of the flame may be seen; and the construction of the lamp is such that the light emitted through the opening between the two chimneys is the same whenever the tip of the flame appears opposite the slot, whether towards the lower or the upper end. The bands M connecting the two chimneys are half the width only of the tube that surrounds the flame. When the lamp is vertical, so that these bands are in a plane perpendicular to the horizontal bar of the photometer, a point in the plane containing the edges of the bands nearest to the photometric disc, midway between these edges, and at the height of the centre of the aperture through which the luminous flame is visible, is to be taken as that from which distances are to be measured. This point represents the zero of the usual photometer scale. In order to easily obtain the plane in which this point lies, two slots S are cut in the bands on the side nearest the disc; and into these slots a flat piece of metal fits, of the same thickness as the depth of the slots. The point from which distances are measured lies on the surface of this piece nearest to the disc. Suitable attachments are provided for carrying a plumb-line P, to serve in setting the lamp vertical, and for carrying a small piece of coloured glass fitting in the plumb-line socket T so as to stand opposite to the slot O. By reflection from, or direct vision through, this glass it may easily be observed when the tip of the flame is within the slot.

The height of the gauges that will produce, when burning "pentane," a light equivalent to a half, one, or one-and-a-half, standard English parliamentary candles, has been found by the patentee to be respectively 7½, 16, and 27·5 mm.

GASHOLDERS.—Gadd, W., and Mason, W. F., of Manchester. No. 13,521; Oct. 6, 1887. [8d.]

The specification of this now well-known invention—inasmuch as it has been frequently referred to in recent issues of the JOURNAL—appeared almost *verbatim* three weeks ago, pp. 503-4.

GAS-COCKS.—Foster, T., of Manchester. No. 14,939; Nov. 2, 1887. [6d.]

These improvements consist in the construction of a cock or tap that may be used independently of, or in combination with, an ordinary gas-

cock, for the purpose of enabling a small jet or flame, consuming a previously arranged fixed quantity of gas, to be left burning in workshops or other places during meals, or at times when the full amount of gas is not required. The object of the invention is to prevent waste of gas by a large flame being left uselessly burning, and also to avoid the risk of escape through carelessness by turning the gas-jet out and afterwards turning the tap on without the gas being ignited.

GAS COOKING-OVENS.—Greenwood, T., of Halifax. No. 12,236; Sept. 9, 1887. [11d.]

This invention relates to improvements on patent No. 12,460 of 1886; the patentee now finding that the two inner side plates of the oven do not require bolting to the snugs on the back plate, but only on the front edges of the snugs on the door-frame. The back plate too is constructed to slide into its place without bolting as in the former patent. Also all the inner plates are left free to expand or contract, as there is only a bolt at the bottom of each side plate, and at the bottom of the back outer plate, in such a position that it will accommodate itself to expansion and contraction.

IGNITING APPARATUS FOR GAS MOTORS.—Crossley, F. W., and Anderson, F. H., of Manchester. No. 15,010; Nov. 3, 1887. [8d.]

This invention relates to the construction and use of igniting apparatus for gas-engines, so arranged as to admit a portion only of the combustible charge into a tube heated externally by means of a flame kept constantly alight.

GAS-ENGINES.—Abel, C.D.; communicated from the Gas Motoren Fabrik Deutz, of Deutz, Germany. No. 17,108; Dec. 12, 1887. [8d.]

This invention relates to gas-engines, which operate with a cycle of four strokes—viz., a charging, a compression, a working, and an expelling stroke—such as engines of the "Otto" type.

In such engines, the slide that effects the ignition of the compressed charge, and the valve that allows the products of combustion to escape after the working stroke, have heretofore been worked by means of a counter-shaft driven at half the speed of the crank-shaft, in order that they may only operate respectively at the end of every alternate instroke and at the end of every alternate outstroke. According to the present invention, the counter-shaft is entirely dispensed with, and the igniting-slide and escape-valve are worked directly from the crank-shaft; the igniting-slide being driven by an eccentric or cam on the crank-shaft, so as to make a to-and-fro stroke at each revolution, while the escape-valve is worked by a cam on the crank-shaft so arranged as to be automatically slid to one side thereon at every second revolution, and thus only effect the opening of the escape-valve once every two revolutions. The arrangements employed for this purpose are applicable as well for horizontal as for vertical engines.

APPLICATIONS FOR LETTERS PATENT.

14,008.—ATKIN, H., "Improvements in making gas from coal or other bituminous or combustible substances." Sept. 29.

14,047.—BARKOWSKI, R., and ANDREWS, C. J. D. (for and on behalf of the Schülke Gas-Lamp Company, Limited), "An improved lighting apparatus for gas-lamps." Sept. 29.

14,049.—WALLWORK, R., and WELLS, A. C., "Improvements in connection with self-generating gas or vapour burners." Sept. 29.

14,105.—SUO, W. T., "An improved mode of and means for lighting by gas." Oct. 1.

14,174.—HUGHES, R. H. and R. S., "Improvements in gas-lamps." Oct. 2.

14,177.—CHANDLER, S., sen., CHANDLER, S., jun., and CHANDLER, J., "Improvements in and relating to lamps." Oct. 2.

14,198.—SMITH, S. F., "An improved combined ventilator and gas-bracket for walls." Oct. 3.

14,248.—CROSSLEY, F. W., HOLT, H. P., and ANDERSON, F. H., "An improvement in gas motor engines." Oct. 3.

14,261.—M'ALLEN, C. F. A., "Improvements in gas motor engines." Oct. 4.

14,266.—JOHNSON, A., "Oiling the screw of main gas-valves." Oct. 4.

14,283.—LUTHER, W. H., and ROSE, G., "Improvements in and relating to oil, vapour, or gas and air lamps for lighting and heating purposes." Oct. 4.

CARLISLE CORPORATION GAS AND WATER SUPPLY.—The accounts of the gas and water undertakings of the Carlisle Corporation for the year ending June 30 last will be submitted to the Town Council to-day. We learn that the gas profits amount to upwards of £800, and the water profits to £4300; and it is the intention of the Gas and Water Committee to make proposals to give the consumers some advantage from the continued and increased prosperity of the two undertakings. We understand they will propose to reduce the price of gas from 2s. 6d. to 2s. 3d. per 1000 cubic feet, and increase the current rate of discount upon the water accounts from 1½d. to 2d. in the shilling.

SALE OF SHARES IN THE SWANSEA GAS COMPANY.—An important sale, by Messrs. J. M. Leeder and Son, of shares in the Swansea Gas Company took place at the Mackworth Arms Hotel, Swansea, last Friday afternoon. There was a large attendance of buyers and others, who took a keen interest in the bids. The auctioneer referred to some articles adverse to the Company which had appeared in one of the local papers, and also to the contemplated lighting of some of the public lamps by electricity, which certain members of the Corporation threatened to introduce; but pointed out that with gas sold at 2s. 10½d. per 1000 cubic feet to the public, and at 3s. to private consumers, the shareholders of gas companies need not be soared or intimidated by such threats. They were made, he said, with the view of depreciating the Company's property, in order that the Corporation might at a not far distant date purchase the undertaking; but he assured them that the Company was governed and managed by competent and businesslike men, who were not to be frightened by the attacks of either the Corporation or the Press. He then proceeded to show that the present 7½ per cent. shares of £25 each were selling in the open market at from £40 to £41 each; and that, taking this as their value, the 7 per cent. shares to be then sold should realize £38 each. The shares were then put up in lots of four, and the first few realized £37 15s., £37 10s., and £37 per share. The remainder were sold at £35 10s. and £35 5s. per share; the latter price paying about 5 per cent. to the investor. The total amount realized was about £9000.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

THE COMPETITION OF OIL WITH GAS AMONG SMALL CONSUMERS.

SIR,—The Gas Committee of the Stratford-upon-Avon Corporation are very anxious to second my efforts to supply gas to cottagers and other small consumers where oil is our strongest competitor. For this purpose I am desirous of obtaining all the information I can, bearing upon the subject. As it is not so much a question of collecting the accounts as that of providing interior fittings upon which I wish information, I shall be glad to hear of any plan that has been adopted elsewhere, and found to work satisfactorily. It may be presumed that under our Local Act we possess the power to supply gas-fittings and carry out the work required in fitting up houses; but I anticipate a difficulty in arranging with the owners of property. An agreement would have to be entered into between the parties interested, by which the owner of the property would give permission to the Corporation to fix the necessary fittings, and also provide for the removal of the same at the wish of either party to the agreement. Upon this point I consider a clear understanding should exist. It would therefore be necessary that the agreement be very carefully drawn up to meet the various contingencies likely to arise. The question of paying a small rental for the hire of the fittings is also one to be dealt with. This I consider should be sufficient to pay the interest on the outlay and meet any charge which may occur for wear and tear and renewals.

Any information on the above question will, I am sure, be of interest to many other managers; as it is by adopting this or some similar plan that we shall be able to compete with the cheap oils now so generally used by occupiers of small houses.

Stratford-upon-Avon, Oct. 6, 1888.

J. S. CRANMER.

THE BOARD OF TRADE RETURNS FOR 1887.—THE NEW REGULATIONS AS TO GAS COMPANIES' CAPITAL.

SIR,—I shall feel much obliged if you will kindly permit me to state in the JOURNAL, in answer to numerous correspondents, that the above-mentioned returns are not yet ready, and I am unable to say when they may be expected. I have, however, ordered the usual number of copies; and immediately they are delivered to me, the subscribers to the Gas Companies' Association (or anyone else at the same time, upon giving me due notice) may rely upon receiving copies.

With your permission, I will avail myself of this opportunity to state, for the information of those Companies who contemplate applying to Parliament in the ensuing session, that the recent regulation of requiring all new capital to be sold by auction, together with the sliding scale, has introduced many irregularities into gas legislation which, until the Gas-Works Clauses Act is altered and enlarged, will require to be dealt with in the Special Acts. I have prepared a paper to show what these are, but it is too long to ask you to insert it, at this late hour, in to-morrow's issue; so I will trust to your indulgence for next.

Gas Companies' Association, Palace Chambers,
Westminster, S.W., Oct. 8, 1888.

W. LIVESLEY.

PIPE EXTRACTORS.

SIR,—In your issue of Sept. 13 you describe a "New Pipe Extractor;" but as we have had for a number of years a system of pipe extraction in use here which is I think equal, if not superior to that there described, your readers may be interested in hearing of it—more especially as you speak of the "ordinary process of cutting out," which I had previously supposed somewhat out of date. As for the appliance described in your columns, whilst no doubt it will serve its purpose well, I do not think it will be quite so speedy as the arrangement we use; there being a power to drive the joint off. I am afraid that in the case of turned and bored joints, with a recess in the front of the socket filled with lead, the process will be slow, as the force required to drive these joints is so great that either the clip will slip or the joint will not give way at all.

Our arrangement consists of a hydraulic jack working against a clip fixed on the pipe close to the shoulder of the next socket to the one to be driven. Against this clip a block of wood is laid on the pipe, to make up the distance between the clip and the foot of the hydraulic jack. The head of the jack works against the socket to be driven off; a half-inch packing being placed under it, so that the jack will not force the lead off with the socket. We are accustomed to raise and lower the pipe by the block, to aid in loosening the joint; working the jack while the pipe is being lowered. If the joint is an obstinate one, and does not drive off at once with the force of the jack, the loose end of the pipe is raised and lowered several times. But, contrary to the method described in your columns, we generally loosen the lowering screw of the jack when raising the pipe; thus allowing the upper side of the socket to slip back slightly, as we find this tends to loosen the lower side of the joint. In most cases the pipe is completely drawn at the first or second attempt; but sometimes the whole force of a 15-ton jack is required to drive off a 12-inch pipe.

In any case, however, the taking out of mains need only constitute a small fraction of the work when a large main has to be laid in the same trench. But if it is done by the process of cutting out, it cannot fail to be a "tedious business," and not only so but an unworkmanlike job when done.

Gas-Works, Burnley, Oct. 5, 1888.

JNO. P. LEATHER.

MODIFICATIONS OF HARCOURT'S COLOUR TEST.

SIR,—I have no wish to enter into a lengthened controversy with Mr. Hinks; but there are one or two points in his letter which require a little notice.

He says: "Does Mr. Greville really think that an unskilled person can more easily judge the colour of solutions to be of the same tint, or discriminate between a strong contrast such as a red and blue or a colourless liquid and a bright red liquid?" There is, of course, no doubt whatever that the latter discrimination is the easier; but this is only a partial statement of the case. What I really do think is that the original Harcourt test, taken as a whole, is less liable to error in the hands

of comparatively unskilled persons than the more essentially chemical methods advocated by Mr. Hicks.

With regard to the question of the absorption of sulphuretted hydrogen by aqueous solutions, I have found, as a result of several experiments, that a very appreciable volume of gas containing sulphuretted hydrogen has to be passed through 70 c.c. of distilled water before a stain is visible on even very delicate lead paper; the error being apparently the greatest where the amount of sulphuretted hydrogen is initially the highest. Mr. Hicks seems to think that "novelty" is due for the use of "gas normal solutions." If he wishes to claim novelty for altering the strength of a test solution already well-known to chemists, I suppose he must do so.

There is nothing further in Mr. Hicks's letter calling for comment from me, except that I regret that he has chosen to assume that my recent criticisms of his apparatus are due to the fact of my having myself introduced some modifications of the Harcourt test. I can only assure Mr. Hicks that personal considerations of this character have not exerted the least influence over my conduct. Mr. Hicks writes, when alluding to my article: "He says in effect that my apparatus does not come up to his modification of Harcourt's colour test." What I did say was that I did not regard Mr. Hicks's apparatus as a modification of the Harcourt colour test; and this opinion I still adhere to. Mr. Hicks adds: "This, however, is only a matter of opinion from a not unprejudiced source, which each reader of the JOURNAL will better decide for himself." I entirely assent to this as an abstract proposition; for it applies equally well to Mr. Hicks as to myself. The whole discussion is, of course, in a sense, much a matter of opinion. Mr. Hicks will form his, being an engineer; I have formed mine, being only a chemist.

H. LEICESTER GREVILLE.

Commercial Gas Company, Stepney, Oct. 6, 1888.

THE OIL LIGHTING AT ERITH.—The oil lighting at Erith still occasions many complaints. Although the light is fairly good, one may walk about the district when the lights should be in use, and find many of them not burning. Messrs. Defries, the contractors, contend that this is caused by interference with the lamps; but the Lighting Committee will not admit this to be the case, and attribute the non-illumination to the want of proper organization in carrying out the contract. If the lamps are in future found unlighted between the specified hours, the Board intend putting in force the penal clauses of the contract.

THE PUBLIC LIGHTING OF STROUD.—At the meeting of the Stroud Local Board last Thursday, a letter was read from the Stroud Gas Company, in reply to one from the Board asking for a reduction in the charges made for lighting public lamps. The Company consented to make a reduction of 3s. a year on the ordinary lamps, but stated that they could not allow any abatement as regards the Sugg lamps. If the lamps lighted at present only six months, at a charge of £2, were lighted for eight months, an extra 10s. for each lamp would be charged. A discussion ensued; and it was ultimately decided to light all the lamps, including about forty to be erected, all the year round; the increased cost being stated at £40.

THE PUBLIC LIGHTING OF MAIDSTONE.—At the meeting of the Maidstone Local Board last Thursday, Mr. Barker stated that great complaints had been made in the town as to the quality of the gas, and the high price charged by the Company for the public lighting. Alderman Doe thought it was quite time the Board took steps to see whether the street-lamps were supplied with gas of proper illuminating power. For some time past he had noticed the poor light afforded by the lamps. In certain thoroughfares they gave such a dim light that he scarcely saw them. He contended that as the Board paid a large sum for the public lighting, they ought to have the work done properly. It was resolved that a Committee should be appointed to consider the matter.

THE GLOSSOP TOWN COUNCIL AND THE PRICE OF GAS.—At a meeting of the Lighting Committee of the Glossop Town Council held last Wednesday, a communication was read from the Gas Company respecting the gas burned by five special lamps for the past six years, which had been supplied gratuitously to the Corporation, and was considered equal to a gift of £60 per annum. The Company proposed to withdraw from this arrangement. They also stated their intention to reduce the price of gas consumed in the street-lamps 1d. per 1000 feet, and 2d. per 1000 feet for the gas used in the Town Hall and offices. The letter was discussed, and it was decided that a meter should be attached to one of the special lamps, to see what quantity of gas was burned.

THE NORTHERN COAL TRADE.—There is decidedly more activity in the coal trade of the North, and the tendency is towards higher prices, whilst the possibility of strikes in other coal-fields is likely to bring orders here. For steam coal, the demand is better; and the approach of the closing of some of the Baltic ports makes shippers anxious to get cargoes away. In the gas coal trade many of the collieries are hampered by the restriction which some of the workmen practise; and thus, having less coal to sell, they more readily obtain the higher prices they have asked of late. The demand for gas coal is still improving, and must be expected to do so for some two months yet; but the export demand for the North will fall off soon. Manufacturing coals are dearer all round. The activity at the shipbuilding yards is causing a larger consumption of fuel, and it is also stimulating the production of iron, which is one of the largest contributors to the prosperity of the coal trade. Generally speaking, coal in the northern district promises to be from 4d. to 1s. per ton dearer for next year's supplies.

THE PRICE OF GAS IN THE MANCHESTER OUT-TOWNSHIPS.—At the meeting of the Levenshulme Local Board on Monday last week, the Chairman (Mr. J. M. Pollitt) reported that, in company with the Clerk, he met the representatives of the various Local Boards supplied with gas by the Manchester Corporation. From figures submitted, it appeared that the Corporation were making a very large profit. So far as the out-townships alone were concerned, the sum charged by the Gas Committee for the gas supplied beyond the city, including street-lamps, was £103,775; and of this it was estimated that no less a sum than £26,650 was profit. Taking the city and suburbs together, it appeared that after allowing £33,623 for depreciation and £29,832 for interest, there remained a net profit of £76,240; so that it was quite clear that the Corporation had ample funds at their disposal to make a very considerable reduction in the price charged. The opinion of the meeting seemed to be that unless the Corporation met them in a satisfactory manner, it would be the wisest policy for the various Local Boards to make their own gas, singly or in groups, according to position. When it was shown that a town like Bury could supply gas at 2s. per 1000 cubic feet and make a profit, it was clear that other large districts around Manchester could do so on the same terms; and it would be folly to go on paying 3s. 2d. to the Corporation if gas could be produced at 2s.

Miscellaneous News.

COMMERCIAL GAS COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held last Friday, at the Cannon Street Hotel.—Mr. R. BRADSHAW in the chair.

The SECRETARY (Mr. H. D. Ellis) read the notice convening the meeting; and the Directors' report and the statement of accounts, the principal portions of which were given in the JOURNAL last week (p. 596), were taken as read.

The CHAIRMAN: Gentlemen, the resolution which I have now to propose is—"That the report and accounts be read and adopted, and entered on the minutes." In moving this resolution, it is usual to make a few remarks; but I am compelled to ask your indulgence to-day. I have been suffering from illness for a considerable time—an illness which prevented me from presiding at your meeting in April last—and it is of a nature which very much affects my breath, and consequently, my power of speaking. Although, therefore, it has never been my custom to trouble you at any great length, yet to-day you must excuse me if I am even shorter than usual. Happily, there is nothing for me to say. But before dealing with the report and accounts, it is my painful duty to announce the death of our colleague Mr. Griffith Thomas, who was lately the Deputy-Chairman of this Company. His death has occurred very recently—since the report was printed. Mr. Thomas, as probably most of you are aware, was connected with this Company from its early stages—first, as a Solicitor, and subsequently as a Director; and his connection lasted from those early stages down to the day of his death. He was the last one left of the gentlemen who took part in the management of the Company in its early days. Though perhaps of late years he has not taken so prominent a part, yet, in days gone by, he rendered very great and valuable services to the Company. As a fact, I may state this—that he was connected with the Company when the £5 shares could be purchased at 2s. 6d. each. He lived to see the day when its £100 stock was quoted in the market at £281 10s. I am sure that the Directors have only anticipated your wish in passing, as they have done, a resolution, recording their appreciation of the services rendered by Mr. Thomas, and expressing their deep sympathy with the members of his family in the loss they have sustained. I have now the pleasure of announcing to you that your Directors have elected as the Deputy-Chairman of the Company my friend Mr. Ratcliff (cheers). This is an appointment I felt sure would meet with your most cordial approval. In turning to the report and accounts, I think I may venture to say that the latter are very satisfactory. I think I may say that they are more satisfactory than any accounts ever presented before. I think if you will refer to the accounts, and compare them with those of the corresponding period of 1887, you will find that every item of importance in the revenue account shows a gratifying increase; while, on the other hand, every item of importance in the expenditure shows a gratifying decrease. You will see that the gas sold amounted to 918,668,000 cubic feet, against 878,810,000 feet—an increase of 39,858,000 feet, or something in excess of 4½ per cent. There were 1017 tons more coals carbonized; the figures being 96,080 tons in the one half year and 95,063 tons in the other. The gas-rental—the most important item in the accounts, perhaps—produced £116,947, against £112,176; being an increase of £4771. Stove and meter rental showed an advance of £96, while residuals realized £37,523, as against £34,533—an increase of £2989, to which coke contributed £1589; breeze, £62; tar, £1026; and sulphate and ammoniacal liquor, £311. You see, therefore, this most gratifying feature—that there is an increase in every item mentioned; the gas-meter rental and every one of the residuals showing an increase. The miscellaneous receipts exhibit a small falling off of £100; but the result is that in the total receipts there is an increase of £7754—the figures being £157,308 in the present half year, against £149,553 in the corresponding period of the previous year. On the other side of the accounts, we find that the coals cost us £57,694, against £59,009—a saving of £1315, notwithstanding the larger quantity carbonized. It follows from this that the greater quantity cost less than the smaller quantity. I think the saving works out to between 4d. and 5d. a ton—nearly 5d. The other items in the manufacture of gas were pretty much the same as last time; there being a small saving of £208. The other items are very much the same. Distribution of gas cost £241 more; owing, no doubt to the larger quantity distributed. I am sorry to say that the bad debts showed an increase of £191. I think we are served by a very efficient staff of collectors, to whom we hold out every inducement to get in the accounts. Probably, some of the increase in this item is due to the bad times we are passing through, which we have had occasion to refer to in past half years; but in regard to which I think there are some signs of amendment. You will, I think, be glad to hear that the law costs were £30 less; and in the item of superannuation, we saved £125. The general result is this—that the receipts show an increase of £7755; and the expenditure a decrease of £1403. Putting these two sums together they amount to £9158, which represents the increase of net profit in the past half year, over and above the net profit made in the corresponding period of 1887. The question then arises, having earned this £52,166, what shall we do with it? We recommend the payment of a dividend of 13½ per cent. on the old and of 10½ per cent. on the new stock—the highest dividends we have ever asked you to accept. The payment of these dividends will absorb £44,800; and the debenture stock interest being also paid, there is a surplus left to be carried forward. That surplus, being added to the balance brought forward from previous half years, we have £49,765 to commence the present half year, if you agree to the payment of the dividends which the Directors recommend.

The DEPUTY-CHAIRMAN (Mr. T. W. Ratcliff) seconded the motion.

Mr. THORNTON asked whether the accounts could not be presented in such a way as to show the shareholders not only the results of the half-year's working to which they related, but also the figures of the corresponding period of the previous year. It would be a convenience to the shareholders to be able to compare the results of the two periods.

The CHAIRMAN: The accounts are in the statutory form. I do not know whether we have any right to do what you suggest. I know that they do it in some other gas companies and in railway companies. I do not know that there would be any objection to it; but if you had all information given to you, you would leave me nothing to say. (Laughter.)

The motion was carried unanimously.

On the motion of the CHAIRMAN, seconded by the DEPUTY-CHAIRMAN, the dividends recommended were agreed to.

Mr. COLEMAN, on the part of the shareholders and himself, congratulated the Directors on the results of the half-year's working, and joined with the Chairman in the sympathetic expressions he had used in reference to the loss which the Company had sustained by the death of Mr. Griffith Thomas. It had been said that no good could come out of the East-End of London; but what they had heard to-day proved that the contrary was the case. He was sure that they all approved of the appointment as Deputy-Chairman of their excellent friend Mr. Ratcliff—a gentleman he

had known throughout a long life connected with the East-End. In conclusion, he proposed a vote of thanks to the Chairman and Directors.

Mr. CECIL seconded the motion, which was unanimously adopted.

The CHAIRMAN: I beg to thank you, on my own behalf and on behalf of my colleagues, for this handsome vote of thanks which you have just proposed. I gather from what my friend Mr. Coleman says that he and the rest of the shareholders are very pleased by the report we present. I need not say it is gratifying to us to be able to present such a report. I trust that myself and colleagues may be spared for many half years to meet you; and I also hope that the accounts may not be less satisfactory than they have been to-day.

Mr. ENNIS referred to the handsome dividends which had been declared, and observed that it was supposed generally, that with such a dividend affairs were easily managed. Those, however, who were behind the scenes in a measure, and who knew something of the internal working, knew that a great undertaking like the Commercial Gas Company, really wanted watching in every sense. He proposed a vote of thanks to the officers for their services in the half year.

Mr. GOULD seconded the motion.

The CHAIRMAN: I have very much pleasure in "thirthing" the motion" and no one knows better than the Board that your officers thoroughly deserve this vote of thanks. Of course, we, as Directors, do the best we can for you; but we have to rely on our officers. I think I may say that no Company is better served by its officers than the Commercial Gas Company. Our Engineer has just returned from America. I do not know whether he has anything of interest to tell you.

The motion was heartily agreed to.

The ENGINEER (Mr. H. E. Jones, M. Inst. C.E.): I was about to say that perhaps I never deserved this vote so little as at the present moment; for I am only just back from a most charming holiday of a month's duration, for which I am indebted to the kind indulgence of the Directors, and which gave me an opportunity I have been looking forward to nearly all my life to visit the great continent of America. I have derived a great deal of personal pleasure from this visit; although I had to encounter in mid-ocean an equinoctial gale, which shortened my life by at least two days; for I got nothing in those two days but a great deal of tumbling about. I saw a few things in America which I am sure concern you all; and therefore, at the risk of boring you, I would like to say a few words on matters which apply to the special industry in which we are all concerned. I saw, in some of the remotest parts, away from the seaboard and the chief towns, like Boston and New York, not cities, but villages lighted by the electric light; and I saw at the same time in those villages a tremendous combustion of gas, and a considerable amount of oil being burned. I put myself in communication with the leading spirits connected with the supply of gas there; and I found that all these three industries are going forward together; and in the case of the most important gas-works I visited, their increase in the past year had been not less than 20 per cent. At the same time they admitted that there was a field for electricity; and one of its functions was to so intoxicate people with the luxury of light that they went straight off to the gas company and doubled their supply of gas. I came across another matter, on which I do not feel at liberty to dilate; but I do think my holiday will not be spent to your disadvantage. I came upon a process for the rapid development of gas of a high quality, which, as far as I can see at present, will most probably be of use even to an English Gas Company. It has to do with the ever-abounding and increasing supply of natural oil which is rising now in Russia as well as in America, and which tends now to alter very much the relations of the supply of light or the sale of any illuminating agents. I will not, however, go further now than to say that I see a means of adapting the cheap supply of oil which is coming very much to the front to the use and service of gas making.

The SECRETARY also returned thanks for the vote; and the proceedings then terminated.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

The Half-Yearly General Meeting of this Company was held on Saturday, the 29th ult.—Mr. E. FOTTELL, J.P., in the chair.

The SECRETARY (Mr. W. F. Cotton) having read the notice convening the meeting, the report of the Directors, an abstract of which was given in the JOURNAL last week, was taken as read.

The CHAIRMAN said the report and statement of accounts now presented compared very favourably with those for the corresponding period of last year. The shareholders would find in the accounts the exact figures for each department of the works; and therefore it would be unnecessary for him to go over them. He would, however, call their attention to the fact that there had been an increase in the quantity of gas supplied, which was extremely satisfactory. Since the last half year, there had been an increase of 183 in the number of their customers. This caused him very great pleasure, because it showed that, notwithstanding the opposition that might possibly be given to them, the public were pleased with the gas. As the shareholders knew, the Directors had in certain cases for some time allowed a discount to consumers using gas for other than illuminating purposes—that was to say, for gas-engines and for cooking. They had now come to the conclusion that in all cases where gas was being employed for these outside purposes, they would grant a reduction of 10 per cent. He believed that the adoption of this course would be the means of encouraging people to use gas; and, no doubt, the Company would reap a benefit from it during the current half year. With regard to the residual products, it was a matter for congratulation that to a certain extent there was an increase in the sale of tar and ammoniacal liquor, which was, he thought, a sign of a slight revival of trade. The principle on which they had sold the residual products was that of the sliding scale; so that whenever an improvement took place in trade which enhanced the value of these materials, the Company obtained an advance in the prices in proportion to that enhanced value. The sale of coke had not been so satisfactory. The demand was greater in other places than in Dublin; and although they had an inquiry for it from localities outside Dublin, they found it extremely difficult to get a freight that would enable them to deliver it. With this exception, everything had gone with the Company to their entire satisfaction. The shareholders were aware that they were now in the quarter for the reduction of the price of gas to 3s. 4d. per 1000 cubic feet. He had no doubt that the reduction of 2d. would cause an increase in the consumption of gas, and would yield a beneficial result. He should also call their attention to this—that in the coming half year they would have the advantage of the entire interest of the reserve fund to add to the profit and loss account, which would be in accordance with the Act of Parliament. He might add that the works were in a very satisfactory state. There was one thing he would allude to which he would rather have passed over in silence; but it was necessary, in order to keep themselves straight, that he should refer to the correspondence that had passed, and to the debates that had taken place at the Corporation meetings. As early as April last some speculatives were made there of a character which would certainly seem to be an attempt to place the Directors of the Company in an unfair light—in fact, they were accused of charging for more gas than they delivered.

That was a serious accusation. They at once contradicted it through a private letter from their Secretary, and not through the press; and the reply they received was to a certain extent an apology, and a statement that the assertions made were not borne out. But the charge had been repeated again and again; and, in fact, it had come to this—that it had been so often repeated that they were bound to notice it. In looking over the reports of what had taken place at the Corporation, he found that a Committee had been appointed to inspect the lighting of other cities, and that this Committee had reported that Dublin needed improvement, as its lighting compared unfavourably with other places. He wished to point out that in the towns which were compared with Dublin there were gas-lamps at every 50 yards. This, of course, gave a greater quantity of light; but the illuminating power of the Dublin lamps was quite as good. The Committee of the Corporation stated in their report: "We feel bound to observe that our city has need of improvement in this respect; the public lamps having the appearance of not being properly maintained, notwithstanding the heavy cost incurred." He did not know what the Committee meant by speaking of the "heavy cost incurred." Gas was supplied to the Corporation on the same terms as to private customers—they were charged exactly for the quantity of gas they consumed, and they themselves fixed the hours for lighting the lamps. The lamps were the property of the Company; and they were kept up at about half the cost the Corporation would have to pay for maintaining them. The Company supplied all the plant free; and the Corporation were charged merely for the repairs and painting. It was very unpleasant for him to have to refer to these things. The Company had been long maligned; and they were determined to put an end to these disputes between themselves and the Corporation. They had tried by interviews and by letters to bring about a settlement, but had failed. They had therefore come to the conclusion that they would alter the system of charging the Corporation for gas. They would give up the meter system, as the Corporation would not carry it out. The Company were allowed by Act of Parliament to make a contract for the lighting of the city. They had previously had such a contract; and they should go back to it again, for they saw nothing else in order to avoid the repetition of these troubles and annoyances with the Corporation. They should adopt this course in self-defence. If they did not come to proper terms with the Corporation, the Act of Parliament gave the Corporation the privilege of going before arbitrators, and having the matter settled. But the Directors were determined to go back to the old system. They would do this to avoid the conflicts that were going on, and which, instead of decreasing, were increasing. He would not say any more on the matter, for fear he might say too much. He believed there had been some other interest at the bottom of what had been done. By the time they met again, the system of their dealings with the Corporation would be changed. He concluded by moving the adoption of the report and accounts.

Mr. C. LALOR seconded the motion.

Mr. T. J. COTTON (the Corporation Lighting Inspector) said he would rather the task of answering the Chairman had fallen to a more suitable person than an officer of the Corporation. The Chairman had referred to the members of the Corporation; but he regretted that these gentlemen occupied the position of buyer and seller, and therefore were unable to answer him. This was an anomalous position for any member of the Corporation to be placed in; but so it always would be as long as the law stood as at present. Some of the observations of the Chairman were incorrect; and he questioned the good taste of introducing at all matters which were at present in dispute with the Corporation. It was perfectly well known that a large section of the Corporation were of opinion that the present state of things in the Gas Department must cease—that it was not free and independent. The Chairman had referred to circumstances that occurred several months ago, when an imputation was made against the Company. This was an imputation with which he never agreed, and did not agree up to the present time. The Chairman omitted to mention that the Corporation had called for an impartial inquiry, and asked for permission to test the regulating apparatus. How did the Company meet them? The Corporation asked for permission to test 200 or 300 governors, which would occupy a week or more. The Company, however, said that the Corporation should do nothing of the sort—that if the governors were tested at all, the whole of them should be tested, which would take three or four months to do. If the Company were anxious for an impartial inquiry, why did they not allow what the Corporation asked for? The position at the present time was that the lamps were the property of the Company, and not of the Corporation; and the Company said the Corporation had no right to touch them or to examine the apparatus by which the gas was measured. This, he maintained, was most unreasonable. Again, though the price of gas was reduced, the Corporation had to pay about 20 per cent. more than they had to do ten years ago. The Corporation were simply doing their duty in calling attention to these facts; and the Company, instead of meeting them as commercial men, met them with skilful reports and artfully concocted letters. Let them meet like business men. He did not mean to make any charge against the gentlemen of the Board. He did not think the Board would take any unfair advantage of the public or of the Corporation which represented the public; but he would say this—that the officers of the Company did not treat the Corporation like business men. A large section of the Corporation at present held the opinion that the officers of the Company regarded the Corporation as a great milk cow. This must be stopped. They should measure the gas correctly, so that they would not force the Corporation to take more than they wanted; and if their officers tried to make them take more, they would do nothing of the sort.

Mr. W. SPILLANE said the Chairman had omitted to say anything about the question of the coal contract. It was decided at the last meeting that the coals should be bought in the open market.

The CHAIRMAN acknowledged this was an omission on his part. He said the coals had been advertised and contracted for.

Mr. SPILLANE said he was aware that the coals were advertised for; but what he wanted to know was the terms of the contract.

The CHAIRMAN said he could not give any information as to the terms of the contract. He did not think any mercantile company should be called upon to disclose such a matter; and he would not do so. He might say that the cost of soft coal was 12s. 10d., and of cannel coal 15s. 6d. per ton.

Mr. SPILLANE said he was quite aware of the prices paid at present; but what he wanted to know was what would be paid for coals under the terms of the contract which would come into operation in October. A substantial reduction was to be made in the price of gas—to which he did not object, as it might be very wise economy to sell it as cheap as possible; but if they were to continue to keep up the dividend they must have a considerable reduction in the cost of coal. The reduction of 2d. per 1000 cubic feet of gas must be made up for in some other quarter; and it would amount to no less than £4000 or £5000 in the six months. He considered 12s. 10d. per ton an enormous price for soft coal in Dublin. Only ten days had been allowed for tendering for the supply of 300,000 tons of coal; and this was not nearly sufficient. In fact, he had been told by several English gentlemen that they had not had an opportunity of sending

in tenders. This he regarded as a grave error of judgment on the part of the Directors.

Mr. CORREY contended that the matter of the coal contracts was one on which the Directors surely ought to be allowed to use their own judgment; and he, for one, was confident they exercised it in the interest of the shareholders.

Mr. MILO BURKE remarked that Mr. Spillane no doubt took great interest in the Company's coal contracts; but he questioned whether his speech would do any good.

Mr. GUNN said they had had all this matter of the coal from Mr. Spillane at the last meeting, when he read the Directors a lecture which he (Mr. Gunn) did not know whether they deserved or not. Although Mr. Spillane was very severe, and told them a great deal about what they ought to do, he was very reticent as to his own transactions in another place. It would be very interesting to know the figure at which he succeeded in getting coal in Limerick. If he would furnish more details as to how he bought coal there—if he showed that he bought it considerably cheaper in Limerick, considering the greater cost of carriage, than it was obtained in Dublin, and disclose the name of the merchants from whom he bought it—then he would be giving some good advice. But to say that 12s. 10d. per ton was too much was not the proper way to treat the matter. He (Mr. Gunn) confessed that he did not know whether 12s. 10d. was too little or too much; but if Mr. Spillane or anyone else told them he bought coal at 11s. 10d. per ton, then he thought they would have reason to complain of the manner in which their business was being carried on. In the absence of any such statement, the shareholders must assume that the Directors were doing the very best for the Company, and that they were purchasing the coal at the lowest possible price. With regard to the observations of Mr. Cotton, he did not think that was a place for having a dispute of the sort. He denied Mr. Cotton's right as a shareholder to ventilate at that meeting the opinions he held as an officer of the Corporation. He had stated that the Corporation had been made to use more gas than they wanted; but the shareholders had also heard the statement of the Chairman, that the Corporation had the power of turning on and shutting off the gas themselves. He (Mr. Gunn) thought they shut it off too early. The fault rested with the Corporation. They ought to treat the public better, and keep the streets lighted longer. Surely the capital of Ireland had a right to be as well lighted as Manchester or any other large town in England. He noticed that the Chairman had said, with regard to the gas contract, that the Corporation could have the terms settled by arbitration. He hoped that the contract entered into by that means would be of a satisfactory character.

The CHAIRMAN said it was, perhaps, only right to set Mr. Spillane's mind at rest. He had great pleasure in assuring him that the price for coals under the contract would be less—he would say considerably less—than they were now paying; and, therefore, without venturing to prophesy, he might say there need be no apprehension as to the dividends being reduced.

Mr. T. J. COTTON, referring to the remarks of Mr. Gunn, said that, attending there as a shareholder, he wished to be in harmony with the meeting; but, on bearing what the Chairman said about the Corporation, he thought he had a right to reply to him.

The CHAIRMAN said with regard to Mr. Cotton's remarks as to the Corporation's gas contract, he thought it was not the time for a discussion of that sort. There had been a great deal of correspondence carried on, and personal rancour displayed in the matter; and the Board had come to a resolution to alter the system. If the Corporation then considered they were asked too much, the proper course would be to go to arbitration.

Mr. T. J. COTTON said the Company had no power to alter the system.

Mr. SPILLANE remarked that if there was any desire to hear the name of a place where the coals would be obtained cheaper, he could give it.

Mr. CLAY said this was not the question. The question was what Mr. Spillane was paying in his own case.

The CHAIRMAN said he knew a good deal about other gas undertakings as well as their own; and he was sure their contract for coals bore comparison with that of any other company, considering the position they were in. He defied anyone to assert to the contrary.

Mr. SPILLANE: I say that Cork is buying coal at 11s. per ton.

The motion was then put, and carried unanimously.

On the motion of the CHAIRMAN, seconded by Mr. Alderman WINSTANLEY, it was resolved that the dividends recommended—10½ per cent. per annum on the old shares, and 7½ per cent. per annum on the new—be declared.

A cordial vote of thanks having been accorded to the Chairman for presiding, and for his labours on behalf of the Company,

Mr. CLAFFEY proposed a similar vote to the officers; remarking that they were very efficient, and did all they could for the benefit of the shareholders.

Mr. CORREY seconded the proposition, which was carried.

Mr. W. F. COTTON having briefly returned thanks, the proceedings terminated.

SHEFFIELD UNITED GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held on Monday last week—Sir F. T. MAPPIN, Bart., M.P., in the chair.

The LAW CLERK (Mr. W. WAKE) having read the notice convening the meeting, the report of the Directors, with the accounts for the six months ending June 30 last, an abstract of which appeared in the JOURNAL for the 18th ult., was presented.

The CHAIRMAN moved—"That the Directors' report be approved and entered on the Company's minutes, and that a copy of the resolutions of this meeting be sent to each shareholder." In doing so, he remarked that the shareholders would see that the report was a good one, and as satisfactory to them as it was to the Directors. They could not complain if they paid a dividend at the rate of 10 per cent. per annum for the half year, and had a surplus balance of £4029. They had placed £2895 11s. 7d. to the reserve fund (which was all they had power to put there), and the balance had been carried to the credit of the present half year; and therefore he was justified in saying that the report and accounts must be satisfactory to them all. He predicted on a former occasion that the Company would soon be in a better position than it was at that time; and this prediction had been verified. For the first half of 1887 they were able to add £1908 to the reserve fund; and for the second half, £1066. For the past six months they were able to complete that fund, and to carry forward a balance. The extension in the consumption of gas continued in the district pretty much the same as it had done for some years. During the past half year the Company had received £3037 more for gas than in the corresponding period of last year. Then meter and stove rents had been £167 more; and in the receipts for residuals, they had been equally successful. Coke had brought the Company £554 more; and the sales of tar had increased by £1311. The returns from the sale of sulphate of ammonia had increased by £1044. Thus their income had been considerably enhanced. On the other side of the accounts, they had had to expend £533 more for stokers' wages; repairs of various kinds to the works had cost £2593 more; repairs to

mains and streets, £832 more; and repairs of meters, £599 more—leaving the balance he had already named. From his observation and experience, he did not think that at the end of the current half year they would be in any worse position, but rather a better one. On several occasions a request had been made for a reduction in the price of gas in the Dore and Totley district. This request was brought before the Board at a meeting when the nominee Directors representing the Sheffield Town Council were present; and as they did not object, the Board had felt themselves in a position to grant the request. With regard to the quality of the gas, he believed it had been kept up to the same standard as hitherto. During the half year, 1038 tests had been made, which showed an average illuminating power of 16·20 candles; and if this had been calculated by the London standard burner, it would have equalled an illuminating power of 17·70 candles. The storage of the Company had been considerably increased, and was now equal to 8,280,900 cubic feet; but this was not quite a day's consumption sometimes, and further extensions would therefore be necessary in the immediate future. The number of meters out and in use on June 30 was 44,191. Of these 24,574 were 2-light and 8763 were 3-light meters; so that their business was on a very satisfactory and broad footing. They had so many customers that he did not think they would experience any very large reduction in the consumption of gas, whatever development took place in regard to electricity. On several occasions previously, he had urged users of gas to attend closely to their fittings; and he desired to repeat this advice. He was sorry to say that in the manufacture of gas they were still troubled with naphthalene. They had done all they could to discover the cause of this, and to remedy it. They had had the best advice, and experiments had been tried by the most eminent chemists in the country; but as yet the difficulty was unsolved, not only by the Sheffield Company, but also by a large number of other gas companies who suffered occasionally from this trouble. At one of the Company's stations nothing of the kind occurred; so that they transferred the coals that were used at the other works to this place, and still there was no complaint of it. The results were the same. At one of the works they appeared to produce it, and at the other they did not, whether they used the same or other coals. It was suggested—he believed by an old official of the Company, who had left their service—that the cause was that at one works they made more gas per ton of coal than at the other. But at the works where they produced the greatest quantity of gas per ton of coal, they did not find any naphthalene. Therefore this suggested cause was not the correct one. There was one subject he wished to mention, which he thought would have the hearty sympathy of the shareholders. They were bound at that time (perhaps it had been delayed too long—at all events it had been delayed long enough) to pay some compliment to their esteemed Law Clerk. All who knew what he had done for the Sheffield Gas Company must feel that this gentleman was entitled to some recognition. The Directors had considered that the best mode in which they could show their appreciation of Mr. Wake and his services was to have his portrait painted by some eminent artist and placed in the Board-room of the Company. The Directors did not intend to ask the shareholders to defray the expenses out of the funds of the Company, as they thought it would be a greater compliment to Mr. Wake to meet it in another way. The shareholders would be invited by circular to contribute to the fund, the subscription would be quite voluntary on their part, and be regarded as an expression of their good will to their esteemed friend. Having given a sketch of Mr. Wake's connection with the Company (which commenced in the year 1835), the Chairman said he thought the proprietors would have no hesitation in joining with the Board in presenting Mr. Wake with his portrait, and in asking him to allow it to be placed in the Board-room of the Company. With these remarks he begged to move the resolution he had read.

Sir H. STEPHENSON seconded the motion.

Mr. F. SIBBAY congratulated the shareholders on what he believed was one of the most satisfactory reports ever presented to any body of shareholders in that room. On behalf of the consumers of Dore and Totley, he thanked the Board for the concession they had made, and assured them that it would be heartily appreciated.

Mr. ROOME called attention to the statement in the report that a very large increase in the supply of meters had followed upon the decision of the Directors to put them gratuitously in the houses of consumers, and said it seemed that every effort made to supply the public was met by the public responding, to the advantage of the Company. They went largely into the supply on hire of gas cooking-stoves; and he asked if the same principle could not be applied to warming appliances for drawing, dining, and bed rooms. He thought such a plan would result in benefit to the public and also to the Company.

Mr. WILSON remarked that some misunderstanding existed with reference to the statement in the report as to the meters. Did the 1777 additional meters fixed during the past twelve months relate to new consumers, or did they simply replace old meters?

The CHAIRMAN said the meters were all for new consumers; and the 1777 favourably contrasted with the 678 additional meters which were fixed during the previous year. This, as Mr. Roome had remarked, was very much owing to the Company not charging for fixing; and the Directors anticipated such a result when they decided on making the change.

Mr. WILSON: Then it appears the electric light is not going to kill us.

The CHAIRMAN said no. The Directors would be glad, if they could, to carry out Mr. Roome's suggestion as to the use of gas-stoves in bed-rooms. Whenever it was possible, they would be glad to act upon any suggestion from the shareholders which would be for the benefit of the Company.

The motion was then put, and carried unanimously.

The CHAIRMAN next moved—"That the following dividends be now declared for the half year ending June 30—viz., 5 per cent. on the 'A' 'B' and 'C' stocks, and 6s. per share on the 'E' shares; and that the same be payable on Tuesday, the 2nd of October."

Mr. J. HOBSON seconded the motion, which was carried.

Messrs. Hobson, Harrison, and Blake were then re-elected Directors of the Company, and the business of the ordinary meeting concluded.

An extraordinary general meeting was then held, "for the purpose of obtaining the sanction of the shareholders to the creation and issuing of 20,116 shares of the nominal amount of £6 each, to be called 'D' shares; and for the purpose of passing such resolutions as may be necessary for effecting the aforesaid purpose."

The LAW CLERK having read the notice convening the meeting,

The CHAIRMAN moved a resolution sanctioning the issue of the shares; explaining that the Directors had deemed it advisable to exercise the powers already conferred upon them by Parliament and create the stock. They would be able to give to each holder of £100 stock—whether or not it had all been called up—three £6 shares; and they proposed to call up on each of them £1 4s. He would not predict the time when the Directors would make another call on the new shares; but they would certainly call up the whole of the "E" shares before doing so.

Mr. HOBSON seconded the motion, and it was agreed to.

A vote of thanks was then accorded to the Chairman, for the efficient service he had at all times rendered to the Company.

The CHAIRMAN said it was a great pleasure to him to preside at the Company's meetings, particularly when the Directors were able to satisfy the shareholders, as they had done, not only on that but on former occasions. The Directors secured the best scientific help they could get, and the best officers. They hoped their new Engineer, Mr. F. W. Stevenson, would give them as great satisfaction in the mode in which he would advise them as they anticipated from his knowledge and experience. He trusted that when they met on future occasions they would have the same satisfaction in their success and progress as they had had for many years past. He cordially thanked the proprietors for the compliment they had paid him, and his colleagues for their efforts on behalf of the Company. The proceedings then terminated.

EAST LONDON WATER-WORKS COMPANY.

The Half-Yearly Assembly of this Company was held last Tuesday, at the Offices, St. Helen's Place, E.C.—Mr. A. W. GADESSEN, J.P., D.L., in the chair.

The SECRETARY (Mr. I. A. Crookenden) read the notice convening the meeting; and it was decided to take as read the Directors' report and the statement of accounts (see *ante*, p. 519).

The CHAIRMAN: I now beg to make a few remarks upon the report; and I will make them as short as I possibly can. In the second paragraph of the report, you will see that the increase in the revenue is described as "moderately satisfactory." I, however, was going to ask you to regard the increase as very satisfactory. I think that the shareholders will take a rather more sanguine view of the matter than the Directors appear to have done. This word "moderately" has, I think, crept into the report through the ambitious views of our Secretary, who is very difficult to satisfy, and who is certainly not satisfied with small increases. The second part of that paragraph, however, qualifies the word "moderately," when it says, "having regard to the deplorable condition of some branches of industry in the Company's district." This reference is in allusion to the sugar-refining industry, those engaged in which were formerly large consumers of our water. In the last twelve months two refineries have been closed, which paid us between £4000 and £5000 a year. That is a large loss to the Company; but, notwithstanding, our revenue has increased. I would also draw attention to the fact that, at the close of 1887, the Company recovered revenue for purely domestic supply equal to that we enjoyed before those enterprising legislators, Messrs. Dobbs and Torrens, had entered upon their labours. I am pleased to tell you that our income from domestic supplies continues to advance, and that the increase in the half year ended Midsummer, 1888, as compared with the same period of the previous year, is just £2000; so that you may say that the increase which appears in our accounts of £2300 is almost entirely due to the additional domestic supplies. This, I think, is a satisfactory condition of things. Now, turning to the maintenance account, you see that the charges are rather less this half year than usual. This arises from two causes: First of all, we have enjoyed very great immunity from accidents to mains and machinery; and our maintenance charges have had the benefit of this. The decrease also arises in part from a charge for the fixing of hydrants for the Metropolitan Board of Works. Some of these expenses were incurred in the previous half year, but the whole credit for them has come into the present half year; accounting, in a measure, I think, for the decrease in the cost of maintenance. Then, with respect to the past half year, we may say we have been free from the anxiety we have experienced in former half years from lack of water—in fact, if we have had any anxiety at all in the past half year, it has been through our having had too much water. We have gone on very well indeed, as far as our water supply is concerned; and I am pleased to say that the quality of the water has also maintained the excellent character it gained in previous half years. The Secretary has put into my hands the report of the Registrar-General, who says: "The water, principally derived from the Lea, and distributed by the New River and East London Companies contained less organic matter than any of the Thames supplies. Both samples were clear and bright." I think that this is very satisfactory. The next matter I will trouble you with is a reference to the progress which is being made with our works. With respect to the Waltham Abbey works, I think you may consider them practically completed. The engines are fixed, and have been working admirably for some weeks—in fact, they leave nothing to be desired. I believe we shall get as large a duty out of these engines as has been obtained from any previously fixed by any Company. We have not quite done driving into the chalk, so as to get the largest supply we possibly can; but this will be accomplished, I daresay, in two or three weeks. Everything, therefore, is ready for putting the works into operation. With reference to the works at Lea Bridge, they are also proceeding satisfactorily. The engines are finished, and will be shortly at work; and the continuation of the sinking operations will be proceeded with as soon as we get the water out of the present shaft. These works promise an abundant supply of water. As to the works at Walthamstow, considerable difficulty has been experienced. They have not gone on so well as we had hoped; but there is nothing in the works themselves which presents any unusual difficulties. We have had some trouble in getting the cylinders down; but the work is now proceeding satisfactorily, and I think, in a comparatively short time, we may also get these works into operation. I may further state that the pumping of water from the gravel at Sunbury, which has been reported at previous meetings, is also giving very good results indeed. It is a valuable supply of water; and the volume is equal to slightly more than 2 million gallons daily. Altogether, therefore, you may consider that we are in a fairly satisfactory position. There is one point to which I must now refer, which is of a less pleasant character than the other matters I have spoken of. I allude to a case which appeared in the Police Court recently, and respecting which, perhaps, the shareholders may expect a few words from me. It was a case in which a man applied to us for a supply of water, and that supply was refused on account of there being no cistern attached to the house to receive the water.* I will just give the shareholders as clear a statement of the case as I possibly can. The Company require that every applicant for a supply of water shall provide a proper cistern to serve as a reserve of water. All our Acts involve this requirement. When Mr. Johnson applied, a survey of his house was made; and, no cistern being on the premises, we gave him the usual notice to fix one. This he refused, and eventually summoned the Company for non-supply. In addition to the proper cistern, every house must be provided with a water-closet service-box, and an efficient waste-preventing apparatus, so constructed as to be capable of discharging 2 gallons of water at each flush; and this flush practically empties the service-box. When the Magistrate heard the case, he maintained that this service-box, being, in effect, a cistern, no other was needed, and ruled that the plaintiff, having practically complied with the Act, we were in the wrong; and he inflicted a penalty of £5 for our neglect, together with the usual £1 per day for lack of water to an empty house,

and £1 1s. costs, together £15 1s. The effect of this decision would be, in case of failure of supply, which must occur occasionally through fires, repairs to mains and consumers' private fittings, that the house would be left without any water. It is to be regretted that the Solicitor representing the Company should have lost his temper when the Magistrate's decision was given. The remark made to the plaintiff was unfortunate; and the effect of the indiscretion has been, as it were, to place the Company in the wrong, whilst the wrongdoer, the plaintiff, is regarded as a martyr. We, of course, cannot leave the matter in its present state. We are going to appeal against the decision; and we think there can be no doubt as to the issue of the appeal. That is all I have to say at the present time. As I observed before, I myself regard the increase in our revenue as, under the circumstances, satisfactory. With respect to the resignation of our esteemed friend and colleague Mr. Mashiter, we are, of course, very sorry indeed that he should have thought that the time had arrived when he ought to retire; but he had made up his mind that he would do so, and we could not alter his decision. He has been a very valuable member of the Company for a great number of years, and his experience and past knowledge of its affairs were of considerable value to us. I can only repeat that we much regret his resignation. I will now move—"That the Directors' report and the accounts submitted to the meeting be received and adopted, and that, as recommended by the Directors, a dividend of £3 10s. per cent., less income-tax, on the ordinary stock of the Company, be declared, payable on the 12th of October."

Mr. HERBERT DALTON seconded the motion.

Mr. P. D. TUCKETT said he had no desire to make any remark in a hostile spirit; but some of the shareholders were a little disappointed at the dividend, for the accounts seemed to show that another $\frac{1}{2}$ per cent. had been made. It would only take a further £5000 to pay this addition to the amount proposed; but it was, of course, too late now. The revenue account, however, showed an increase of this amount as compared with the same period of the previous year, and there was a sum of £11,000 in hand. It was very nice that they were going to receive three dividends in one year; and they must all feel very much obliged to the Directors for the greater promptness displayed in paying the dividend. At the same time he did not think this was a sound reason for not declaring a larger dividend if this could be done. He believed that the proprietors were greatly indebted to the Directors and officers for managing the affairs of the Company as they had done, for otherwise they would not have gone on as well as they had, in spite of hostile legislation. Many proprietors, however, it should be remembered, had bought their stock by tender, and had given 190 per cent. for it, in the modest expectation that a $\frac{1}{2}$ per cent. dividend would be paid on it. Owing, however, to the adverse legislation to which the Chairman had referred, the dividends had been cut down to 7 per cent., which was barely $\frac{3}{4}$ per cent. on the price they had paid for the stock. He thought nothing should go forth which would lead to the supposition that the proprietors were in receipt of large dividends; and he hoped this was the last occasion on which they would have a distribution at the rate of 7 per cent.

Mr. F. TENDRON said he could not follow the figures of the previous speaker. The amount brought from the profit and loss account to the dividend and interest account was £73,000; and deducting interest on the debenture stock, they had a sum of £61,700 available. The proposed dividend would take £60,220, and there would only be a surplus of £1500 towards paying the additional $\frac{1}{2}$ per cent. suggested, whereas the sum required to pay such increase would be £4300. Nothing could be more unwise on the part of a Board of Directors than not only to draw upon a balance to pay a dividend larger than the amount earned, but to discount the future. They had no certainty, though they might hope to see the day when the Company would pay $7\frac{1}{2}$ per cent. It was very necessary for a Company like theirs to have a certain amount of undivided profit in hand. He thought that one reason why persons were ready to buy the stock of the Company at 200 was that 7 per cent. was reliable. He hoped the Directors would not think of paying more dividend until they were perfectly clear they could maintain the higher rate.

The CHAIRMAN: In reply to what has been said, I would point out that it would be injudicious in any Board of Directors to suggest an increase of dividend unless they saw their way to a continuation of it. The safest thing for a shareholder is to have whatever dividend he is pretty certain of receiving. Irregular dividends are very destructive to the success of any undertaking. I therefore think the Directors were perfectly right in proposing that we should pay the dividend we recommended, of 7 per cent.

The motion was carried unanimously.

Mr. TENDRON stated that he held the proxy of Mr. Bevan, of the firm of Barclay, Bevan, and Co., the bankers of Lombard Street, for the special purpose of proposing the election as a Director of Mr. Mashiter's son, Mr. Herbert Helme. Mr. Mashiter had been a Director for 39 years, and during that time had seen great changes in the history of the Company. He trusted that, in his retirement Mr. Mashiter would write his experiences—a proceeding which he was sure would be of great service to the Company. He scouted the idea of anyone stating that a water company had a monopoly. In the 39 years during which Mr. Mashiter had served them, the Company had also been enlarging their works, and they were that day proposing a dividend of 7 per cent. Was there any business in the City which had been successfully carried on for a period of 39 years, even allowing for vigorous competition, that paid so small a return? Water companies were great benefactors of the inhabitants; and he believed that a pamphlet of the kind to which he had already referred, written by Mr. Mashiter, would tend to convince the public that water companies were their servants and were benefiting the public largely. He did not believe that the attacks which were made on the water companies emanated from their customers, but that they came from a few men for political purposes, or that their assailants were agitators. He was glad to think that the Press was taking a more enlightened view of the duties of water companies.

Mr. ILSLEY seconded the motion.

Mr. ROKERY PRICE said he was very sorry that he felt it his duty to oppose the motion. He thought that a very serious principle was involved in the election—that a father should retire and his son succeed him. He proposed that the election of a Director be postponed till the next half-yearly meeting, so that sufficient time and opportunity might be afforded of finding a successor to Mr. Mashiter among the proprietors of the Company.

No one seconding the amendment,

The Chairman put the resolution, which was agreed to.

Mr. PRICE then proposed a vote of thanks to the Chairman and Directors for the able way in which they had conducted the business of the Company.

Mr. J. T. BLABY seconded the motion.

The CHAIRMAN having acknowledged the compliment,

Mr. ILSLEY proposed a vote of thanks to the officers.

The CHAIRMAN seconded the motion; observing that he could not speak too highly of their Engineer (Mr. W. B. Bryan, M.Inst. C.E.)

The motion was carried unanimously.

* A report of the case referred to was given in the JOURNAL for the 25th ult. (p. 555).—Ed., J. G. L.

Mr. BLABY: Is the money you intend to borrow to extend the works further?

The CHAIRMAN: I am much obliged to you for mentioning that matter. We have in hand certain works, and the money we propose to borrow will be for the purpose of finishing them. I hope the amount will be quite sufficient for the purpose.

The SECRETARY having returned thanks for the compliment paid to the officers of the Company the proceedings terminated.

THE SWANSEA CORPORATION AND THE GAS COMPANY.

THE TOWN TO BE LIGHTED BY ELECTRICITY.

In view of the decision come to by the Swansea Gas Company to raise the price of gas supplied for both public and private purposes, the Gas Committee of the Corporation, at their meeting last Tuesday, decided to recommend the Council to apply for a Provisional Order to light the town by means of electricity. At the outset it was explained that steps had been taken to see whether the right originally vested in the Corporation, by an Act of Parliament obtained in 1884, to erect gas-works in the town was still in force. The Town Clerk (Mr. J. Thomas), who, in accordance with instructions, had obtained Counsel's opinion on the subject, placed before the Committee the case he had submitted on the question to Mr. R. S. Wright. In the statement the Town Clerk stated: "There are existing in the borough of Swansea gas-works, the property of the Swansea Gaslight Company, and at present the Corporation pay the Gas Company a price per annum for the lighting of all the public street lamps in the borough. The Corporation are now desirous, in consequence of the high price charged by the Gas Company for gas, of erecting works themselves, and of lighting the public street lamps from such works." After recapitulating certain Acts of Parliament, the statement concludes: "Counsel is requested to advise generally as to the powers of the present Council of the borough of Swansea to establish gas-works under the powers of the Swansea Improvement Act, 1844, and more particularly upon the following points:—(1) Supposing the site for gas-works (two acres) under the powers of the Act of 1844 is too small, and Counsel is of opinion that there are no extended powers under the Public Health Act, 1875, allowing the Corporation to purchase other lands for this purpose, may the Council, having chosen, as site for the two acres, land adjoining their own property, utilize their own land in addition to the two acres for the purposes of gas-works? (2) Whether the Council have now the power reserved to the Local Board of Health by virtue of the Provisional Order to erect gas-works and apparatus, lay pipes, &c., and supply gas under the Swansea Improvement Act, 1844. (3) As to the powers of the Corporation to borrow money under the Public Health Act beyond the £15,000 authorized by the Swansea Improvement Act of 1844, sec. 49, giving power to borrow, being repealed. (4) Whether the powers of the Swansea Improvement Act as to lighting are confined to the old town and franchise, or whether the same have been extended by the Provisional Order incorporating the Public Health Act, 1848, and the Public Health Act, 1875, now replacing that Act. (5) Is it competent for the Council, under the provisions of 45 and 46 Vic., cap. 50, sec. 137, to make an order extending those powers to the whole of the borough?" The opinion of Counsel was in the following terms:—"I am of opinion that the powers conferred by sections 145 and 146, and following sections, of the Local Act of 1844, upon the Commissioners created by that Act are exercisable by the Council of the borough. This part of the Local Act was kept alive by the Provisional Order of 1850, which abolished the Commissioners, and repealed many of the provisions of the Act of 1844. The 5th section of the Provisional Order transfers the powers so preserved to the Corporation as Local Board of Health, and empowers the exercise of them by the Corporation in the same manner as if they had been powers granted by the Public Health Act, 1848. The Gas Company's Act of 1861, sec. 67, expressly saves all powers possessed by the Corporation as the Local Board of Health; and the effect of the Public Health Act, 1875 (see sections 313, 326, 341), is to preserve these powers to the Corporation as the Urban Sanitary Authority under that Act. As to the specific questions asked: (1) I am of opinion, having regard to the limit of two acres imposed by section 146 of the Local Act, and to the fact that no modification is introduced into that section by the Provisional Order of 1850, that the Corporation could not safely exercise for this purpose the general power of purchasing land conferred upon them by section 175 of the Public Health Act, 1875. But there will be little or no risk in their utilizing for gas-works' purposes land which is already their property, provided it was not purchased for, and has not been appropriated to, or held in trust for some other specific purpose. (2) For the reasons given above, I answer this question in the affirmative. (3) I am of opinion that the effect of sections 5 and 6 of the Provisional Order of 1850 is to place the Corporation, in executing the unrepealed provisions of the Local Act of 1844, in the same position, and to confer upon them the same powers as to borrowing, &c., as if they were executing the provisions of the Public Health Act. They may, therefore, with the sanction of the Local Government Board, exercise, for the purpose of carrying out their lighting powers under the Local Act, the borrowing powers conferred by section 233 of the Public Health Act, 1875. (4) I am of opinion that the lighting powers conferred by the Local Act of 1844 are extended by the Provisional Order of 1850 to the whole municipal borough. The powers are exercisable (by sections 145 and 146 of the Local Act) 'within the limits' of that Act. The section in the Act defining the limits (section 188) is repealed by the Provisional Order, which at the same time (section 1) defines the district of the Corporation, as the Local Board of Health for the purposes of the Public Health Act, to be the whole municipal borough, and (by section 5) makes the preserved powers under the Local Act exercisable by the Corporation as such Local Board in the same manner as if such powers had been granted by the Public Health Act. The effect is that both the old powers under the Local Act which are preserved, and the new powers given for the first time by the Public Health Act, are to be exercised by the same authority over the same area—viz., the municipal borough. (5) Section 137 of the Municipal Corporations Act, 1882, has, in my opinion, no application to the case. The Local Act which was in force in Swansea in 1835 was repealed in 1844; and its provisions cannot now be put in force." The Town Clerk also produced statistics showing the relative cost of lighting the town by means of gas, electricity, and oil. The cost of the two first-named illuminants was about the same; but offers to supply equal illuminating power by means of oil for about half the money were submitted. After some discussion, it was decided, as above stated, to recommend electricity.

EXMOUTH GAS COMPANY.—At the half-yearly meeting of this Company held last Saturday week, the Chairman (Mr. J. Sloman) congratulated the shareholders on the continued prosperity of the undertaking, and showed that, notwithstanding reduced prices, the earnings were larger than those of previous half years. He reported that the new gasholder, erected at a cost of £3000, was completed; and paid a high compliment to Mr. Willey, of Exeter, by whom the contract had been carried out.

THE CHARGES AGAINST THE HALIFAX GAS-WORKS OFFICIALS.

At the Meeting of the Halifax Town Council last Wednesday—the Mayor (Mr. Alderman J. Booth) in the chair—the charges which have lately been brought against certain of the officials of the Gas Department, and with the nature of which our readers are familiar, gave rise to a long discussion. Mr. W. Carr, the former Gas Engineer and Manager, was present, accompanied by his Solicitor (Mr. W. Storey); and there was a large attendance of the public.

Alderman RAMSDEN moved—"That the deed of indemnity [see *ante*, p. 586] now submitted, between the Mayor and Mr. Thomas King Fox, be approved, and the Mayor be authorized to execute the same on behalf of the Council; and that the Sub-Committee be requested to take all requisite steps in order to ensure a full investigation of the charges referred to."

Alderman J. W. BROADBENT seconded the motion.

Alderman LONGBOTTOM asked if there was to be a report upon the "gas scandal," and pointed out that the *agenda* paper mentioned a report of the Special Sub-Committee.

The Mayor said the Council were asked to sign something, as it were, *in camera*; but after it was signed he thought that an explanation would be given which would justify them in having passed a resolution of that sort.

Alderman LONGBOTTOM said he should not oppose the resolution, because it appeared to be the only alternative now left to the Council. He had previously been opposed to the signing of the indemnity, because he had thought that there was a more economical course open to the Corporation; but now he understood that the Sub-Committee were not able to get at any definite charges against any specific persons unless the indemnity was given. He only wished to point out the position into which they were about to be placed. The Council was putting itself in the hands of the legal adviser of a gentleman who might be prepared to spend any amount of money, seeing that the Corporation purse would be open to him. He wished to say, inasmuch as it had been stated outside the Council—he hoped it had not been said by any member—that he had been in favour of hushing up the scandal, that whoever had made that statement had said something that was entirely opposed to the truth. It had always been his wish that whoever might be the subject of these charges should be brought to book, and punished, if punishment were deserved, with the strongest penalty that could be inflicted. With regard to the indemnity, the fact that Mr. Fox would deposit a sum of £500 in the bank in the name of his solicitor and the Town Clerk, to await the issue of any action which might be taken against him, made a very considerable difference to the question of whether or not it was advisable to sign it; and he could not see that there was now any reason why they should not approve of the indemnity. He was told that certain charges were to be made and certain names were to be mentioned. He moved—"That if any member of the Council be named in the charges now about to be read by the Mayor in the matter of the gas scandal, such member be withdrawn from the Committee of the Council until such charges have been investigated."

Alderman RILEY (Chairman of the Gas Committee) seconded the motion and it was carried unanimously.

The Mayor then said that, before reading over the charges, he thought it was due to the Council that he should, in as few words as possible, give them a short history of the investigations which had been made with regard to the gas scandal. When Mr. Carr called upon him to say that it was his intention to send in his resignation, he (the Mayor) put the point to him clearly and distinctly. He said to him, "Why don't you commence an action against the *Pall Mall Gazette*, because in case you are non-suited through the fact that the law proceedings that you take would be abortive, it would cost you nothing, because I should pay the costs, and you would show to the public at large that you are trying to clear your character?" Mr. Carr replied, "If I thought the *Pall Mall Gazette* would not defend the action, I would at once commence proceedings; but I know that they would defend the action, and I am not prepared to go into the witness-box." He (the Mayor) then said, "But why should you fear to go into the witness-box? If there is nothing wrong, there is nothing for you to be afraid of." Mr. Carr replied, "Well, I have made up my mind that I shall resign; and I am not going into the box." Then he (the Mayor) said, "You are afraid to go into the witness-box;" and Mr. Carr replied, "Well, I am not going." He mentioned that conversation as an answer to a letter which had appeared in the papers, and which was calculated to throw dust in the eyes of the people, inasmuch as it defended Mr. Carr's course in refusing to take action on the ground that if he did so it would prove abortive. This was not the real reason why Mr. Carr had not commenced proceedings. Mr. Carr knew full well that they had information in their possession that he had been bribed to a considerable extent; and he (the Mayor) had no hesitation in saying that they could prove this statement up to the hilt. Going a little farther, he thought it would be a surprise to many members of the Corporation to be informed that they had contracted for a certain class of coal, and had received thousands of tons of coal of another and inferior quality, which had been paid for, though there was a difference of 2s. 6d. per ton in the price of the article contracted for and that supplied. This was not a mere hearsay statement. In order to satisfy himself of the truth of it, he had gone to the colliery and seen the coal being put into the trucks. He assured them that if it was possible to understand language at all, the contracts distinctly ordered a certain class of coal; and the Corporation were certainly not receiving the kind of coal ordered. In addition to this, as far as he could judge—though, of course, an investigation of the kind was a very difficult matter—the Corporation had paid for a very great quantity of coal that they had never received. When he informed them that only 1 per cent. of the coal, only one truck out of a hundred, had been weighed at the gas-works, he thought they would see at once that there had been—what should he call it?—gross neglect, gross and unbusinesslike conduct. The Corporation had a weighing-machine over which the trucks of coal had actually to go, and only one truck out of a hundred received had been weighed. Yet the advice-notes of the colliery company had been copied into the waggon-book just as they had been received; and this waggon-book had been sent forward to the Accountant. Of course, the advice-notes would correspond with the invoice; and when the invoices had come, they had been checked off by the waggon-book, and the account had been passed and paid. So that, as far as the weighing of the coal was concerned, the neglect in not weighing it opened, he considered, flood-gates for fraud and robbery. There was another thing that had caused some inconvenience, and that was with regard to the test-book, which should contain a record of the quality of the coal. He was told there was such a book, and it was a fact that they had the apparatus for testing the coal, and he supposed that it had been tested from time to time; but still they could not find any record of the testing of the coal which would guide them as to its quality. They found that out of 700 trucks of coal received from one colliery there had been five weighed (cries of "Shame"). He believed that when the particulars of other contracts had been gone over thoroughly—contracts of a similar character—they would find that they had been paying from 1s. to 1s. 6d. per ton more for coal than they could obtain the same quality for at other collieries. They hoped in a

short time to have analyses of the qualities of the coal they had been using, and other investigations were being made. The following letter had been received from Messrs. Godfrey Rhodes and Evans:—

*Commercial Bank Chambers, Halifax,
Oct. 2, 1888.*

Keighley Walton, Esq., Town Clerk.
Dear Sir,—As requested, we herewith send you the engrossment of the indemnity for execution by the Mayor. We also enclose the charges by Mr. Fox, duly signed, in separate sealed envelope, which has not to be opened or made use of until after the indemnity is signed. We shall be glad when giving notice of the charges to the parties concerned if you will draw their attention to the terms of the indemnity providing for any proceedings to be taken by civil action, and not by way of criminal information. We may say our client has reason for insisting upon this; otherwise he may be unable to give evidence of facts which are within his own knowledge. Please let us have your undertaking to send us the indemnity duly signed or to return us the sealed envelope enclosed unopened.—Yours truly,
(Signed) GODFREY RHODES AND EVANS.

He had just opened the sealed envelope, after signing the indemnity, and the charges were set out as follows:—

- (1) That William Carr, the Gas Manager, has received moneys by virtue of his position in relation to the Halifax Gas-Works, and has illegally appropriated the same to his own private purposes.
- (2) That Emor Green Wrigley, of Ashton-under-Lyne, has fraudulently substituted another and inferior coal for that which he had contracted to supply to Halifax and other gas-works.
- (3) That Alderman James Turner Riley, J.P., is unfit to occupy the chairmanship of the Gas Committee of the Halifax Corporation.
- (4) That the said William Carr, Emor Green Wrigley, and James Turner Riley have been guilty of malpractices in connection with the Halifax Gas-Works.

(Signed) THOS. KING FOX.

Alderman RILEY said he could only repeat what he had said in the Council Chamber two months ago. In respect of any malpractices, or in respect of any commission that had ever been paid on coal that had gone into the Halifax Gas-Works, he had never received sixpence in his life. If he had received a single sixpence, he had received a million of money. He made that assertion fearlessly, in the presence of forty gentlemen, with many of whom he had been associated for seventeen years. The Corporation had bought very large quantities of coal since he had been Chairman of the Committee; and there had never in his life been a single colliery proprietor, or a single representative of a colliery proprietor, who had said to him, "If you can influence the Gas Committee, and get my firm an order for coal, I will see that you are put in a position so that you shall not lose anything by it," or "I will give you money if you will do so." Never had such a thing happened in his experience; and he thought he ought to make that public statement in the interests of the gentlemen who owned the collieries. He only knew two gentlemen who supplied the Corporation with coal; and he most solemnly assured everyone there—and he asked them to believe him—that he had never received a sixpence, or had a sixpence offered to him, in his life for any such purpose as was suggested. He appealed to the Corporation to wait in respect to the charges and statements that had been put before them that day by the Mayor. And he would like to ask the Mayor if he had any objection to read the correspondence, showing the bungling way in which he (the Mayor) had gone about the matter—correspondence from the colliery proprietors relating to the quantity of coal which he (the Mayor) had stated had come from the collieries to the Corporation. With respect to Mr. Carr, he had stated two months ago that he chose to believe him to be free from corruption. He had been intimately acquainted with Mr. Carr for twelve years; and during the whole of that time he had never found him to be an untruthful man. When this scandal was first raised, he went to the gas-works, and had an interview with Mr. Carr, and had said to him, "Now, you and I have been associated in the management of these gas-works for many years, and I want you to give me a straightforward answer to a pointed question." He replied, "I will." He (Alderman Riley) said, "Have you ever received any commission on any coals which came into these works?" and Mr. Carr looked him straight in the face, and said, "I never have." A gentleman sitting on the aldermanic bench had similarly questioned Mr. Carr, and had received a similar reply. He preferred to believe Mr. Carr to be innocent of the charges until he was proved to be guilty. There were certain circumstances which had transpired that day which would possibly appear to put a different face upon the matter; but his desire was that the whole matter should be gone into. As to the quality of the coal, he did not take the slightest responsibility on that account. That was a question of manufacture. If the Council had been defrauded out of these large sums of money, all he could say was that he had been defrauded also, and most grossly deceived; but he did not take the slightest responsibility with regard to the quality of the coal. He had spent the best part of his life for twelve years in the work of the gas undertaking; and if he had had thousands of pounds invested in the concern, he could not have taken a greater interest in it than he had done. Whether they believed it or not, he assured them that this was true, and that he had been very proud of the progress of the works. When Mr. Carr first came to Halifax, the price of gas was 4s. per 1000 cubic feet, and now it was only 1s. 9d. per 1000. He thought these good results ought to be highly satisfactory to every member of the Council, and to every consumer of gas in the borough. As to the weighing of the coal, he had heard incidentally that a large proportion of the coal which was going into the gas-works was not weighed. He had expressed his surprise at that; and Mr. Carr had said that Mr. Cleasby would explain it. He (Alderman Riley) had tried several times to see Mr. Cleasby, but had not succeeded in doing so. He, however, understood that it had been to a large extent caused by the very short time that was allowed to Mr. Carr for taking the waggons into the sidings. Whether this would be a good and sufficient excuse to the Corporation remained to be seen. He again said emphatically to his colleagues in the Council, and to the rate-payers through the press—he emphatically said and swore there, before the Mayor and the whole of the Council—that he had never received a single sixpence, and had never had it offered to him by any colliery proprietor who had done business with the Halifax Corporation; and, further, he sincerely believed that the late Gas Manager, who was then sitting in the Council Chamber, had never received a sixpence in the shape of commission on coal or anything else.

The Mayor: What about Dempster?

Alderman RILEY said the Mayor should not ask him about that—he was talking about the coal. He would not believe that Mr. Carr had received anything until he was proved guilty. With regard to his own actions, he gave them a positive and serious denial of the charges; and surely he knew what he himself had done. He could not look anyone in that town in the face if he had done what was imputed to him, and could never put his head outside of his own house if he had told his colleagues in the Council a palpable and deliberate lie. He could only assure them, as he had assured the Mayor and the Town Clerk, that his hands were perfectly clean with regard to the matter.

Alderman LONGBOTTOM said that, however the statements made by Alderman Riley might come home to their own consciences, he was afraid they would not satisfy a great number of people outside the Council, in the face of the written statement that he (Alderman Riley) and other

persons had been guilty of malpractices. Therefore, the only course left to the Council, seeing that they had passed a resolution that the indemnity to Mr. Fox should be signed, was to pass another calling upon Alderman Riley to commence a civil action against the person who had made these charges against him. These charges were of the most serious, and, if untrue, the most scandalous character; and he should hardly think that any gentleman would have such a stigma as that attached to his name and character without justifying himself before "twelve good men and true." But he thought that, seeing that they had given an indemnity on one side, they should also give Alderman Riley a guarantee that if he brought an action, and succeeded in clearing his character, he should be nothing out of pocket thereby. As members of the Council, they should see to it that Alderman Riley did not suffer pecuniarily if he came through the ordeal with clean hands. He therefore moved—"That Alderman Riley be called upon to commence a civil action against Thomas King Fox, for the purpose of having the charges made against him fully investigated; and that, in the event of his obtaining a verdict in his favour, he be indemnified against all costs, charges, and expenses incurred by him in such action."

Alderman D. SMITH seconded the motion. He said he thought, in all fairness to his own character and to his standing in the town, Alderman Riley should take the course suggested, so that the matter might be fairly sifted.

The motion was carried.

The Mayor at this point referred to Alderman Riley's statement about his "bungling" in making inquiries at a certain colliery. He said he simply went down to inquire about a particular contract of which he did not know the exact quantity; and in asking them about it, he stated rather more than the quantity they had contracted for. He had said that the contract was for 8000 or 10,000 tons. Mr. Wrigley showed him that the contract was for 5000 tons, and that a second year's contract was for 6000 tons. He believed, however, that instead of the 5000 tons they would find that the Corporation had paid for more than 6000 tons. It was quite an irregular proceeding, when the Gas Committee had accepted a contract for 5000 tons, that 6000 tons should be supplied.

Alderman RILEY said he could explain that. He was sure the Mayor would not do or say anything wrong. (The Mayor: Not for the world.) They were under the necessity of ordering 1000 tons more; and the order was given with the consent and knowledge of the members of the Gas Committee.

The Mayor still persisted that such a course was irregular, and said the additional order ought to have been entered on the minutes of the Committee.

Alderman POLLARD said the charges were very serious ones; and it behoved them all to keep as calm as they could. He rose to propose that, in order not to keep the public in suspense on the subject, the Sub-Committee dealing with the matter should call the Council together every week or every fortnight to receive reports, now that they had signed the indemnity.

Mr. BROADBENT seconded the motion, but expressed the opinion that there was no necessity for it. The Mayor and his colleagues had not been at all dilatory, considering the work they had to do, and were doing it thoroughly. He suggested that they should be left unfettered; and they would, he was sure, at once call the Council together whenever they had anything to report.

Alderman LONGBOTTOM wanted to know what the members of the Gas Committee thought on the subject, and said they seemed to be as "dumb dogs" in regard to the matter.

Mr. J. W. DAVIS, as a member of the Committee, said his colleagues knew nothing of the alleged malpractices. He objected to Alderman Longbottom's observation that they were "dumb dogs" because they had said nothing with regard to the proceedings now going on. They were perfectly content to leave the matter with those in whose charge it was, and to await the result.

Mr. J. BROOK, another member of the Committee, supplemented Mr. Davis's remarks, and explained that during the last four months the weighing-machine at the gas-works had been out of order, and had been under repairs.

Mr. J. BAIRSTOW indignantly repudiated the appellation "dumb dogs."

Mr. J. BRANLEY said his great difficulty had been, on previous occasions when this matter was before the Council, to restrain himself from speaking; but now that they were challenged to speak, he would say one or two things. The duty of the Council was to believe all were innocent until they were found guilty; and he regretted that they should have departed from that course. The Gas Committee, had, he contended, not been treated with the courtesy which ought to have been displayed towards them. With respect to Mr. Carr, he was extremely sorry that the Mayor had felt it to be his duty to make him blacker than he was yet proved to be. He thought it was an injury to Mr. Carr. When the Gas Manager stated his decision to resign, he told the Mayor he was willing to stay at his post until his successor was appointed; and the Mayor replied, "Oh, you can go at once." He thought an old servant of the Corporation ought not to have been treated in that cavalier fashion. He had not approved of the indemnity—not that he would break any part of the inquiry, but he felt that if anyone had charges to make against a servant of the Corporation, they could make them without having an indemnity. He should believe both Alderman Riley and Mr. Carr to be innocent until they were found to be guilty; and he regretted that the Council should have been hounded on by libellous and slanderous things that had appeared in newspapers. So far as he knew the feelings of the members of the Gas Committee up to that moment, they had had, and they still had, the utmost confidence in the Gas Manager and in their Chairman, Alderman Riley.

Mr. L. CLAYTON also objected to Alderman Longbottom's expression "dumb dogs," and said the words must be offensive to each member of the Committee. He could only speak from his own experience on the Committee; and he must say he had found their proceedings had always been conducted in a businesslike and orderly manner (hear, hear).

Alderman LONGBOTTOM disclaimed any intention to be offensive, and described the expression used as a playful one, which he would at once withdraw.

The resolution was also withdrawn.

Mr. PEARSON suggested that the number of gentlemen forming the Sub-Committee should be increased.

The Mayor replied that he thought it would be the wisest course at present to leave the Sub-Committee as it was; if they required a greater number, they would not fail to ask the Council to increase it.

Mr. GRAYDON asked if all the books and papers which Mr. Carr had in his possession as Gas Manager were now in the hands of the Corporation.

The Mayor replied that the "test-book" referred to by him had not yet been found; but he could not at that stage answer Mr. Graydon's question.

The discussion then closed.

A meeting of the Gas Committee was held last Friday—when Mr. Binns, Vice-Chairman, presided. There were 38 applications for the post

of Gas Manager; the salary being £400 per annum. It was decided to consider these at a special meeting to be held on the following Wednesday (to-morrow). A letter was read from Mr. Carr, asking for a quarter's salary in lieu of three months' notice; and it was understood that the Committee would not entertain the application. Mr. Alderman Riley on Thursday placed the matter as affecting himself in the hands of his legal advisers, who are laying the charges before Counsel, with instructions to draw up an indemnity embodying the terms on which he would advise Mr. Riley to sue Mr. T. K. Fox. It is reported that Mr. Wrigley also has placed the matter in the hands of his solicitors, and intends to bring immediate action against the Mayor (Mr. Alderman Booth) for the libellous matter contained in his speech last Wednesday.

The following are some press comments on the matter:—*The Pall Mall Gazette* says: "We are very glad that the Halifax Town Council have found it out at last; but we put it to them whether they ought not, in common gratitude, to recognize the services which we have rendered to them." *The Leeds Mercury* says: "We are not disposed to accept the wholesale accusations which are made as true; but whenever they are specific, they should be traced home, and their truth or falsity established." *The Yorkshire Post*, referring to Mr. Fox's position, says: "The circumstance of any man entering upon any such undertaking under such conditions is a tolerably sufficient guarantee not only that he is in earnest, but that he has perfect confidence in his ability to make his words good, and to satisfy any Court of Law of the justice and truth of his statements." It is added by the *Post*: "The Committee will find it very difficult to persuade the public that their way of managing the gas business of the Municipality was as little blameworthy as they represent it to have been. What sort of management could that have been under which only one truck of coals out of every hundred received was weighed, so as to check the invoices sent from the collieries?"

The following letter has been sent to the local papers by Messrs. Storey and Co., Mr. Carr's solicitors:—"Sir,—As this matter [the Gas Scandal] will in all probability, and at no distant period, be thoroughly investigated in a Court of Law, we would again, on behalf of our client, Mr. Carr, ask the public, through your valuable paper, to suspend their judgment, notwithstanding the extraordinary statements that have been made in the Halifax Town Council Chamber and elsewhere. The course taken against our client so far will, on examination, be found to be unprecedented. The statements referred to are merely *ex parte*—that is to say, one-sided—and look as if they had been made on the principle of 'hanging a man first, and trying him afterwards.' Our client's position is strong enough to enable him to resist all attempts in the nature of coercion or despotic dictation; and as a Court of Law is to be appealed to, he will for the present refrain (however painful and trying the silence may be) from combating the statements made to his prejudice. With some people 'the wish is often father to the thought.' Fortunately, however, the thoughtful and charitable are in a majority, and, before forming a judgment, will, we venture to think, wait until both sides have been heard."

ROCHDALE CORPORATION GAS SUPPLY.

THE ALLEGATIONS RESPECTING THE GAS COAL CONTRACTS.

At the Meeting of the Rochdale Town Council last Thursday—the MAYOR (Mr. J. E. Petrie) presiding—there was a long discussion on the subject of the gas coal contracts. Certain charges, it may be remembered, had been made impugning the honesty of the Gas Committee in the letting of the contracts for coal; and, in accordance with a resolution of the Committee, the Chairman (Mr. Alderman Petrie) replied to the statements. The charges made by Mr. E. Evans at a public meeting on the 20th ult., as already reported in the JOURNAL, were (1) that the tenders were not dealt with, or entered into in a businesslike way; (2) that a member of the Gas Committee proposed that they should go to the Wigan Coal and Iron Company and do the best they could with them; and (3) that the very same class of coals as those accepted was offered by another tenderer at 1s. per ton less.

Alderman PETRIE said the proper answer to the last and most serious charge would be in a very short but unparliamentary word. It was absolutely false. The charge had arisen through the strange and unaccountable conduct of Mr. Parker, who was Mr. Evans's informant. This gentleman did not attempt to prove the allegations before the Committee; but expressed his very strong regret that he had ever spoken on the subject to Mr. Evans. He further told the Committee that the statements made by Mr. Evans were grossly exaggerated, and that he had given an interpretation to them—or had led other people to place an interpretation upon them—which he (Mr. Parker) had never for one moment intended to give. After this Mr. Parker promised the Committee that he would write to the papers on the Saturday following, showing the difference between him and Mr. Evans, and giving an explanation of the matter. But, to the surprise of the Committee, the real effect of the letter was most decidedly to confirm, and strongly confirm, the statements which Mr. Evans had made—putting him completely in the right, and repeating the statements in a more decisive and more offensive form. Proceeding to give the history of the transactions, Alderman Petrie said:—"So long ago as the 6th of June last the coal tenders were presented to the Committee and opened by them. The usual method was adopted; and the Assistant Town Clerk read over the particulars of each tender, and each member of the Committee copied the names of the tenderers and the particulars of their tenders as they were read out, so that he might have them before him for his private consideration. There were altogether no fewer than 34 tenders for different qualities and prices of coal; and this list they made out. A long and careful discussion took place, ranging over the whole of the tenders; and, as always happens in such a case, when we came to compare the prices, qualities, &c., a considerable number of tenders were set aside at once, for we saw that they did not represent the article we wanted. The 34 tenders were reduced to seven. The Committee felt that these were deserving of closer attention and fuller information, in order that they might all be thoroughly investigated. With this purpose a Sub-Committee was appointed, to obtain the best and fullest information they could on each class of coals tendered; and the seven tenders were handed to them. This Sub-Committee met five days afterwards, and set to work at the seven tenders. We collected the very best information we could; and, after going through the figures and results, we brought the seven tenders down to three. These tenders appeared to be very near each other. One of them was for the Arley Coal, and the price of it was 11d. per ton less than the coal we eventually accepted. The price offered was 8s. 4d. per ton, and the price of that which we bought was 9s. 8d. We were quite hoping that we had a coal that would beat anything we had had before. After carefully going into the figures, however, we found that this was not borne out. Although our best coal is 9s. 3d. per ton, we do not use that coal by itself. We mix two-thirds of it with one-third of nuts at 7s. 6d. per ton. This makes our coal for gas purposes 8s. 8d. per ton; but this is still 4d. per ton more than the tender to which I have referred. But from the very best information we obtained, we learnt that the new coal would only give us 17-candle gas. Our standard is 18-candle; and if we were to use that coal we should have to purchase

cannel to improve it, or else buy a much more expensive coal to mix with it. Then we were regretfully obliged to put that tender on one side also. If we had accepted it we should have been losers in the end. Thus we came down to two tenders. One of these was so near in the figures that although they only offered 5000 tons, we decided to test it, and if the test was satisfactory to purchase it. We at once ordered 100 tons, and tried them by a test over the whole works, and extending over two or three days. Fortunately the test was not satisfactory. The tender was then thrown aside, and we were left with one only. We had then to report our decision to the General Committee. There was another long discussion, and it was not without considering all the points that it was decided to give the order to the Wigan Coal and Iron Company. Only one member objected, and that member was Mr. Councillor Parker. After that had been decided, and not before, it was proposed that a deputation should go to the Wigan Coal and Iron Company, with full powers to do the best we could with them. That meant that we were to make the tender as much as we could at the price; and, if possible, to screw the price down a little as well. The deputation went to Wigan; and, after a very long struggle and some very hard bargaining, we got the price so modified as to make a saving of the round sum of £1000 on the whole weight of the tender. That was a pure saving to the rate-payers by the efforts of gentlemen whose character it is much the fashion to impugn at the present time. Between then and now we have had a number of Committee meetings and several Council meetings; but Mr. Parker has not thought proper to give the Council or the Committee the slightest idea that he objected to what was done by the Committee. In the letter which he sent to the papers (see *ante*, p. 600) he says: "My objection was to the position taken by a member of the Committee proposing that a deputation be appointed to wait upon the Wigan Coal and Iron Company 'to make the best terms they could before any of the other tenders were considered.'" This, Sir, is a statement which I hope no one will be found fool enough to believe, for it is absurdly untrue. He says further: "I protested against this proceeding, with the result that some slight consideration was given to a few of the other tenders." That also is a statement which can only cause the other members of the Committee to wonder how Mr. Parker can be possessed of such strange ideas, for they are fancies of a diseased imagination. I think I am justified in calling the conduct of Mr. Parker strange and unaccountable.

Mr. PARKER, in reply, said that when the tenders were opened, the motion that he complained of was made, and he was the only person who objected to it. He asked whether the deputation were going to the Wigan Coal and Iron Company to make the best bargain they could, when there was not one on the whole list who would not make some concession if appealed to. After this, they inquired into some of the tenders on his recommendation; but there were upwards of 20 different tenders that were never gone into at all. In the last there was one coal of a similar quality to the Arley mine coal at more than 1s. a ton less; and there was another coal advertised which would make 12,000 cubic feet of 18-candle gas, and would cost only 8d. more than they were paying. He did not know that he had said anything that he had any reason to retract. He had no intention of charging anyone with dishonesty in any shape or form; but if Mr. Evans so construed his statement, or put it in such a way that it might be so construed, he was a dishonourable man.

Several members of the Gas Committee vouched for the accuracy of Mr. Alderman Petrie's statement of what transpired, and warmly denied the allegations of Mr. Parker. It was suggested that a resolution of confidence in the Committee should be passed; but the Mayor and several members of the Committee thought that this was unnecessary, and it was not pressed.

Mr. PARKER, in a closing statement, said he told the Committee that if they gave the price quoted in the tender, they would be paying too much—that the price of coal quoted at Wigan, which, from a business point of view, was the pit price, was 6s. 6d., and that this, with the railway rate, 1s. 7d., and the cost of the waggon hire, 6d., should bring the coal up to only 8s. 7d. per ton.

Alderman PETRIE, in reply, expressed himself as well satisfied with the tone the discussion had taken. He did not remember the exact remarks of Mr. Parker in committee, but considered it quite possible he might have given them the information to which he had just referred. He had laid before them much information; and the Committee had listened with the greatest deference to what he had to say, because it was felt that, being connected as he was with the coal trade, his remarks ought to be attended to. He (Alderman Petrie) now thought they must attribute the whole of the misunderstanding to Mr. Parker being very excited when the Committee were considering the tenders. His imagination that the proposal to visit Wigan was made before the tenders were considered must have arisen from his being in a state of excitement.

Mr. PARKER: I cannot allow that.

Alderman PETRIE: If Mr. Parker remembers that the proposal was made, he must remember the name of the gentleman who made it.

Mr. PARKER: Then it was Alderman Baron.

Alderman BARON (warmly): That is so absurdly untrue that it needs no contradiction.

The discussion closed, and the minutes of the Committee were passed.

THE PRICE OF GAS AT ACCRINGTON.—The Watch and Cemetery Committee of the Accrington Corporation have lately been considering the desirability of approaching the Directors of the Gas and Water Company with a view of getting the price of gas supplied for the public lamps reduced; and the Town Clerk laid before the Committee a comparative statement of the price of gas supplied in all the boroughs in Lancashire. It was resolved that a table be prepared showing the high charge in Accrington; and the Chairman and one member were deputed to wait upon the Directors of the Company to ask them to reduce the price. Subsequently the deputation reported the result of their interview with the Directors, who had informed them that they had already under consideration the question of a general reduction, which might be adopted after the expiration of the year.

DISMISSAL OF THE HAWORTH GAS MANAGER.—At the meeting of the Haworth Local Board last Tuesday, a recommendation that the Gas Manager (Mr. M'Kenzie) have a months' notice to terminate his engagement was brought forward, and a motion for its adoption moved by Mr. H. Redman. He gave as his reason for doing so the thorough incompetency of Mr. M'Kenzie to properly conduct the works. It was some time before the motion found a seconder; but eventually Mr. J. Redman seconded it. Mr. M'Kenzie said he was totally ignorant that any charge was to be brought against him until the previous morning, when he saw the minute. All he had to say was that in every particular he had done as well as he could since he came to Haworth. After some discussion, the Chairman moved, as an amendment, that the Gas Manager be dismissed and that three months' notice be given to him; but there was no seconder to it. The motion was then put, when Messrs. H. Redman and J. Redman voted for, and the Chairman against it. The other members remained neutral. The motion was therefore carried.

BIRMINGHAM CORPORATION GAS SUPPLY.

INCREASE OF OFFICIALS' SALARIES.—WORKMEN'S HOLIDAYS.

At the Meeting of the Birmingham Town Council last Tuesday—the Mayor (Mr. Alderman Pollack) in the chair—the report of the Gas Committee, of which an abstract was given in the JOURNAL last week, was presented. The principal matters dealt with therein were, it may be remembered, the increase in the salaries of certain officials of the Gas Department and the granting of holidays to the workmen.

Mr. BISHOP, in moving the adoption of the report, said it had never been the practice of the Gas Committee to report increases of salary in the Gas Department, as it was treated as a commercial undertaking; but they had cheerfully complied with the resolution of the Council to prepare a report of all the advances which had been made during the current year. Having described the classes of officials to whom the advances referred, he said that since 1887 there had practically been no increase in the sum-total of the office salaries; while the management salaries had decreased. Alluding to the advance which had been made in the salary of one of the Engineers (Mr. C. Hunt), he said that, although only Mr. Hunt's name was mentioned, it was well known that there was a probability of Mr. Hack having his salary raised, so that the two might be taken together. It was thought by some that Mr. Hack was appointed since the undertakings of the Companies were taken over. This was a mistake. Both the Engineers were left as an inheritance to the Gas Committee—or rather they entered the service of the Corporation on the faith of certain promises made by those who negotiated the transfer. One promise was that their positions under the Corporation should be as good as they were likely to become under the Companies. It was then considered to be a great advantage to have both Engineers; and they had since proved to be of the greatest possible benefit to the undertaking. Mr. Joseph Chamberlain, at the time of the transfer, said the Corporation would do well to deal liberally with the Companies' servants; and after the first three years' experience of the Gas Committee, the right honourable gentleman gave the credit for what had been done to the Engineers in the first instance. He (Mr. Bishop) might be asked how the Committee justified the increase given to Mr. Hunt and the proposed increase to Mr. Hack. He would frankly acknowledge that, in his opinion, the Committee had made a mistake—(hear, hear)—not in the way suggested by the “hear, hear,” but in not giving the increase earlier, by gradations. Instead of allowing nine years to elapse without making Mr. Hunt any advance at all, they would have acted more wisely if they had made one three or four years earlier. But there were two reasons for the course adopted. One was that very extensive works were going on at Windsor Street, and the Committee were anxious to see whether or not they fulfilled the promises of the Engineers. Then the Committee were afflicted with the feeling caused by depression of trade, and were anxious to restrict expenditure as far as possible. In justice to the officers, it should be said that they did not press their claims for the same reason. Mr. Hunt had £800 a year when he entered the service of the Corporation. During the 13 years of his engagement, he had designed and superintended an extension of the works involving an outlay of £360,000. Surely, an advance of £400 during that 13 years was not excessive or extravagant. The works at Windsor Street had been approved by some of the best engineering authorities in the country as being admirably adapted to the requirements of gas making, and at the same time substantial and economic in their construction. Upon Mr. Hunt rested the responsibility of the work; and if the matter had been placed in the hands of an expert, the extra cost would have been £18,000. Similarly, Mr. Hack had carried out works at Saltley, which had cost £100,000; and the next extension at these works would probably be in about six or seven years' time, unless electricity did away with any need of an extension—and the Committee would not hesitate to entrust to Mr. Hack the responsibility of planning and carrying out such works. He wished briefly to refer to the saving effected in the manufacturing charges, in the increased production of gas per ton of coal carbonized, and in the prevention of leakage. The charges for which the Engineers were directly responsible had been gradually reduced at the Saltley works until they were lower by 13d. per 1000 cubic feet than they were in 1876, and at Windsor Street by 8d. At Saltley, the production of gas per ton of coal had been increased by 850 cubic feet; and at Windsor Street by 1200 cubic feet. This had been brought about without any deterioration in the quality of the gas; in fact, there had been an increase in the illuminating power. The leakage had been reduced by nearly 4 per cent.—a result that could not have been brought about without the skill and enthusiastic aid of the Engineers. The total annual savings he had mentioned amounted to £47,000; and in the face of these figures, he did not think the Council would have the ingratitude to complain of the increase. It was in the interest of the undertaking that the officials should be liberally paid. He would speak of the Secretary (Mr. Edwin Smith) last, as he was, after all, the principal official. Mr. Bishop related the circumstances connected with Mr. Smith's engagement, and spoke in most flattering terms of his services to the Corporation. He acknowledged that Mr. Smith had no previous experience of the work; but the promise made to him was that, if he should succeed, his financial position should be as good as any officer in the department, and if he failed he would have to leave at the end of the year without any consideration whatever. This was the pledge given by the Committee. Mr. Smith had not failed; he had more than answered the Committee's expectations. In the matter of bad debts alone he had saved the Corporation £2000 a year; for in 1877 the bad debts of the department were £3400, whereas in 1887 they were only £1400. The market price of such a man was beyond calculation; and he was worth to the gas undertaking far more than the salary paid to him by the Council. In conclusion, Mr. Bishop warned the Council against the mischief—he had almost said the folly—of discouraging their officers from putting forth their utmost energies on behalf of the Corporation they had served so well.

Mr. CLARKE thought the Chairman of the Gas Committee must have been romancing when he stated that £47,000 a year had been saved to the Committee when they handed over only £20,000 to £25,000 to the rates. The salary list was alarming, and wanted thorough investigation; and it was quite time the Council took the question of these salaries into their own hands, and did not continue the mistake of leaving the Committee to report after the advances were made.

Mr. GRANGER characterized the speech of the Chairman of the Committee as very remarkable and unwise. He was astonished to hear of the savings which it was stated had been effected; and he should like to know where the money had gone to. It had not gone into the pockets of the Corporation. The statements made now opened up the whole question that, from its formation to the present time, the Gas Committee had almost treated the Council with contempt—regarded them as enemies—and had tried to prevent the Council knowing what was going on at the gas-works. It was all very well to lay before the Council a lot of figures such as the Chairman of the Committee had produced; but they had nothing to compare them with. He believed the figures which had been adduced were altogether erroneous; and if the Gas Committee refused to give them proper returns, he hoped the Council would compel them to do it. As to the Engineers, he said the time had gone by when two Engineers

were needed; and, in his opinion, instead of the competition between them having been as to who should do best, it had been a competition as to who should squander most.

Mr. M. DAVIS denied that it had been the custom and an understood thing, as the Chairman of the Gas Committee had stated, that the Committee should make the advances and report to the Council. There was no such understanding. The Committee had taken upon themselves to do it; and if it had not been for the resolution passed at the last meeting of the Council, they would have known nothing of these large increases. The Committee ought not to be allowed to treat the Council in this way.

Mr. BRINSLEY said the increase which had been made in Mr. Smith's salary had been well canvassed outside the Council; and he contended that they had already been too good to their Secretary. He might be a good commercial man, but the man to whom they gave £1000 a year would be a very bad servant if he did not look after the bad debts; and with the monopoly the Corporation enjoyed, they ought to make very few, if any, bad debts.

Mr. JARVIS expressed surprise at the tone of the Chairman of the Committee in regard to the workmen and their holidays. At the last meeting of the Council, Mr. Bishop was persistent in refusing to give the holidays.

Mr. BISHOP: There was no persistency at all. I was from the first strongly inclined to grant what was asked.

Mr. JARVIS complained that large increases were readily made to the higher-paid officials; while the reasonable demands of the workmen were considered with great hesitation and reluctance.

Mr. THOMAS inquired whether the coke-wheelers at Adderley Street had received their long-promised holiday; and if not, why?

Mr. WALTER said the feeling of the people of Duddleston was very strong in respect to the increase of the salaries given to the highly-paid officials. He agreed that there should be a scale regulating the salaries, and that the salaries should be progressive; but when one officer's salary reached £1000 a year it was time to stop. He did not know whether it was competent for him to move an amendment without notice; but if it was, he would move that the salaries remain as they were before the increase. If he could not move it at that meeting, he would give notice to do so at the next.

Mr. ELI BLOOR thanked the Committee for the concession they had made to the carbonizers; observing that the holiday was thoroughly appreciated by all the men. With regard to the high salaries, he said, as a Trades Unionist, he had never voted against the raising of salaries. He had first of all ascertained what the ability of the official was; and he had generally found that he was worthy of the increase, and then he had invariably discovered that the salaries paid by the Corporation of Birmingham were lower than they were in other large towns. He thought, however, that the resolution proposed by Mr. Lowe—that in future the Committee should report all increases of salary of £50 and upwards—should be adopted. He could inform Mr. Thomas that the coke-wheelers were going to have their holiday.

Alderman POWELL WILLIAMS, M.P., thought what they had to ask the Committee was to give an explanation of the circumstances under which those repeated increases of salaries were not reported to the Council as they occurred. The Council had laid it down as a rule that no advance of salaries of £100 or upwards should be made without the circumstance being made known to the Council. That of Mr. Smith, however, appeared to have been raised from £1000 to £1250 without being reported to the Council at the time. This required an explanation.

Mr. MANTON believed it would be disastrous to the work of the Council if they hampered and cramped the extent of the Committee's operations. The fullest confidence should be placed in the Committee.

Alderman AVERY explained the powers given to the Committee, and pointed out that this body had not legally complied with the resolution of the Council appointing them, in not reporting the increase in the salaries. While he said this, he must also observe that, in the main, the Committee had managed admirably the great trust conferred upon them by the Council. It had been asked what had become of the profits made. From the reports of the Committee's proceedings, published from time to time, it appeared that they had accumulated a reserve fund and a sinking fund of very little, if any, less than £200,000. This they held as a guarantee against loss. Then they had paid the ratepayers, in direct contributions, sums of money varying from £20,000 to £27,000 a year in the twelve years they had been in possession of the gas undertaking, or something like a quarter of a million of money. Then in the reduction of the price of gas the consumers had had a benefit to the extent of certainly not less than £60,000 a year. He for one, was grateful to the Committee for what they had accomplished. They had not, however, literally complied with the directions given to them; and he hoped for the future they would make a point of stating to the Council what they had done and how they had done it. To take the Council into their confidence was a wise policy, and one that ought to be pursued.

The Mayor, in replying to the question as to what had become of the profits, said the Committee had, during the last twelve or thirteen years, contributed £305,000 to the improvement rate; they had accumulated about £254,000 as a sinking fund; and they had a reserve fund of more than £64,000—the total amount of saving thus being £319,000 in addition to the £305,000 paid to the improvement rate. What was the present condition of the gas undertaking? On the 31st of December last the capital embarked was £2,294,340. They paid for the gas undertaking £2,000,931; so that there was only an increase of about £294,000. If they deducted the amount of £319,000 which he had mentioned as saved, irrespective of what they had paid to the rates, they found that they owed £25,000 less than when they acquired the gas undertaking. They had now a plant 50 per cent. better than in 1876; they had bought 50 acres of land; they had paid a great portion of the expenses of the Art Gallery; they had enlarged the gas-works at Windsor Street; and they had completed the works at Saltley. He quite agreed that the increase of salaries should be reported; and that the Committee, in not reporting them, had simply been following a wrong precedent.

Mr. JACOBS contended that the price of gas in Birmingham was much higher than that charged in other large towns; and, in support of his contention, mentioned the price at Hull and Sheffield, where he said large dividends were paid to the shareholders of the Companies. In Birmingham they paid the paltry sum of £25,000 out of a capital of about £2,500,000. The Council certainly wanted a much stronger Gas Committee than the present one to manage the undertaking.

Mr. BOWKETT asked the amount of salary Mr. Smith received when he was first appointed Secretary of the Gas Department.

Mr. BISHOP said Mr. Smith commenced with a salary—in 1878—of £500. In 1879 it was increased to £600; in 1880, £700; in 1881, to £850; in 1882, to £1000; and in 1888, to £1250 a year. In answer to other questions, he said that if a week's holiday were allowed to each employee, &c., as well as each Bank Holiday, it would cost the Committee £1650 a year. As to Mr. Jacobs's remarks, the price of gas in Birmingham, he fearfully asserted, was as low, when all things were taken into consideration, as it was in any other town in the kingdom. They had been asked what they

had done with their money. He would remind the Council that £350,000. had gone into the pockets of the ratepayers; and the loss on the residuals between 1881 and last year was £58,000. Part of the economies had been absorbed in this way.

The motion was then agreed to.

SALFORD CORPORATION GAS SUPPLY.

RESIGNATION OF MR. HALLIGAN.—COST OF THE HUNTER PROSECUTION.—MR. ELLIS LEVER AND THE QUALITY OF SALFORD GAS.

At the Meeting of the Salford Town Council last Wednesday—the Mayor (Mr. Alderman A. L. Dickins) in the chair—various matters connected with the gas-works undertaking of the Corporation were brought forward.

The minutes of the Gas Committee, under date of the 17th ult., showed that Mr. J. F. Halligan, the Station Manager at the Regent Road Gas-Works, had resigned his position.

The minutes of the Finance Committee showed that, at a meeting held on the 21st ult., an extract was read from the proceedings of the Gas Committee, to which Committee the accounts incurred in the proceedings against Samuel Hunter and others by the Consultative Committee had been sent for payment, with an intimation that the Committee agreed to recommend the Council that any amount that might be hereafter received from Hunter should be placed to the credit of that Committee, and a resolution from the Gas Committee, in reply “that the accounts incurred by the Consultative Committee be remitted to the General Finance Committee, in accordance with the resolution of the Council.” The resolution of the Council was as follows:—“That the Consultative Committee be authorized to direct the General Finance Committee to pay the accounts referred to in the above-mentioned report, if found correct.” The accounts referred to (£927 Os. 6d., £263 13s. 8d., and £687 15s. 4d.) were submitted; and it was resolved to pay them. It was decided to place these amounts to a suspense account, pending the result of the civil proceedings against Hunter.

Mr. J. G. MANDLEY subsequently rose to move the following motion:—“That, having regard to the numerous complaints of the present quality of our gas, Mr. Ellis Lever be informed that the Corporation agree to the proposal made by him in his letter to the Manchester newspapers, dated the 26th ult., headed ‘Salford Gas;’ and that he be requested to name his nominees.”*

Alderman M’KERRON asked what was the proposal referred to. It had never been made to the Corporation officially.

Alderman KEEVNEY asked whether Mr. Mandley knew the decision the Gas Committee had come to that morning.

THE DEPUTY TOWN CLERK read the following resolution passed by the Gas Committee that morning:—“That in view of the motion of Mr. Mandley, based on the letter of Mr. Ellis Lever as published in the Manchester newspapers, this Committee are perfectly willing to afford Mr. Lever an opportunity of placing any statements which he may adduce before a Sub-Committee, consisting of the Mayor, the ex-Mayor, the Chairman and the Deputy-Chairman of this Committee, and Mr. Phillips; and if he can show a *prima facie* case, this Committee will ask the Council to institute a public inquiry into the matter.”

THE MAYOR said that if Mr. Lever made out a *prima facie* case, a public inquiry should be instituted, with an independent man as president.

MR. MANDLEY persisted in moving his motion. He said he did not intend to reflect upon the Gas Committee; he felt that they and the Manager were working under difficulties, because there must still be men at the works who had been accomplices of Hunter.

After some discussion, Mr. Mandley agreed to withdraw his motion, and accept that of the Committee; substituting the names of the Mayor, the ex-Mayor, the Chairman and Deputy-Chairman of the Committee, Mr. Sharrocks, and Mr. Phillips for those mentioned, and omitting the clause with respect to the public inquiry.

Alderman WALMSLEY said he was disinclined to grant the Committee; and he only agreed to it now because he believed it would result in Mr. Lever pronouncing his own condemnation. Mr. Lever had made similar applications before; and when opportunities had been given him, he had refused to make his charges.

THE MAYOR confirmed Mr. Walmsley’s statement. He said Mr. Lever had had several opportunities of making his allegations against the Gas Committee during the last six months. He had received telegrams from Mr. Lever asking for appointments; and when the appointments had been made, he had failed to keep them.

The motion for the appointment of the Committee was then put and carried.

THE RATING OF THE SOUTHAMPTON GAS-WORKS.

At the Meeting of the Southampton Guardians on the 27th ult.—the DEPUTY-PRESIDENT (Mr. H. Webb) in the chair—the Rating Committee reported that, having considered the question of the rating of the property of the Southampton Gas Company, referred to it by the Board, they had resolved to recommend that the gross estimated rental in the parish of St. Mary be increased from £8055 to £9438, and the rateable value from £4694 to £5500—an increase of £806 on the latter.

MR. BATES moved the adoption of the report. He said they were not entirely unanimous in Committee; but he was of opinion that they could well sustain the increase proposed; and they ought to do so in all fairness to other ratepayers in the town.

MR. WILLIAMS seconded the motion; saying the increase asked for was a very modest claim indeed.

MR. PURKISS proposed as an amendment that the assessment remain unaltered. He said he could plainly see that if they moved in the matter they would be drawn into litigation; and the last time they went to law on this question, it cost the town £4200. Now they were in a worse position; for while in 1875 the profits of the Company were £14,873, last year they were but £13,818—more than £1000 less.

MR. PARKER seconded the amendment, and pointed out that some members of the Board fought the Dock Company on the same lines; but the Act of Parliament directed them to rate on the profits, and although the Company had grown in every direction, unless the profits were proved to be greater, the Guardians would lose their case.

* The letter referred to was as follows:—“Sir,—Thirty-four years have elapsed since I commenced my commercial career in the borough of Salford. For nearly ten years I have been boycotted by the Salford Gas Committee because I ventured to tell them they were being defrauded. The numerous complaints appearing in the press as to the quality of the gas in Salford are fully justified; and if the Corporation will allow me to nominate two members of the Council, with power vested in them to nominate a third, I will undertake to show the Council within fourteen days how and to what extent the ratepayers are being defrauded. I have examined the affairs of the Salford Gas Committee; and I have no hesitation in saying that it would be next to impossible to find a town where the administration and the system of bookkeeping have been so entirely unsatisfactory. About the quality of the gas supplied, I would say that ‘You cannot make a silk purse out of a sow’s ear;’ neither can you have good and pure gas from coal and cannel which are notoriously bad, being charged with poisonous impurities.”

MR. PATSTONE supported the amendment; thinking it unwise to raise the assessment at the present time, especially as an electric lighting company was about to be established.

MR. BATCHELOR said that he should like further explanation. Everyone knew the vast increase of the Company’s works, including two large gas-holders, not rated, erected at a cost of £20,000. He should like to know, however, whether the profits had increased since the last appeal, or whether they were on works inside or outside the town. It seemed to him the Company could very well sustain an increased rating.

MR. EMANUEL said it might be perfectly true there was a tremendous increase; but this did not show profits.

Alderman ASLATT thought, as the Company would not object to be fairly rated, the Board might make an amicable arrangement with them.

THE DEPUTY-PRESIDENT was pleased that so many members had spoken in support of the amendment. It was thoroughly understood that these public companies were to be rated, to all intents and purposes, according to their profits. It was true there had been additions to the plant in the shape of gas-holders and a tram-line; but it should be known that these were carried out entirely from additional share capital, and not from profits. In 1877, when the appeal took place, the Recorder decided that the assessment should be £5800 for the borough. According to the professional valuer engaged by the Board, it was shown that the assessment should be on profits put at £14,873. Now, if they would take the Company’s balance-sheet for the last two years, they would find the profits were only £13,800. It might be asked how this came about; but a reduction of 1d. per 1000 cubic feet meant £1000 less profit. Since 1877 the price had been reduced from 4s. 6d. to 3s. per 1000 cubic feet. He had no hesitation in saying they would be doing a gross injustice by increasing the assessment, because he believed it would land them in further litigation.

MR. BATES, in reply, urged that though, on the occasion of the last appeal of the Company, the costs were heavy, they were repaid in a couple of years by the increased rating sustained.

On a division, the amendment was carried by 12 votes to 6.

Alderman ASLATT moved as a further amendment that a deputation wait upon the Company in order to arrive at some satisfactory mutual arrangement with regard to an increased rating. This was not seconded, and the original amendment was carried as a substantive resolution.

OLDHAM CORPORATION GAS SUPPLY.

THE PROPOSED EXTENSION OF THE HIGGINSHAW WORKS.

The Gas Engineer of the Oldham Corporation (Mr. J. Chadwick) has recently suggested to the Gas Committee the advisability of extending the storage capacity of the Higginshaw Gas-Works. He gave the following as his reasons:—“The present storage room at the Higginshaw Gas-Works is 1,600,000 cubic feet, and consists of four holders, each 100 feet diameter and 29 feet deep. The daily make of gas last winter was 1,800,000 cubic feet; the daily delivery of gas during the working days of last winter was 2,000,000 cubic feet. The daily delivery of gas in the winter of 1884 was 1,600,000 cubic feet. The daily increase of 1887 over 1884 is, therefore, 400,000 cubic feet. I think we may assume that the daily delivery of gas will have reached 2,500,000 feet in the winter of 1891. The gas-holder capacity should be equal (or thereabouts) to a maximum day’s delivery. It would take from two to three years to construct a new tank and holder. I have, therefore, to suggest to the Committee the desirability of making other provision in the storage capacity at the works, with the idea of utilizing the land to the best advantage. I propose to construct a gas-holder and tank considerably larger than those at present existing, which by comparison (and in connection with the large works into which those at Higginshaw are gradually developing) can only be called small ones. I have, therefore, prepared plans for a tank 200 feet in diameter and 30 feet deep—the holder to be on the telescopic principle, in two lifts. This would give an additional capacity of 1,600,000 cubic feet, or make the storage at Higginshaw double what it is at present. Doubtless this looks on the face of it a large increase to make at once; but when there is a constantly and continually increasing consumption of gas, when it is scarcely possible to go on with the whole apparatus exactly balanced for any length of time, and when it becomes necessary to increase certain portions of the apparatus, I think due regard should be paid to probable future requirements. Some members of the Committee will remember that considerable trouble and difficulty have been experienced with two of the present tanks at the Higginshaw works, in consequence of water having leaked out of them, and that during the repairs I found that the bottoms of the tanks were in close proximity to some old and disused coal workings, and that the water had leaked out there. In preparing the plans for the proposed tanks, I have, as I think, taken special precautions against any danger which might naturally be expected from previous experience. In the first place—and the nature of the ground favours this—I have kept the level of the proposed tank 12 feet higher than the existing tanks; and I propose to place a layer of concrete over the whole bed of the tank bottom and under the puddle. With these precautions, and others of a minor character, I have not the slightest doubt but that the tank can be constructed perfectly sound and watertight.”

THE PRICE OF GAS AT RAMSBOTTOM.—The Ramsbottom Local Board recently appointed a deputation to wait on the local Gas Company in reference to the price of gas for public and private lighting, and at the meeting of the Board yesterday week the Clerk reported the result of the interview. He said: “On behalf of the deputation I called the Directors’ attention to the following facts:—The Rossendale Union Gas Company charge private consumers 3s. 7d. per 1000 cubic feet, whereas the Ramsbottom Gas Company charge 3s. 11d. For public lighting the Rossendale Company charge the Bacup Corporation 3s. per 1000 cubic feet, and the Ramsbottom Gas Company charge your Board 3s. 6d. Your Board pay almost as much per lamp for gas alone as the Rawtenstall Local Board pay not only for gas (supplied by the Rossendale Union Gas Company) but also for wages, &c., for lighting and extinguishing the lamps, cleaning, repairs, painting, and putting the lamps in and taking them out and storing them at the termination of the lighting season. The Haslingden Union Gas Company charge private consumers 3s. 9d., and for public lighting 3s. 11d. per 1000 feet, and allow 5 per cent. discount to consumers if paid within 14 days; whereas the Ramsbottom Gas Company charge 3s. 11d. and 3s. 6d. respectively, and do not allow discount in any case. The Bury Corporation charge private consumers within the borough (except the newly added areas) 2s. per 1000 feet, and private consumers outside the borough and consumers within the newly added areas, 2s. 11d. per 1000 feet. Notwithstanding these facts, which clearly show how extraordinarily excessive the Ramsbottom Gas Company’s charges are when compared with those of other companies, Mr. Stead, on behalf of the Directors, said that his Company could not at present reduce their charges, and gave as a reason the fact that there was a considerable decrease in the price they now obtained for their residuals as compared with the price they obtained several years ago. The Directors promised that they would make a reduction as soon as they could see their way clear to do so.” No remarks were made upon the report.

THE GAS AND WATER ORDERS OF THE SESSION OF 1888.

The Board of Trade report on their proceedings under the Gas and Water Works Facilities Act, 1870, during the session of the present year has just been issued. It states that 24 applications were made to the Board for Orders, in which power was sought to raise £558,500 by shares, and £142,616 13s. 4d. by loans—a total of £701,116 13s. 4d. Of this sum, £217,500 of share and £56,750 of loan capital was for the purposes of gas undertakings; £186,000 of share and £47,166 13s. 4d. of loan capital for water undertakings; and £155,000 of share and £38,700 of loan capital was for the combined gas and water undertakings.

The applications for the Gas Orders were from the following places:—Chigwell, Loughton, and Woodford; Dursley; Great Berkhamstead; Hatfield; King's Lynn; Littlehampton; Oakham; Poulton-le-Fylde; Snodland; Swansea; and Workop. Six of these applications—viz., Dursley, Great Berkhamstead, Hatfield, Oakham, Poulton-le-Fylde, and Snodland—related to existing undertakings which, having no parliamentary powers, sought for authority to maintain and continue works already constructed, and to make and supply gas. The other five applications related to undertakings already possessing parliamentary authority, and sought for the following powers:—The Chigwell, Loughton, and Woodford Order, to extend the existing limits of supply and to raise additional capital; the King's Lynn and Littlehampton Orders, to construct additional works, to purchase more land, and to raise further capital; and the Swansea and Workop Orders, to raise additional capital. Objections were lodged against many of the Orders; but in no case was it deemed necessary to hold a local inquiry, and, with certain modifications and amendments, all the applications were granted.

The sliding scale of price and dividend was inserted in all Orders with the exception of the Swansea Order, the initial price per 1000 cubic feet being fixed as follows:—Chigwell, Loughton, and Woodford, 4s. 11d.; Dursley, 4s. 1d.; Great Berkhamstead, 4s. 7d.; Hatfield, 4s. 3d.; King's Lynn, 3s. 6d.; Littlehampton, 4s. 3d.; Oakham, 4s. 6d.; Poulton-le-Fylde, 5s. 10d.; Snodland, 4s.; Workop, 3s. 8d. In the case of the Swansea Order, the Board of Trade, after hearing and considering the objections raised by the Corporation, reduced the existing authorized maximum price (4s. in the borough and 5s. 6d. outside) to 3s. 9d. and 5s. respectively. The Corporation, however, renewed their opposition to the Order in the House of Commons, with the result that the maximum price was still further reduced by the Select Committee to 3s. 6d. in the borough; the maximum price of 5s. outside the borough remaining unaltered. In the Poulton-le-Fylde Order a clause was inserted by agreement, requiring the undertakers, under certain circumstances, to sell their undertaking to the Local Authority. The illuminating power was fixed at 15 candles in all Orders except the Poulton-le-Fylde Order, in which an illuminating power equal to 16 candles was prescribed. The Gas-Works Clauses Acts, 1847 and 1871, were incorporated where necessary; and the usual clauses as to sale of capital by auction or tender were inserted in all the Orders in which additional capital was authorized. The usual clauses as to limits of dividend and profit, pressure and mode of testing the gas, insurance and reserve funds, excess of profits, quantity of land to be taken by agreement, &c., were inserted in all Orders to which they were applicable. Two Bills to confirm the Orders were introduced into the House of Commons on the 7th of May. The Bill containing the Swansea Order was opposed in the House of Commons by the Corporation of Swansea, with the result that the maximum price to be charged for gas was reduced as previously stated, and a clause as to pressure of gas inserted. Neither Bill was opposed in the House of Lords; but, at the suggestion of the Chairman of Committees, the clause empowering the promoters to manufacture, purchase, and supply gas appliances and apparatus, &c., was modified so as to exclude "engines and machines for the production of motive power." Both Bills received the Royal Assent on the 24th of July.

The Water Orders were applied for in respect of the following places:—Barrow-upon-Soar and District; Hayward's Heath and District; Herne Bay; Kettering; Mansfield; Mid-Kent; Mid-Sussex; Wimborne Minster; Workop; Wotton Estate. Of these applications, five were promoted by new Companies, who sought power to construct works and to supply water in the following districts:—Barrow-upon-Soar and District; Hayward's Heath and District; Mid-Kent (parishes of Snodland, West Malling, &c.); Mid-Sussex (parishes of Hayward's Heath, Cuckfield, &c.); and Wimborne Minster. Of the remaining applications, four related to existing undertakings having parliamentary authority—viz., Herne Bay, Kettering, Mansfield, and Workop. In the Herne Bay and Workop Orders, power was sought to raise additional capital; in the Kettering Order, to construct additional works; and in the Mansfield Order, to extend the existing limits of supply and to raise additional capital. The remaining application—the Wotton Estate Order—related to an existing undertaking without parliamentary authority; and by it power was sought to maintain and continue existing works, to construct additional works, and to supply water. Orders were granted by the Board of Trade in eight out of the ten applications; but in the case of the Barrow-upon-Soar and District and the Hayward's Heath and District applications, the Board declined to grant Orders. In these two cases, the decision not to proceed was arrived at after consideration of the report of Major F. A. Marindin, R.E., C.M.G., who was appointed by the Board to hold a local inquiry in each case. With respect to Barrow-upon-Soar, the Local and Road Authorities withheld their consent to the application, and some of them actively opposed it. Major Marindin in his report stated that in his opinion sufficient reasons had not been given to justify the Board in dispensing with the consent of these authorities, and that he was unable to recommend that the Order should be granted. In the Hayward's Heath and District and Mid-Sussex Orders power was sought to supply water to the same area; and the Local and Road Authorities having consented to both applications, Major Marindin's inquiry resolved itself into one concerning the respective merits of the two undertakings. In his report he stated that, after hearing the arguments and evidence on both sides, he had come to the conclusion that the Mid-Sussex was the better scheme; and he accordingly recommended that this application should be granted. The Board of Trade, acting upon Major Marindin's recommendation, decided to refuse the Hayward's Heath and District application, and to grant the Mid-Sussex application, subject to certain modifications and amendments suggested in his report. In all Orders granting power to charge rates for the supply of water, the rateable value of the houses, as ascertained by the valuation list, was fixed as the basis on which the rates should be charged. In no case were the undertakers exempted from giving a constant supply. In the Mid-Kent Order it was provided that if, after three years, the Local Authority or 20 inhabitant householders of any parish should represent that the undertakers were not supplying the parish, and that other undertakers were prepared to do so, the Board of Trade might amend the limits of supply so as to exclude the whole or any part of such parish. In the Mid-Kent, Mid-Sussex, Wimborne Minster, and Wotton Estate Orders, the undertakers were authorized to supply water in bulk by agreement within and without the limits of supply subject to certain limitations. In the Wotton Estate Order, which was promoted by an individual proprietor, it was provided that no sale or assignment of the undertaking

should have effect until approved by the Board of Trade. In the Mid-Sussex Order a clause as to the purchase of the undertaking by the Local Authorities was inserted. Following the practice now adopted by Parliament, clauses were inserted in all Orders authorizing additional capital to secure the sale of such capital by auction or tender. Where necessary, the Water-Works Clauses Acts, 1847 and 1863, were incorporated, and the usual clauses as to regulations for preventing waste, misuse, or contamination of water, supply of water by measure, and the quantity of land to be taken by agreement, &c., were inserted. Two Bills to confirm these Orders were introduced into the House of Commons on April 23 and May 7 respectively. They passed through both Houses without opposition, and received the Royal Assent on the 24th of July.

There were three applications for Gas and Water Orders—viz., from the East Berks and West Oxford District, Sheringham, and Winchester. Two of these Orders were promoted by new Companies (East Berks and West Oxford District, and Sheringham), and sought power to construct gas-works and water-works, to make and supply gas, and to supply water. The third application was from the Winchester Water and Gas Company, who wished for power to purchase additional land, to raise further capital, to sell surplus lands, and to amend their Act of 1865. All three applications were granted. In the case of the East Berks and West Oxford District Order, many of the Local and Road Authorities were opposed to the application; and the Board of Trade, after consideration, decided to limit the operation of the Order to the parishes of Goring and Streatley, and to alter the title to the Goring and Streatley District Gas and Water Order. The Winchester Order was in the first instance opposed by the Corporation of Winchester; but upon the promoters agreeing to strike out certain of the provisions objected to, the Corporation withdrew their opposition, and the Board of Trade granted an Order authorizing the Company to raise additional capital. The sliding scale of price and dividend for the gas undertaking was inserted in the Goring and Streatley District and the Sheringham Orders; the initial price being fixed at 5s. per 1000 cubic feet in each case. The rates authorized by these Orders to be charged for water are to be based on the rateable value of the houses, as ascertained by the valuation list. In neither case were the undertakers exempted from giving a constant supply of water. The promoters of the Sheringham Order agreed to the insertion of a clause requiring them to supply and maintain a public tap at Sheringham, from which water for domestic purposes might be drawn free of charge. In the Goring and Streatley District Order and the Sheringham Order, the undertakers were authorized to supply water in bulk by agreement within and beyond the area of supply, subject to certain limitations. Where applicable, the Gas-Works Clauses Acts, 1847 and 1871, and the Water-Works Clauses Acts, 1847 and 1863, were incorporated; and the usual clauses as to limits of dividend, creation of an insurance and reserve fund, and excess of profits, regulations for preventing waste, misuse, or contamination of water, supply of water by measure, pressure and testing of gas, and quantity of land to be taken by agreement, &c., were inserted. A Bill to confirm these Orders was introduced into the House of Commons on the 7th of May. It passed through both Houses without opposition, and received the Royal Assent on the 24th of July.

Appended to the report as a tabular statement showing the number of Orders sanctioned by the Board of Trade from the passing of the Gas and Water Works Facilities Act, 1870, down to the present time. The total applications were 323; of these the Board granted 301, of which number 298 were confirmed by Parliament.

THE MASSACHUSETTS GAS COMPANIES AND THE MANUFACTURE OF WATER GAS.

A correspondent of the *American Gaslight Journal* gave, in the last issue of that publication to hand, an account of the proceedings before the Gas Commissioners of Massachusetts in connection with the petitions presented by certain Gas Companies of that State who are desirous of being authorized to manufacture water gas under the provisions of an Act passed last spring. The Companies concerned were the following:—Cottage City, Spencer and Miller's River, South Boston, Roxbury, Amesbury and Salisbury, and Brockton. The petition of the Spencer Company was first considered; their representative (Judge Hill) explaining that their desire to manufacture water gas was prompted mainly by the fact that it could be produced at less cost than coal gas. In this he was supported by the Company's Superintendent (Mr. E. Evans), who said it would cost \$24.75 to manufacture 50,000 cubic feet of coal gas in Spencer, whereas the cost of 100,000 cubic feet of water gas would be only \$27.124. The Spencer water gas he said contained 25 per cent. of carbonic oxide. He also stated that the men about the works were in good health, and that he had never heard of any accident occurring in the manufacture of water gas. Judge Hill's remarks also contained an interesting exposition of the success which had attended the reduced gas-rate; the rate at Spencer having been reduced to \$1 per 1000 cubic feet some months ago. In the summer of 1887 the Company placed 87 gas cookers, and last summer 105 others had been disposed of (Spencer contains probably 9000 inhabitants). The Company also rented out small heaters in the winter, which were returned during the summer season; and the number of heaters used in bed-rooms was between 25 and 30. The Company operated 9 miles of pipes, all of wrought iron. Only one break in the system had occurred, and that was the fracture of a T-piece, which permitted an escape of gas into a drain, whence it passed into the cellar of a house. The Amesbury and Salisbury Company's case was then taken up. The President (Mr. W. E. Biddle) testified that his Company employed the Granger process, and that, on a daily make ranging between 10,000 and 35,000 cubic feet, they charged \$2.50 to small and \$2 to large consumers. They did have one contract under which gas was sold to a manufacturing company at the rate of \$1.30 per 1000 feet. Mr. R. F. Briggs, a large gas consumer in the district, did not think that the gas sold by the Company was injurious to health, although he admitted that some trees along the line of gas-pipe had withered away. The President of the Commission (Mr. Commissioner Coffin) here read a communication, signed by 15 residents of Amesbury, setting forth that the manufacture of water gas was going on in that place without leave; that it was represented as detrimental to the public health; and that a number of trees had died along the line of the gas-pipes, owing, it was believed, to the passage near them of the poisonous gas. The petitioners asked the Commissioners to visit Amesbury for the purpose of making an investigation, and intimated that if the gas were shown to be injurious, they wished its manufacture to be stopped; if not, all cause for objection on their part ended. The Commissioners decided to hold an inquiry at Amesbury on Sept. 28, and then adjourned the general hearing to Oct. 9, when the petitions of the other Companies will be considered. The correspondent of our contemporary says the hearing was conducted in a thoroughly impartial manner, and reflected great credit on the good temper and apparent earnestness of the petitioners, while it also added new laurels to those already won by the Gas Commissioners. He adds: "Perhaps the wisdom of creating similar bodies in other States will soon become patent to those of the fraternity who, failing to lead, are very hard to convince that others could possibly open up a road over which all might travel in safety."

PETROLEUM FUEL.

[Extracts from a Paper by Mr. S. S. Leonard read at the recent National Electric Light Convention in New York.]

The use of petroleum is by no means of recent date; it was known to the ancient Greeks and Romans, being used by them for illuminating purposes, as they had no electric lights in that day. In fact, the word "petroleum" is of Latin derivation, meaning "rock oil." It has been, and is being, used for various purposes, from the sure cure of numerous diseases to the generating of steam for electric light stations. It is found in many parts of the globe, although there are but a few localities that are especially noted for its production. In America, New York, Pennsylvania, Ohio, and West Virginia produce the greater part of the supply. Although it was known to the early settlers of these States, very little importance was attached to its value.

To say that petroleum is a new fuel would hardly be correct; for petroleum has been used as such for a number of years. Experiments to determine its practicability as a fuel have been creating a great deal of attention from those interested in the matter for the last 20 years; and it is now occupying the minds of some of our ablest engineers and inventors. Quoting from a very able paper on this subject by Charles E. Ashcroft, which was published in the *Boston Journal of Commerce*, May 26, 1888, the author says that the calorific power of petroleum for the purpose of generating steam and the evaporation of water is several times greater than that of ordinary coal. The successful use of oil as a fuel has, however, been of very recent date, yet so rapidly has it grown in favour that to-day it is regarded as a strong competitor of coal for steam-generating purposes, or where heat and fire are wanted.

Its advantages over other fuels are many. In the first place, it is much easier handled; a steadier fire is easily maintained under your boilers, consequently the steam is kept at a more even pressure—a very important thing in the running of electric lights; there is no opening of furnace doors, allowing cold air to come in contact with the boilers and there are no impurities in the oil such as abound in coal. When you have done with it, by a turn of the wrist your fire is put out, and your ash-pits are as clean as they were before the fire was started. In less time than it takes to tell it, you can start the fire. It is only rivalled in handling by natural gas; and even then, unless we have all the modern appliances for the handling of this gas, it is far easier to manipulate.

Permit me to describe the arrangements for the handling and use of this oil put in under the supervision of the writer. The oil is received in tank cars, holding from 90 to 150 barrels each (42 gallons to a barrel). From these cars it is drawn off through a valve in the bottom of the car to a storage tank or tanks (there being two of them), holding about 300 barrels each. These are placed underground, so that the oil runs from the car into them by gravity. Care should be taken not to spill the oil or stir it up more than is necessary, as the odour from it is fully equal in strength to that of new-mown hay, if not quite so agreeable. To prevent the stirring up of the oil, the supply-pipes entering through the top of the tanks run nearly to the bottom, so that the tanks are practically filled from the bottom. In the top of each tank are man-holes and a vent-pipe. This latter is extended above the tanks a short distance. These tanks, which are boiler shaped, are placed end to end, with a space of about 8 feet between them. This gives room to get at the various pipes. They are joined together at the bottom by a pipe, which also connects with the supply-pipe running to the boiler-room. Then in the bottom of each is a drain-pipe, which will admit of cleaning them out whenever necessary. There is also a gauge-glass in the end of each, to show how much, if any, water is in them. There is also a gauge made by a copper float, which indicates the quantity of oil in each tank. In cold weather a steam coil is inserted in the tank car around the mouth of the valve to heat the oil so that it will flow readily; for when the thermometer is in the vicinity of 30° or 40° below, the oil is apt to be a little thick. Care should be taken not to heat the oil too much, for when hot it generates considerable gas, which is not only very odorous, but is really the cream of the fuel. I think it an advantage to have the storage tanks underground; there being less danger from them in case of fire, and during the winter the oil is less likely to chill. An open light should never be used near them, although the oil itself is really hard to ignite unless heated to a certain degree; still there is apt to be more or less gas around; which is explosive if brought in contact with fire. The supply-pipes to the furnaces are provided with a valve where they enter each tank, also one in the fire-room. This pipe, a 2½-inch one, is enlarged to a 6-inch, for about 4 feet, and in this 6-inch pipe a small steam-pipe is inserted. With this, the oil is heated from 130° to 140°. This lightens it so that it burns more readily, or, I should say, is turned into gas.

We now come to the burners, which are also fed by gravity, as the storage tanks, although underground, are still higher than the furnaces. One might suppose that, owing to the recent introduction of petroleum as a fuel, some difficulty might be experienced in obtaining a burner; but they are as numerous as electric light systems, and like them in another respect—each man's is the best. Our experience has been that the more simple the burner the better the result. One that thoroughly vaporizes the oil before burning it, is, we think, preferable to one that burns the oil. In the former there cannot possibly be any waste. In furnaces where we have been using this kind of burner, the bricks are as clean as they were the day they were put in. Steam and hot air are the other ingredients used in connection with the oil; and an abundant supply of the latter, we have found, adds very much to the efficiency of the fire.

Regarding the proper settings, circumstances will determine this to a certain extent. There is no doubt that a hotter fire can be obtained from oil than from coal or wood; and when the oil is properly used, the smoke nuisance question—which has been agitating the minds of the people of some of our large cities—is solved, for there is not a particle of smoke to be seen issuing from the stack, not even when everything is running full blast.

A word as to its danger. When properly put in and handled with ordinary care, or when good common sense is used in the employment of this oil, I do not see why it should be any more apt to cause trouble than coal, although the insurance companies insist on higher rates when used. I think it more from ignorance of the subject than from their being any more danger. At the same time, I am willing to admit that it could be put in and used in such a way as to greatly increase the danger of fire.

As to its economy over coal, I have already mentioned that there was a saving of from 20 to 25 per cent. on the cost of fuel, and from 40 to 50 per cent. in labour. From tests recently made by us, the following figures were obtained:—111.34-horse power, running six hours, used 250 gallons of oil, costing \$5.50, or at the rate of 70c. per 100-horse power per hour; 104.8-horse power, running six hours, used 346.1 lbs. of coal, costing \$5.45, or at the rate of 86c. per 100-horse power per hour. Another test gave the following figures:—96.45-horse power, running eight hours, used 401.47 lbs. of coal, costing \$6.32, or 80c. per 100-horse power per hour; 115.64-horse power, running seven hours, used 233 gallons of oil, costing \$5.05, or 62c. per 100-horse power per hour. On the above figures, oil is from 17 to 32 per cent. cheaper than coal. The highest evaporation made with oil was 14.8 lbs. of water per pound of oil with feed water at

103°, and with coal 5.38 lbs. of water per pound of coal, feed water at 103°. The coal used was a good grade of Illinois lump, costing \$3.15 per ton, but which is usually worth \$3.25.

In the matter of labour, one man can easily attend from seven to ten 150-horse power boilers, and then have less to do than if he were firing one boiler with coal. After a week's run with oil, boiler flues are much cleaner than they would be from the use of bituminous coal for one night. There being no ashes, you are saved the expense of handling them, as well as the dirt; and the former is no small matter where some 20 tons of coals are being used every 24 hours. I might say that the above tests were made during a part of the day's run; and it is our opinion that a more favourable showing could be made with the oil where a larger number of boilers are in use. It seems to work better with a good fire than where a small fire is sufficient.

BIRMINGHAM CORPORATION WATER SUPPLY.

At the Meeting of the Birmingham Town Council last Tuesday—the Mayor (Mr. Alderman Pollack) presiding—the report of the Water Committee on the subject of the proposed new works, to which reference was made in the *JOURNAL* last week, was presented.

Sir J. MARTINEAU moved that confirmation should be given to a resolution of the Committee agreeing that a loan for £50,000 for various works should be raised, repayable in 30 years, according to the condition imposed by the Local Government Board. He explained that the Local Government Board, having heard an application for their sanction to a loan of £100,000, had consented to the Council borrowing £50,000, on the condition that the period of repayment should not be extended beyond 30 years. As the works on which the money was to be expended were principally mains, the Committee did not consider that the limitation was an unreasonable one; and therefore they had no difficulty in consenting to the condition.

The motion was carried.

Sir J. MARTINEAU then formally moved the adoption of the report. He referred to the expenditure of £1945 7s. 2d. in connection with the main between Whitacre and Plant's Brook beyond what had been expected; and said this was due to a larger portion of the main having been duplicated than had been intended. When the main was duplicated throughout, there would be £1945 worth less work to be done. The arrangements which the Committee had made with regard to the stamping of water-fittings for manufacturers, and for making a small charge for water supplied to builders when putting up new houses, had been carried out without any friction. The former arrangement should contribute to preventing waste from defective fittings, and the latter would produce a not inconsiderable item of income to the department. With regard to the loan for further works on capital account, he would only remind the Council that the Committee reported fully in February last concerning works they proposed to carry out during the next five years. Under the Water Act of 1875, the Committee had power to borrow £150,000, and a further sum of £100,000 with the consent of the Local Government Board, but not without; while under their Act of 1879, they had power to borrow sums amounting to £300,000. In February last both the £150,000 and the £300,000 were exhausted; and so there remained only the £100,000, for which they had to ask the consent of the Local Government Board. They believed they would have obtained permission for the whole sum at once; but this was not the view of the Local Government Board. The latter thought they were to sanction every item from time to time; but as this would have been a very troublesome procedure, communications were made, with the result that the Board consented to give a general sanction for half the amount. The Committee stated in February that they did not intend to incur any of the proposed expenditure during the present year, except for the laying of mains in the extension of their system. They had carried out this policy, and were still adhering to it in the works now proposed to be entered upon for the extension of the water-mains to Acock's Green and Solihull—an extension which he believed would prove a remunerative one. As to the provision of fresh sources of supply, the Committee had the matter under consideration, but were not yet prepared to report.

Mr. SHAMMON seconded the motion, which, after a short discussion, was adopted.

PLYMOUTH CORPORATION WATER SUPPLY.

DIFFICULTIES WITH THE PROPOSED RESERVOIR.

A Special Meeting of the Plymouth Town Council was held last Wednesday—the Mayor (Mr. Alderman H. J. Waring) in the chair—to consider a report from the Water Committee, submitting a joint report from Mr. T. Hawksley and Professor Etheridge on the result of their examination of the site of the proposed storage reservoir at the Head Weir and land adjacent thereto, and to take such action thereon as the Council might deem necessary or expedient.

In the course of their report the above-named gentlemen say: "We find that the geological conditions of the ground on the line near the Head Weir, authorized by Parliament, are such as to almost, if not quite, preclude the idea of making a safe and sound water-tight embankment in that position. The valley, both in its bottom and sides, is filled to a great depth with a superstratum of granite debris of the character of a coarse sand, pervious to water, and possessing no retentive characters; whilst the substratum of rock upon which the debris reposes has not been reached in several instances, although the borings have been carried down to a depth of 80 and even 90 feet below the surface. The making of an embankment in this situation, and under these circumstances, would, in our opinion, be not only a precarious operation, but would also involve so many difficulties and such large expenses that we feel compelled to advise you not to make the attempt, but rather to seek such amended parliamentary powers as may appear to you advisable. We have caused trials to be made in several parts of the valley to the south of the parliamentary line, with only such partial success as will not justify us in making any recommendation for your consideration, except as follows:—Guided to some extent by the surface indications, we have had nearly 20 pits and borings put down in a line running almost due west from the Longstone Farmhouse; and from these investigations we are led to infer that an embankment may be constructed in this position with fewer difficulties, and at a smaller cost, than at any other available part of the valley situate between the Head Weir and Sheepstor Bridge. Difficulties of a formidable character still, however, remain, as named above, and can only be overcome by the exercise of more than ordinary care, energy, and skill. On the question of cost we are not at present able to offer a very definite opinion, because of the uncertainties to which we have referred; but we incline to the opinion that the undertaking may be well executed for less than £120,000, including the expense of works of construction and outlays to be incurred for the purchase of lands and buildings, and for other charges and compensation. In our opinion the line lastly described is the best the valley of the Meavy affords within the area to which our attention has been called."

Mr. MOON said that the Water Committee had unanimously adopted the

joint report which had been presented, and had decided to ask the Council for instructions. He detailed at length the onerous labours in which the Committee had been engaged since March last, and explained the position in which they were placed. Referring to the difficulties connected with the site of the proposed reservoir, he said that, at the meeting of the Committee on the 4th ult., Professor Etheridge stated that in no part of Great Britain were they so great as in their case—they were, in fact, almost insurmountable. He added that the care which had been exercised by all concerned was beyond all praise; and the money had been spent in the most economical manner. At the same meeting Mr. Hawksley expressed his entire concurrence in Professor Etheridge's observations, and confirmed every statement he had made. On Sept. 28, Messrs. Hawksley and Etheridge presented the report now before the Council. Since the report had been printed, he had received several letters from Mr. Hawksley, in the course of which he explained that his estimate included a sum for 40 acres of additional land necessary to be purchased if the Head Weir reservoir was to be made. He also wrote as follows:—I understand it to be the wish of the Council and of the town, too, that the reservoir should be made so as to collect and deliver its water into the leat in the vicinity of Head Weir, or above Sheepstor Bridge. If some new situation is to be sought for and adopted, then, at least, 100 acres will be wanted; and in that event what is to be done with Sir Massey Lopes and his present agreement? I do not see how delay will help the matter. The dilemma to which I have pointed will be exactly the same in another session as in the coming session, unless, indeed, it is made worse by Sir Massey in the meantime insisting on the payment of the great sum of £15,750. As to this, however, I do not presume to offer any opinion; but one point I should like to be clearly understood by the Council, and that is that your explorations have been most valuable in two ways. First, they have settled the question of the impracticability of the line insisted upon last year; and, secondly, they have demonstrated amongst all the lines the comparative economy of the line upon which Professor Etheridge and I have just reported." In closing his speech, Mr. Moon remarked that the opinion of a high geological expert was that the site they had selected was a unique one. However, a town's meeting on July 6, 1883, emphatically declared for the Head Weir site; and another meeting on Nov. 26, 1886, unanimously approved of parliamentary powers being applied for to obtain the site. The Committee had been loyal to the inhabitants in the perseverance with which they had prosecuted their labours up to the present point. The result was before them; and if the Council and the inhabitants desired to incur the cost, by all means let it be incurred. If, on the other hand, it was desired to put forward the desirability of the Harter or of any other streams in the neighbourhood, then let the explorations be made; but they must bear in mind that they would lose one year of benefit and of future financial profit. He moved the adoption of the Committee's report, which embodied the report of the two experts.

Mr. WOOLLAND seconded the motion, and it was agreed to. Alderman HARRIS stated that at present the water revenue was estimated to produce £11,200 in round figures. The charges on this were, in the first place, about £3000 for maintenance and £800 for salaries. Then there was a debt of at least £40,000 at the present time, which at 4 per cent. was £1600. The reservoir put before them that day was estimated to cost £120,000. But estimates were exceeded; and looking at experience in all directions relative to water-works, it was doubtful whether it would be carried out for the money. Supposing it was; this would mean a charge of £4800 a year; and putting all the sources of expenditure together, they got a total of £10,200 on an income of £11,200—thus leaving a surplus revenue of but £1000 a year. The matter was so important that he did not think they should proceed further with it in the coming session of Parliament. He moved that they should not go on with the matter in the next session of Parliament, which would allow time for consideration, and perhaps the selection of another site.

Alderman FILLMAN seconded the motion, and expressed himself greatly disappointed that, after the statements again and again made in the Council Chamber that the reservoir was to cost £25,000, it was suggested that £120,000 should be spent upon it.

Mr. WOOLLAND remarked that the mover of the resolution had forgotten to tell them that there would be a very considerable increase in income when they had the new reservoir. If the Surveyor had been asked to test the valleys, he believed that the Harter site would have proved a most efficient and economical one. He proposed, as an amendment, that the Surveyor should receive instructions from the landowners to test any part of the moor which he considered necessary.

Mr. MORRIS seconded the amendment, because he thought it was the common-sense view of the situation.

Mr. LATIMER said it was his impression now, as it was last year, that they rushed into the application to Parliament for the Act much sooner than they should have done, and that they ought to have tested the Harter site before they agreed to pay so large a sum of money for the site they had chosen.

Mr. BELLAMY asked why, instead of wasting a considerable sum of money on a "roving commission," Mr. Woolland's resolution should not be modified, and instructions given that, under the direction of Mr. Hawksley, the Harter site should be examined, in order that it might be seen whether it was a fit and proper place for a reservoir. They certainly should commence with the Harter site before going farther. He proposed that the resolution should read that the Surveyor should make the necessary borings at Harter.

After some discussion, the resolution before the Council was submitted in the following form, and carried unanimously:—"That the Water Committee be instructed to test any part of the valleys that they may think desirable for the reservoir before going to Parliament."

Referring to the reservoir question last Thursday, the *Western Morning News* said:—"The position in which the town is placed is singularly unfortunate. It has acquired from Sir Massey Lopes, at a cost of about £16,000, land intended for a reservoir. It has obtained a Bill in Parliament enabling that land to be paid for and a reservoir constructed. Neither of these things has been done. Sir Massey, however, holds an undertaking from the town to pay him the sum agreed upon; and unfortunately there has been omitted from that agreement a clause, which existed in a prior agreement, to the effect that if the borings proved unsatisfactory the town might be released from its bargain on paying a fine of £1000. This reasonable and necessary stipulation, it appears, ceased to have force when the Bill received the Royal Assent. It will be interesting to learn who is responsible for this omission. But as facts now stand the town is completely at the mercy of Sir Massey Lopes. It has agreed to buy of him for £16,000 land which it cannot utilize without buying 40 acres more at an unknown price; and if the present site be altogether abandoned, and another be purchased, still there will be further land required. There is, however, this clue to the cost of the land at Harter—that Sir Massey Lopes definitely promised to sell it to the town for £5000. No one can imagine that he would go back from that, especially if he has received also a very large sum for the Head Weir site, which has proved useless. Being in this dilemma, the Town Council wisely decided yesterday

to 'hark back.' By reason of a perfectly unique geological formation, so Professor Etheridge and Mr. Hawksley say, modest local talent notwithstanding—an embankment can be constructed at the Head Weir only at a prodigious outlay of perfectly uncertain amount, although, as a guess, £120,000 is named. Mr. Hawksley has from the first under-estimated the value of money in the West. It is true that an adequate supply of pure water is so priceless a boon that if the 100,000 inhabitants of Plymouth and its neighbourhood were compelled to pay £1 or £2 a head in order to obtain it, they would be wise to do so. But if they are not so compelled—if they can get such a supply, as we have hitherto been told, for £60,000—Plymouthians do not want to pay double or treble this sum simply to be able to boast of large figures, or to give large percentages to engineers. There are plenty of better ways in which, for town improvements, money so saved can be spent; and the water revenue has proved too valuable a possession in times past to admit of its being lightly absorbed by water-works expenditure. So the Water Committee are now instructed to search anew for a site for a reservoir of sufficient but not exaggerated size, which can be made at a reasonable cost; and, until the facts have been fully elicited, application for parliamentary powers is deferred. Obviously, this is the best that can be done under the circumstances."

THE METROPOLITAN BOARD OF WORKS AND THE SEWAGE PURIFICATION OF THE THAMES.

THE CHEMICAL EXPERIMENTS.

In the JOURNAL a short time since, various references were made, in our articles on "Water and Sanitary Affairs," to the reports presented to the Metropolitan Board of Works by Sir H. Roscoe on the treatment of the sewage of the Metropolis. It may not be uninteresting, in connection therewith, to trace the steps which led up to the appointment of the above-named distinguished Chemist, from the information contained in the last annual report of the Board.

The report states that the disposal or treatment of the sewage of the Metropolis in such a manner as effectually to prevent its polluting the River Thames, has probably been the most important of the many subjects which have occupied the Board's attention during the past few years. In 1882, in consequence of complaints made to the Secretary of State for the Home Department by the City Corporation, in its capacity of Sanitary Authority of the Port of London, and by the inhabitants and local authorities of Erith, a Royal Commission was appointed to inquire into, and report upon the system under which the London sewage was discharged into the Thames; also to ascertain whether or not any evil effects resulted from it, and in that case what measures could be applied for remedying or preventing the same. The Royal Commissioners made two reports—one in January and the other in November, 1884. In their first report they came to the conclusion that at certain seasons evil effects did result from the discharge into the river of sewage in its crude state; such evil effects showing themselves in a foul state of the water, and in an accumulation of mud, causing offensive smells and other inconvenience. In their second report they expressed the opinion that it was neither necessary nor justifiable to discharge the sewage in its crude state into any part of the Thames; that some process of deposition or precipitation should be used to separate the solid from the liquid portions of the sewage, and that such process might be conveniently and speedily applied at the two present main outfalls; that the liquid portion of the sewage remaining after precipitation of the solids might, as a preliminary and temporary measure, be suffered to escape into the river, but that it would not be sufficiently free from noxious matters to allow of its being so discharged permanently; and that the separated liquid would require further purification, which in the Commissioners' opinion, according to the then state of knowledge, could only be done effectually by the application of the liquid to land. If suitable land in sufficient quantity and at reasonable cost could not be procured near the present outfalls, the Commissioners recommended that the sewer liquid, after separation from the solids, should be carried down to a lower point of the river, at least as low as Hole Haven, and there be discharged.

The Board gave the most careful attention to the Commissioners' reports and to the evidence upon which their conclusions were arrived at. Notwithstanding, however, the great weight to be attached to the opinions and recommendations of the Commissioners, the Board felt that it could not divest itself of the statutory responsibility which devolved upon it of devising a scheme of dealing with the sewage which should be at the same time thoroughly effective, and yet not necessarily burdensome to the ratepayers upon whom the expense would fall. Some of the Commissioners' conclusions received the ready assent of the Board. For instance, the inquiry had made it tolerably clear that, at certain seasons when heat and drought prevailed, the discharge into the river of sewage in its crude state was to some extent productive of nuisance. The discharge of crude sewage could not be said to be absolutely necessary; and, this being so, the Board were of opinion that it would not be justifiable to allow it to continue. Accordingly, the Board determined to apply, as soon as practicable, some process of deposition or precipitation to separate the solid from the liquid portion of the sewage, and to allow only the fluid which remained after precipitation to pass into the river. Careful experiments made, first with small and afterwards with larger quantities of sewage, showed clearly that chemical precipitation of the matter held in suspension could be satisfactorily effected by adding to the sewage certain proportions of lime and protosulphate of iron, and then allowing it to remain for an hour or two in settling-tanks. The Board submitted the results of the process to four independent Chemists of the highest standing—viz., Sir Frederick Abel, Dr. Odling, Dr. A. W. Williamson, and Dr. A. Dupré—one of whom (Dr. Williamson) was a member of the Royal Commission above referred to. These gentlemen advised that the method of precipitation adopted was a good one, and that it produced a fairly clear liquid, but that it left a sufficiently unpleasant smell to prohibit the effluent water being discharged into the river during warm weather at all states of the tide. It appeared, in fact, that the clarification of the sewage would not be sufficient to ensure complete immunity from smell arising from secondary fermentation and a fresh development of offensive gases in hot weather. Such immunity, however, it was deemed necessary to attain.

The Royal Commissioners seem to have been of opinion that the only effectual way of attaining it was, after precipitation of the solid matter, to further purify the liquid by a process of filtration through earth; and they advised that such a process of filtration should be adopted if it was decided to discharge the sewage effluent into the Thames in the vicinity of the present outfalls. The acquisition of sufficient land, however, in the neighbourhood of Barking and Crossness to enable the vast quantity of London sewage to be effectually filtered through the soil was found to be attended with such great difficulty, to say nothing of cost, that the Board conceived it to be its duty to endeavour, under competent advice, to find some other method sufficiently effective to obviate the necessity of earth filtration. What was required seemed to be an oxidizing agent which would not only effect the immediate destruction of any offensive odour still remaining after chemical precipitation, but would at the same

time prevent the development of noxious gases. It was found that permanganic acid was effectual in accomplishing both these objects.

The Board were extremely anxious that there should be no mistake in the conclusion arrived at upon this important point, as upon it would mainly depend the determination of the course to be taken. The Board accordingly again sought the opinion of the four eminent Chemists who had already advised upon the method of precipitation. They all, after careful observation of the experiments made, gave it as their opinion that, if the liquid resulting from precipitation with lime and protosulphate of iron were subsequently treated with manganate of soda and sulphuric acid, it would be deodorized and purified to such an extent as to render its discharge into the river unobjectionable at all states of the tide. With this authoritative opinion before it, the Board felt that the filtration difficulty might be regarded as overcome, and that it might safely be concluded that the adoption of the process of precipitation, with the further resort to permanganic acid in hot weather, as proposed, would effectually render the discharge of the sewage into the river innoxious and inoffensive all through the year.

This conclusion arrived at, the Board proceeded at once to act upon it, and ordered plans to be got ready for the works necessary to enable the process to be brought into operation. The plans for the works at Barking, the site of the outfall on the north side of the Thames, were first prepared; and in January, 1887, a tender was accepted for the execution of the works for the sum of £406,000. The undertaking comprises the construction of sludge settling and precipitation channels, sewer outlets, iron-water and liming station, engine and boiler houses, two chimney-shafts, a superintendent's house, twelve cottages for workmen, and a pier and jetty. [Some particulars in regard to these works will be found below.]

Whilst the permanent works at Barking have been in progress, experimental operations have been going on at Crossness. The total quantity of sewage treated during the past year has been a little more than 2000 million gallons. The wet sludge obtained therefrom amounted to 62,000 tons, which, on further settlement in the subsiding-tanks, was reduced to 41,000 tons. Of this quantity 39,556 tons were pressed into 14,401 tons of sewage sludge cake; the remaining 1444 tons being treated for experiments in various ways. About 10,985 tons of the cake were delivered last year into trucks at the Abbey Wood Station of the South-Eastern Railway, or into vessels alongside the Board's wharf at Crossness, free of charge, to farmers and others who applied for it for experimental use in agriculture.

As regards the permanent method of disposing of the sludge, it may be mentioned that the Royal Commissioners suggested that it could be applied to the raising of low-lying lands, or burned, or dug into land, or carried away to sea. The Board, having considered with care these various suggestions, came to the conclusion that the only practicable course, in the case of the Metropolis, was to carry the material away and cast it into the sea, unless it should fortunately turn out that the sludge could be applied with advantage for agricultural purposes. Every facility has been, and will continue to be afforded to persons willing to try the use of the sludge for agricultural purposes. As, however, the Board felt that, even in the most favourable circumstances, considerable time must elapse before the merits of the sewage sludge as a manure could be so widely recognized that farmers would be found ready to take the whole of the supply off the Board's hands, and as it was necessary to provide for its removal at once, the Board gave directions for a vessel to be specially constructed for the purpose of carrying the sludge out to sea, and there discharging it.

The vessel was built at a cost, including fittings, of £16,952 10s. It was launched on the 25th of May last year, and arrived in the Thames, off Erith, on the 29th of June following. The vessel will carry the sludge at such a level that it will have a sufficient head of discharge when the vessel is loaded; the head being maintained by the rising of the lightened vessel as the sludge flows out.

During the long-continued hot and dry weather of the past summer, it was found necessary (as in the previous year) to deodorize the sewage of the two main outfalls, before allowing it to pass into the river. The Board, thinking it desirable to obtain the opinion of some leading Chemist who had not previously been consulted on the subject, had recourse to Sir Henry Roscoe; and, under his advice, chloride of lime and subsequently manganate of soda with sulphuric acid were used at the outfalls. During the first two months—viz., from the 2nd of July to the 27th of August—chloride of lime was employed; 980 tons being used at Crossness and 1231 tons at Barking. From the 27th of August to the 5th of October, when the deodorizing operations ceased, manganate of soda in conjunction with sulphuric acid (making permanganate of soda) was the agent employed; 870 tons of manganate of soda and 388 tons of sulphuric acid having been used at Crossness, and 1208 tons of manganate of soda and 368 tons of sulphuric acid at Barking. In addition to the foregoing, there were also used for the purpose of experiments in the outfall sewer at Deptford, on the 4th and 5th of August, 109 tons of sulphuric acid and 95½ tons of manganate of soda. The total quantity of chemicals used during the 95 days the deodorizing operations were in progress was 2211 tons of chloride of lime, 2173 tons of manganate of soda, and 885 tons of sulphuric acid; and the total cost of the same was £42,467 12s. 1d.

THE NEW PRECIPITATION WORKS AT BARKING.

At the present time the whole of the sewage of the Metropolis north of the Thames is conveyed to Barking Creek by three culverts, each 9 feet high by 9 feet wide; and is, in the first instance, delivered into a covered reservoir divided into 4 compartments, and altogether extending over an area of 9 acres. The sewage is stored in this reservoir during eight hours of each tide, and discharged into the river at high water at the top of the ebb. This reservoir is situate on the east side of the sewer, and immediately adjacent to the river bank.

The new works consist of covered precipitation-tanks adjacent to this reservoir on its north side, and occupying the ground between the Outfall Sewer and Barking Creek, an area of between 10 and 11 acres. There will be 13 of such tanks, each 31 feet 6 inches wide and averaging about 1000 feet long. Communications will be made between the Outfall Sewer and each of these tanks, each fitted with two penstocks, so that communication may be opened or shut off at pleasure. The sewage will be admitted into each of the tanks in succession, and after being allowed to remain quiescent for a sufficient time to admit of the deposit of the solids in the sewage, the precipitation of which will be expedited by the admixture of 3·7 grains of lime and 1 grain of proto-sulphate of iron per gallon, the effluent will be run off over a weir which will fall as the water in the tank lowers, so that the top film of the effluent only will be taken off, and the tank emptied gradually so as to prevent any disturbance of the solids by the operation.

The effluent after flowing over the weirs (of which there will be ten in each tank), will pass into culverts carried transversely under the tanks and extended, some into the compartment of the existing reservoir, and some into a chamber under the Outfall Sewer through which, at present, the sewage is discharged into the river from the existing reservoirs.

When the level of the tide will admit, the effluent will be discharged through this chamber direct into the river; but when the water in the river is too high to admit of this the effluent will be conveyed by the other culverts into the several compartments of the present reservoir, and stored there until the level of the water in the river will admit of its discharge.

When each compartment is emptied of the effluent, the sludge, which will be in a semi-liquid state, will be discharged through culverts passing under the Outfall Sewers into a collecting culvert, from which it will be conveyed by pipes into a receiving well or sump, and pumped into a series of 12 tanks placed side by side and situate between the Outfall Sewer and the river. These tanks will each be 20 feet wide and 140 feet long, will cover an area of over an acre and a half, and, like the precipitation-tanks, will be covered so as to prevent nuisance.

The sludge will be allowed to remain quiescent in them so as to allow of a further precipitation, and the effluent water will be discharged over weirs into a culvert which will convey it into a store under the tanks, from whence it will be lifted and discharged through pipes to the liming station, there to be mixed with lime which is used for precipitation. The settled sludge remaining after this further precipitation will be discharged through culverts into a sludge store situate under the tanks, and will be lifted thence and conveyed by pipes along a jetty, and to a landing stage to be erected in the river, and there discharged into ships which will convey the sludge to sea. In the event of the ships being detained by stress of weather there is a further store for sludge at a lower level extending under the whole of the area occupied by the upper stores.

On the north side of these sludge tanks will be erected engine and boiler houses and workshops in connection, to contain engines and machinery for lifting the sludge into the tanks, and the settled sludge into the ships, as well as for pumping the sludge effluent to the liming station. The lime for assisting the precipitation of the solids of the sewage is introduced into the Outfall Sewers at a point about 700 yards and the protosulphate of iron about 530 yards above the precipitation channels.

The liming station will comprise a lime store, floors for slaking the lime, and six tanks for mixing the slaked lime with the effluent water from the sludge settling-tanks or with sewage taken direct from the Outfall Sewers; an elevated lime-water tank or reservoir built above the lime store, and into which the lime-water will be lifted by pumps, for which machinery and the requisite engine and boiler houses will be erected adjacent to the lime stores. From this elevated tank the lime water will be conveyed to and injected into the sewage passing along the Outfall Sewers, through cast-iron injectors placed in the sewers.

There will be means of turning the lime-water into any one of the three lines of sewers and of regulating the supply by means of sluice-valves fitted to the pipes leading to the injectors. The injectors consist of cast-iron chambers 4 feet 6 inches in length, 6 inches wide, and 6 feet in height, fitted with a number of nozzles, through which the lime-water will be injected and mixed with the volume of the sewage as it flows past.

The iron-water station comprises timber shed for storing the protosulphate of iron, a mixing-shed in which the iron will be crushed and mixed with water, an engine-shed to contain engines and machinery for crushing the iron and mixing it with water, as well as for raising water for boilers and into mixing tanks. The iron-water will be conveyed by stoneware pipes, carried underground and along the top of the Outfall Sewer into a service-tank, from which it will be carried by pipes into each of the three Outfall Sewers, and injected into the sewage through perforations in a pipe fixed vertically in each of the sewers. As with the lime water, there will be appliances for regulating the supply of iron water to each of the sewers, to meet the varying requirements of the discharge.

There will be a large settling-pond, covering an area of 1½ acres, situate near the river, divided into six compartments, each 60 feet by 60 feet, and about 7 feet deep, into which water will be received from the river and allowed to settle; the clear water being afterwards filtered and used for the supply of the several boilers, for slaking the lime, and for mixing with the proto-sulphate of iron.

The jetty, which will extend 576 feet into the river from the present river bank, will be 15 feet wide, and will be a timber structure supported upon piles. At the river end of the jetty will be a timber landing stage 300 feet in length and 20 feet wide.

The iron pipes for conveying the sludge to the ships will be carried under the platform, and will be furnished at the end with a delivery pipe, socketed to admit of a vertical movement, so as to discharge the sludge into the ship at varying levels of the tide. A tramway will be laid along the full length of the jetty connecting it with the whole of the works.

The contract for the works includes the erection of 12 cottages and a residence for the superintendent, and the diversion of the Old Galleons sluice and ditch, which is one of the main sewers under the jurisdiction of the Essex Commissioners of Sewers.

There will be a large quantity of surplus earth from the excavations which will be used in forming the banks for the tramways, and in raising the general level of the ground, which is now 6 or 7 feet below the level of Trinity high water.

The works extend over an area of about 50 acres, the quantity of sewage to be dealt with will amount to about 90,000,000 gallons per day, and the quantity of lime to be used in precipitation to 23 tons per day.

Two contracts have been entered into for the execution of the works—one (as stated above) with Messrs. Mowlem and Co., for the general work, for £406,000; and the other with the Glenfield Company, of Kilmarnock, for engines and machinery, for £42,567.

REDUCTIONS IN PRICE.—The Directors of the *Newcastle and Gateshead Gas Company* have agreed to reduce the price of gas in Benton and Forest Hall from 3s. to 2s. 9d. per 1000 cubic feet, less the usual discount for prompt payment. The reduction will take effect on the 1st of January next. —At *Colnbrook*, where the gas-works have just passed out of the hands of the Colnbrook Gas Company (who had been in possession since June last) into those of a local firm of coal and corn merchants, the price of gas has been reduced by 6d. per 1000 cubic feet.

DARLINGTON CORPORATION GAS AND WATER SUPPLY.—At the meeting of the Darlington Town Council last Thursday, Mr. Manson moved the adoption of the half-yearly report of the Gas Committee. The profit, after paying interest, for the six months ending June 30 last was £2276. Taking off liquidation, £1582, there was left a profit of £694. There had been an extraordinary expenditure for plant, &c., of £277, and 4d. per 1000 feet had in two years been taken off the price of gas, which was equal to £1000 for the half year. The report was adopted, as was the Water Committee's report and accounts, which showed a revenue of £5038—an increase of £128. There was a profit of £177, after paying liquidation. The Gas Committee have just accepted the tenders for next year's coal—6000 tons of Binchester screened coal, at 8s. 3d. per ton; and 4000 tons of Kelloe treble nuts, at 8s. These figures show the prices now asked for coal delivered to gas-works only about a dozen miles from the edge of the Durham coal-field.

NOTES FROM SCOTLAND.
(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday.*

Mr. Smith Clark, of Edinburgh, has been again illustrating the marvelous fertility of his mind, and at the same time how far wrong it is possible for a really able man to go when his reasoning is not founded on a correct basis. On Wednesday night last he addressed his constituents—a preliminary to the ensuing Municipal elections; and, in the course of his speech, referred to the Edinburgh gas transfer in terms so extraordinary, that I am afraid I must reproduce them somewhat fully in order that I may be able to treat of the fallacies which underlie his remarks. "He observed," he said, "that one of majority of the Council, in speaking to his Ward Committee about a week ago, said, 'he thought the gas purchase would turn out a very good thing for the city after all.' Why was it, seeing the published statements for the last year showed a net profit of £9000, that he left this as a matter of opinion? He thought he could tell them. It was because that gentleman knew that the Leith Company's accounts before they were submitted to Mr. Lass had all been remodelled. The fact was that owing to—should he call it the folly of their representative, in this transaction?—the two Companies were left to spend or not to spend as they chose upon the all-important matters of repairs and depreciation. They, of course, chose to spend as little as they possibly could. What the Edinburgh Company spent they had no precise means of knowing; but they knew that the Leith Company during the last year expended £4000 only under these heads. He inferred that the Edinburgh Company probably spent less; but he would assume that it spent as much. If the two Companies had charged revenue for repairs, depreciation, &c., at the same rate as the Glasgow Gas Corporation did per 1000 cubic feet of gas sold, they would have debited it with a sum of £50,000 instead of £8000. In this way the £63,000 of apparent profit would have been reduced to £21,000, for which they were paying £54,000 per annum—a deficit against the city of £33,000. This deficit, fortunately for them and him, would probably be reduced in the current year in consequence of the somewhat cheaper price of material; but he told them that if this question of repairs and depreciation were based on the same fair and equitable footing that it was based in Glasgow, they would escape from the consequences of their bargain with remarkable cheapness if they got off with an addition of about 2d. per £1 on the taxation. Unless circumstances arose which at present they had no reason to anticipate, the gas purchase would form a financial blight upon the progress of the city, he feared for the next quarter of a century."

Mr. Smith Clark is wrong on the following points:—(1) He did not explain when speaking of the remodeling of the Leith Company's accounts, that this was done to bring them into the style prescribed by the Gas-Works Clauses Act, 1871. The Company did not work under that statute, having an Act of Parliament of their own, passed in 1840; and their accounts were kept in accordance with it. But when it came to a question of transferring the undertaking to the Corporation, they re-cast the accounts, in order to facilitate a comparison with accounts kept under the modern statute. The Company at the same time produced their own accounts; so that no prejudice could have been done to the purchasers. As a matter of fact, the surpluses are very much larger under the remodelled accounts than under the old form. (2) The Companies were not left to spend or not as they chose upon repairs. The Edinburgh Company were bound by their provisional agreement to keep their works "in good working order;" and the Leith Company, not having been settled with, would find it to be to their interest not to let the condition of their works down until a bargain was made. The Leith Company's expenditure of £4000 is only £200 below the expenditure of the previous year, when the question with them was not that of transfer but of fighting the Edinburgh Company, and when, consequently, there was no likelihood of their neglecting the maintenance of their works. (3) No comparison can be made between Edinburgh and Glasgow. On account of the state of the Glasgow works at the date of the transfer to the Corporation in 1869, a very large expenditure upon repairs has been necessary ever since. The capital of the Glasgow undertaking is more than three times that of both the Edinburgh and Leith undertakings; and its business is about double. Therefore, on the basis of capital, had the two places compared been on the same level as regards the condition of the works, the expenditure in Glasgow should be three times that of Edinburgh, and, on the basis of the amount of business done, twice that of Edinburgh. In Glasgow the expenditure was £39,000; in Edinburgh and Leith Mr. Smith Clark places it at £8000. Taking these figures, the outlay in Edinburgh and Leith should, on the basis of capital, have been one-third, or £13,000; and on the basis of business done, one-half, or £18,500. Of course, I dispute the comparison; but apart from that, there is sufficient to demolish Mr. Smith Clark's position in the fact that he contended for an expenditure of £50,000 for repairs and maintenance in Edinburgh and Leith, which would have been £11,000 higher than the amount spent in Glasgow. I need not pursue the subject further. Mr. Smith Clark is an alarmist whom it would be futile to try and convert. It is fortunate for the community that his malady is of so pronounced a type, because his statements are usually more forcible than wise, and so defeat their object. His attempt to scare the public over a prospective gas-rate of 2d. per £1 is, on the face of it, absurd in the extreme. No movement in that direction will be made, should it ever be necessary, until the Gas Commissioners have exhausted the more natural method of increasing their revenue—raising the price of gas.

The Perth Town Council, at their meeting last Monday, had before them a recommendation by a Committee to sell 1½ acres of land on the South Inch to the Gas Commissioners, to be used in connection with the extension of the gas-works. The price recommended by the Committee was £2000. Mr. Smart moved, as an amendment, that £1750 be agreed to. Mr. Shaw pointed out that the Water Commissioners recently purchased five acres of land on Moncreiffe Island for £800; and he thought £2000 was exorbitant. It was explained that the Gas Commissioners intended to let a portion of the ground, from which they would derive rental sufficient to pay interest on £2000. This sum was afterwards agreed to.

Public men in Perth must be more difficult to manage than they are elsewhere, or they must possess, in an unusual degree, the faculty of not knowing their own minds. They acquitted in a distressingly unbusiness-like way with the proposal to extend the gas-works; and they are treating the extension of the water supply in the same manner. Rejecting the proposal, some time ago, to appoint a high-class engineer, they placed the work in the hands of Mr. Peattie, a local engineer. Mr. Peattie's plans, which were submitted to a meeting of the Water Commissioners on Monday, showed an intake in a gravel bed on an island in the Tay 150 feet above Perth Bridge; and from there an alternative route below the bed of the river to the pumping station in the town. The cost of the two routes was estimated at £4488 10s. and £5878 2s. respectively. With an 18-inch pipe, he considered that a supply of 2,900,000 gallons per day would be obtained; and with a 21-inch pipe, a supply of 4,372,000 gallons per day. He recommended a 21-inch pipe, and that the well at the pumping station should be deepened; the head of 9 feet being, in his opinion,

insufficient. The Commissioners could not agree with Mr. Peattie's proposals, and appointed Mr. Leslie, C.E., of Edinburgh, to report upon them. This is not business. It is ridiculous to expect that Mr. Leslie, a great consulting engineer, will come into the affair and adopt Mr. Peattie's suggestions. A better way would have been to have had a scheme prepared by Mr. Leslie, and then to have employed Mr. Peattie to carry it out. It is altogether a reversal of the proprieties to ask a local engineer to do the important work of preparing a scheme, and then to consult a first-class member of the profession to advise as to the details.

At the recent meeting of the Galashiels Corporation, the Clerk submitted a report on the proposed conversion of debt on the town's water-works. A scheme has been devised whereby a large sum will be saved to the town. The Corporation borrowed £50,000 for the water-works from the Public Works Loan Commissioners, of which there is £45,000 still to pay. The rates of loan were:—On £10,000, 4½ per cent.; and on £40,000, 4 per cent. Having power under a Local Act to pay off the money, the Corporation have contracted for a new loan with the Life Association of Scotland, at the rate of 3½ per cent. The permission of the Council was given to effect this transaction.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday.*

I have just been informed that the Purchasing Committee of the Glasgow Gas Trust have this week closed contracts for upwards of 100,000 tons of cannel and other gas coal on very favorable terms. With the purchases made in the spring or early part of the summer, they have now received something like 250,000 tons of coal for the current financial year. In no case, I believe, have the orders to any individual firms exceeded 15,000 tons. The varieties and quantities of coal purchased have been so arranged as to provide the consumers with gas having an illuminating power of from 23 to 24 standard candles. Incidentally, I may here mention that very favorable purchases of coal have also been made by the Paisley Corporation Gas Committee—the average price being, I am told, about 9d. per ton under that of last year. With cheap coal purchases, an increased price for the secondary products, and a very material increase in the consumption of gas, it is confidently anticipated that the present will be a highly successful year for the Paisley Corporation gas undertaking.

Very decided headway is being made by the Dalmuir, Kilpatrick, and Bowling Gas Company throughout the district which is embraced in their area of supply. One part of the Burgh of Clydebank—namely, Clydebank proper—is supplied with gas by the Glasgow Corporation Gas Commissioners, and at the Glasgow price. This circumstance places the Dalmuir Company at a disadvantage, inasmuch as some of their consumers naturally feel annoyed at having to pay a much higher price than that charged for the Glasgow gas. Those of them, however, who understand the question are well aware that the gas supplied by the Company is the cheapest gas in Scotland for any locality similarly situated. The extent of gas-piping throughout the district is probably greater than that of any other Scotch gas company having a similar wake. Since the present owners of the works entered into possession, they have year after year reduced the price of the gas—from 7s. 6d. to 5s. 5d. per 1000 cubic feet; and as the works and plant are capable of providing and delivering a very much larger supply, the consumers can only hope to have the price permanently reduced by supporting the Company as their customers. It is well known that it was by a mere accident that the Glasgow gas supply was extended to Clydebank. The Partick, Hillhead, and Maryhill Gas Company had their mains laid as far as Scotstown, quite sufficient to meet the wants of the district, when the Glasgow gas authorities stepped in, and laid their pipes to Clydebank, without making any extra charge. The district was wanted by the Partick and Hillhead Company; and, in a sense, it naturally belonged to them.

By way of supplement to my "Note" of last week on Dumbarton gas affairs, the following figures may be of some interest. The expenditure of the Gas Corporation for the year ending Aug. 1, 1888, including a balance of £810 7s., amounted to £6021 18s. For coal there was expended £2276 19s.; and for salaries and wages the expenditure was £902 16s. The profit and loss account shows the past year's profits to have amounted to £769 4s. 9d. For gas-rental there was received £5300 3s., which, with arrears and sales ledger account, gave a total revenue of £6021 18s. The total assets are set down at £33,393 15s.; the principal item of which is £31,310 13s.—being the amount expended on the gas undertaking up till Aug. 1 last year. Up to the same date there had been expended in purchasing annuities the sum of £2300 4s.; and during the past year £56 6s. was expended in making further purchases—the total being £2356 10s., which is the amount at which the sinking fund now stands. Amongst the debts of the Gas Corporation, there is an item of £10,350 in the shape of loans on debentures. The sum of £8350 12s. 10d. is set down in the capital account as accumulated profits.

At the beginning of almost every lighting season, the ratepayers of the village of Kilmacolm are made aware that there are amongst them some mean persons. There is no sort of municipal government for the village; and consequently the public street lighting has to be done by voluntary assessment. Last night the ratepayers held their annual meeting to receive a report from the Lighting Committee, and to fix the assessment for the ensuing year. It transpired in the course of the proceedings that, out of 271 ratepayers, only 136 paid assessment for the past year; the rest being quite willing to take the benefit without having to pay for it. It has been resolved to continue the voluntary system for another year; the rate agreed upon last night being 2d. per £1 of rental. A strong feeling is arising in favour of adopting certain portions of the "Lindsay" or Scotch Police Act; so as to cause every ratepayer to bear his due share of the public burdens.

At the monthly meeting of the Kilmarnock Town Council on Wednesday, it was reported by the Gas Committee that Messrs. W. C. Holmes and Co. had completed the extension of the gasholder, and that the enlarged holder was working satisfactorily.

An improvement in the price of sulphate of ammonia, after a long period of depression, is reported by salesmen. A couple of weeks ago the price was about £11 5s. per ton f.o.b.; but this week the quotation has advanced to £11 12s. 6d., while an additional 5s. per ton was asked for forward delivery.

The time for Town Councillors and Police Commissioners to render accounts of their stewardship has arrived; and one of the first to come before his constituents was Bailie Colquhoun, one of the representatives of the Ninth Ward in the Town Council of Glasgow. In addressing a meeting of the electors last night, he said that the gas accounts were in a satisfactory state and were continually growing, so much so that they had been able to reduce the price 2d. per 1000 cubic feet. He proceeded to remark that, in view of the early extension of the city boundaries, negotiations had for some time been going on between the Corporation and the Partick, Hillhead, and Maryhill Gas Company, with the result that, at the next meeting of Council, a proposal would be submitted by the Gas Committee, asking for authority to conclude a bargain between the Corporation and the Company

with a view to the amalgamation of the Company's works with those of the Corporation. He (Baillie Colquhoun) was not very much in favour of taking over undertakings of that sort; but he frankly confessed that a case of hardship had been made out in some respects by the shareholders of the Company before Parliament. If the extension of the city had taken place without some arrangement whereby their works were to be taken over, the shareholders must have suffered loss. However anxious the citizens of Glasgow might be for amalgamation of the suburban burghs, he was sure that not one of them would like to injure the shareholders of a public Company like the one in question; and his hearers would be gratified to know that through the negotiations which he had spoken of, an amicable arrangement, fair to both sides, was likely to be arrived at.

The course of the Glasgow pig-iron warrant market this week has been rather disappointing, especially in view of the satisfactory position of trade. Scotch iron ranged in price between 41s. 5d. on Monday and 40s. 2d. on Tuesday; while the closing price yesterday afternoon was 40s. 8½d. per ton cash buyers. A considerable increase has been made to the stocks in store this week.

Both in the home and export departments, the coal trade of Glasgow and West of Scotland is decidedly active this week. The price of household coal has been advanced 1s. per ton in Lanarkshire and 6d. per ton in Ayrshire; and the increase has very generally been conceded by merchants. Shipping coals are unchanged in price.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Oct. 6.

Sulphate of Ammonia.—The strong market this week has been due to the continued good inquiry from French consumers; and all available parcels have been readily taken off the market at prices up to £11 12s. 6d. f.o.b. Hull and Liverpool, and £11 10s. f.o.b. Leith. Germany, evidently a little frightened at the tone of the market, is now to some extent joining in the requisition for October and this year's contracts; and consequently fair values have been secured by those makers who could make up their minds to anticipate the disposal of their production. Generally, however, makers set their face against entering into forward contracts; and in their decision they appear to fall again into the mistake so often made, of not getting rid of, at all events, a portion of their production when buyers are willing and prepared to accord good prices. This argument is specially applicable now; and it is hardly a reasonable conclusion to draw, that prices will keep advancing at this season of the year. There is a large production coming on; and sulphate will cease to find customers during the months in which it is not absolutely required, if and when quotations rise above the parity of nitrate. The latter has, of course, much to do with the improved position of the sulphate market, although there can be little doubt that "bull" speculation has driven up rates rather more than they would have done in their natural course.

As the nitrate market requires watching—because it will probably direct the course of sulphate during the next few months—a statement of the position of this commodity on the 1st of October this and corresponding years may not be out of place:

United Kingdom and Continent.

Year.	Deliveries during Sept.	Stocks.	Afloat.
1888 . . .	29,000 Tons.	45,000 Tons.	200,000 Tons.
1887 . . .	26,000 " "	19,000 " "	180,000 " "
1886 . . .	24,000 " "	58,000 " "	88,000 " "

This makes the visible supply at date 245,000 tons in 1888; 199,000 tons in 1887; and 146,000 tons in 1886. The price in Liverpool was 9s. 6d. this year; 9s. in 1887; and 8s. 9d. in 1886.

LONDON, Oct. 6.

Tar Products.—The demand for pitch and tar oils is a little better; but other products remain quiet, and in some cases neglected. Prices may be taken as follows:—Tar, according to position, 17s. 6d. to 22s. 6d. per ton. Benzol, 90 per cent., 3s. per gallon; 50 per cent., 2s. 4½d. Toluol, 1s. 9d. per gallon. Solvent naphtha, 1s. 3½d. per gallon. Crude naphtha, 30 per cent., 1s. per gallon. Light oil, 3d. per gallon. Creosote, 2d. per gallon. Pitch, 12s. to 13s. 6d. per ton. Carbolic acid (crude), 3s. 4d. per gallon. Cresylic acid, 9d. per gallon. Tar salts, 15s. per ton. Anthracene, 30 per cent., "A" quality, 1s. 6d. per unit; "B" quality, 1s. 3d.

Ammonia Products.—Sulphate of ammonia is in much better odour; and important sales have been made. Price is firm, at £11 10s. to £11 15s., with an advancing tendency. Prices of other products remain the same as last week: Gas liquor (5° Twaddell), 7s. 6d. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 1½d. per lb. Carbonate of ammonia, 3½d. per lb. Muriate of ammonia, brown, £18 per ton; white, £27. Sal-ammoniac, £30 per ton.

[From the *Chemical Trade Journal*, Oct. 6.]

Sulphate of Ammonia.—The market has been very firm indeed during the entire week; and the Continental demand has improved values a little. Supplies are scarce; and even odd parcels only obtained with difficulty at current rates. Beekton price is £11 12s. 6d.; while London outside makes are fetching £11 12s. 3d. At Hull and Leith business has been brisk; the prices at the former port reaching £11 12s. 6d., while at the latter the market may be said to close at £11 10s. While the present demand continues, there need be no fear of prices receding, though it must not be forgotten that the make is increasing as the days lengthen, and requires to be dealt with very cautiously.

Tar Products.—In spite of prognostications of a better state of things, benzoles continue *in statu quo*. It is said that 90's can still be purchased for 2s. 11d., and 50/90's for 2s. 4d.; and the big make will soon be upon us. Solvent naphtha is, on the other hand, very firm, and is expected to remain so for a few weeks at any rate. For 90 per cent. at 160° C., as much as 1s. 5d. is asked, although we have not heard of business above 1s. 4½d. Carbolic acid (crude) is still weak, and there are as yet no signs of recovery; for there are certainly signs that it is losing its ground as a universal disinfectant. Lucigen oil continues to move off freely; while pitch has slightly improved in value—it being stated that Beekton has recently made sales at 15s.

OPENING OF NEW GAS OFFICES FOR THE STAFFORD CORPORATION.—On Monday last week, the members of the Stafford Corporation met the Gas Committee, by invitation of the Chairman (Mr. Alderman Dudley), for the purpose of inspecting the alterations which have recently been made in the gas offices. The visitors were received in the office of the Gas Engineer and Manager (Mr. J. F. Bell), where Mr. Alderman Dudley gave an interesting account of the improvements which have been introduced into the plant during the past five years; alluding specially to the adoption of regenerator furnaces and apparatus for the manufacture of sulphate of ammonia. At the close of the address, the visitors were conducted round the works; satisfaction being shown at the evidences of good management which were everywhere present.

TRINIDAD GASLIGHT AND COKE COMPANY, LIMITED.—This Company was registered on the 2nd inst., with a capital of £100,000, in £5 shares (of which 50,000 are preference shares), to acquire a contract for lighting the Port of Spain, Trinidad, or elsewhere in the West Indian Islands, by gas or other illuminant, and to acquire lands, buildings, collieries, pitch lake, and other minerals in Trinidad or elsewhere.

LONGTON CORPORATION GAS SUPPLY.—At the meeting of the Longton Town Council last Thursday, it was stated that the gross profits of the gas works for the year ended June 30 last were £7238; and after deducting payments for principal and interest, there was a balance of £2263. Of this amount £236 had been set aside for re-sheeting and repairing the gas-holder; leaving a balance of £2027 to go towards a reduction of rates.

THE PROPOSED EXTENSION OF THE BRADFORD WATER-WORKS.—Last week, Dr. C. Meymott Tidy made an inspection, in the company of a Sub-Committee of the Bradford Corporation Water Committee, of the water in the Nidd Valley and in the Grimwith district, from one of which localities it is proposed to obtain an additional supply for the borough. The question of appointing another Engineer besides Mr. A. R. Binnie, the Corporation Water Engineer, to examine the districts, along with the Sub-Committee and Dr. Tidy had been discussed by the Committee, and the suggestion was made that he should accompany Dr. Tidy also; but inasmuch as the latter's visit was purely for chemical and analytical purposes, it was not deemed advisable that any engineering question should be dealt with.

THE PROPOSED PURCHASE OF THE LUTON WATER-WORKS BY THE CORPORATION.—According to the *Luton Times*, no greater surprise has ever come upon the ratepayers than that occasioned by the resolution of the Town Council, at a special meeting last Friday week, to offer £120,000 to the Luton Water Company for the acquisition of their undertaking, to which reference was made in our columns last Tuesday. It was admitted that the Company serves the town well, and that its officials are beyond reproach; and it was not pretended that the borough would gain any immediate benefit. The whole case rests upon the possibility of an increased demand for water in the future, and on the Corporation carrying on the undertaking with the same, if not indeed greater economy, than now characterizes its management. The paper alluded to thinks that such problematical advantages do not justify the Council in forcing the scheme upon the ratepayers without adequate information being laid before them, and full opportunity also for its consideration. It is likely the proposal will cause some excitement at the forthcoming elections.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see *ante*, p. 628.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon invest. ment.
£			p. c.	GAS COMPANIES.				£ s. d.
500,000	10	12 Apr.	10½	Alliance & Dublin 10 p. c. .	10	18½-19½	..	5 7 8
100,000	10	"	7½	Do. 7 p. c. .	10	13-14	..	5 7 1
900,000	100	2 July	5	Australian (Sydney) 5% Deb.	100	110-112	..	4 9 3
100,000	20	30 May	10	Bahia, Limited	20	23-25	..	8 0 0
200,000	5	11 May	7½	Bombay, Limited	5	71-73	..	4 16 8
40,000	5	"	7	Do. New	4	52-53	..	5 4 2
380,000	Stock	29 Aug.	11	Brentford Consolidated . .	100	220-225	..	5 4 5
110,000	"	"	8	Do. New	100	161-166	..	5 5 5
220,000	20	13 Sept.	10	Brighton & Hove, Original .	20	43-45	..	4 13 4
320,000	20	28 Sept.	11	British	20	45-47	..	4 15 9
50,000	10	13 Sept.	11	Bromley, Ordinary 10 p. c. .	10	19-21	..	5 4 9
89,000	10	"	8	Do. 7 p. c. .	10	13-14	..	5 14 8
328,750	10	30 May	8	Do. New do.	10	141-151	..	5 3 2
200,000	100	2 July	6	Buenos Ayres (New) Limited	100	110-112	..	5 7 1
150,000	20	10 Aug.	7	Do. 6 p. c. Deb.	20	25-27	..	5 3 8
550,000	Stock	12 Apr.	13½	Cagliari, Limited	100	270-275	-3	5 0 0
130,000	"	"	10½	Commercial, Old Stock . .	100	214-219	..	4 18 2
121,234	"	28 June	4	Do. New do.	100	123-128	..	3 10 3
557,320	20	14 June	12	Do. 4½ p. c. Deb. do. . .	20	45-46	..	5 4 4
212,680	20	"	12	Continental Union, Limited	20	30-31	..	5 8 1
200,000	20	"	9	Do. New '69 & '72 . . .	20	36-38	..	4 14 8
75,000	Stock	28 Sept.	10	Do. 7 p. c. Pref.	100	205-215	..	4 18 0
234,060	10	27 July	13	Crystal Palace District . .	10	252-261	..	4 18 1
121,000	10	"	13	European, Limited	10	252-261	..	4 18 1
354,060	10	"	13	Do. New	7½	184-191	..	5 0 0
5,468,600	Stock	29 Aug.	13	Do. do.	5	124-131	..	4 16 8
100,000	"	"	4	Gaslight & Coke, A. Ordinary	100	248-252	-1	5 3 2
665,000	"	"	10	Do. B, 4 p. c. max. . . .	100	100-105	..	3 16 3
80,000	"	"	5	Do. C, D, & E, 10 p. c. Pf.	100	260-265	..	3 15 6
60,000	"	"	7½	Do. F, 5 p. c. Pf.	100	215-230	..	3 16 11
1,800,000	"	"	7	Do. G, 7½ p. c. do. . . .	100	182-187	..	4 0 2
463,000	"	"	10	Do. H, 7 p. c. max. . . .	100	167-172	..	4 1 4
1,061,150	"	14 June	4	Do. J, 10 p. c. Pf.	100	258-263	..	3 16 1
294,850	"	"	4½	Do. 4 p. c. Deb. Stk. . . .	100	120-123	..	3 5 0
650,000	"	"	6	Do. 4½ p. c. do.	100	125-130	..	3 9 3
3,600,000	Stock	11 May.	10	Do. 6 p. c. do.	100	175-178	..	3 7 5
75,000	5	14 June	6	Imperial Continental . . .	100	211-214	+1	4 13 5
560,000	100	1 Oct.	5	Malta & Mediterranean, Ltd	5	5-51	..	5 9 1
541,920	20	14 June	6	Met. of Melbourne, 5 p. c. Deb.	100	112-114	+½	4 7 9
150,000	5	30 May	7	Monte Video, Limited . . .	20	20-21	..	5 14 3
60,000	5	28 Sept.	0	Oriental, Limited	5	94-95	..	5 2 7
420,000	100	2 May	6	Ottoman, Limited	5	6-7	..	5 0 0
500,000	100	1 June	6	People's Gas of Chicago—	100	107-110	..	5 9 1
100,000	10	26 Apr.	10	1st Mtg. Bds.	100	95-100	..	6 0 0
500,000	Stock	29 Aug.	15½	2nd Do.	100	16-17	..	5 17 8
1,350,000	"	"	12	San Paulo, Limited	100	306-311	..	4 19 8
141,500	"	"	13	South Metropolitan, A Stock	100	241-245	..	4 17 11
550,000	"	28 June	5	Do. B do.	100	245-255	..	5 1 11
60,000	"	29 Aug.	11	Do. C do.	100	135-140	..	3 11 5
717,407	Stock	28 June	9	Do. 5 p. c. Deb. Stk. . . .	100	11-13	..	4 4 0
1,720,560	Stock	12 Apr.	7	Tottenham & Edm'tn, Orig.	5			
700,000	50	14 June	9	Chelsea, Ordinary	100	260-265	..	3 7 11
708,000	Stock	10 Aug.	10½	East London, Ordinary . .	100	197-202	..	3 9 4
1,043,800	100	28 June	9	Grand Junction	50	124-128	..	3 10 4
406,200	100	"	7½	Kent	100	270-275	..	3 16 4
200,000	Stock	28 Sept.	4	Lambeth, 10 p. c. max. . . .	100	260-265	-1	3 7 11
500,000	100	27 July	12½	Do. 7½ p. c. max.	100	203-208	..	3 12 1
1,000,000	Stock	"	4	Do. 4 p. c. Deb. Stk. . . .	100	116-120	..	3 6 8
902,300	St. k.	14 June	6	New River, New Shares . .	100	348-352	-1½	3 8 10
126,500	100	"	6	Do. 4 p. c. Deb. Stk. . . .	100	124-128	..	3 2 6
1,155,066	Stock	14 June	10	Do. 4 p. c. do.	100	166-171	..	3 10 2
				Do. 7½ p. c. do.	100	157-162	..	3 14 1
				Do. 7½ p. c. do.	100	265-270	..	3 14 1

WATER COMPANIES.

† Next dividend will be at this rate.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES

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HYDRAULIC AND GAS ENGINEERS, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

TELEPHONE No. 2698.

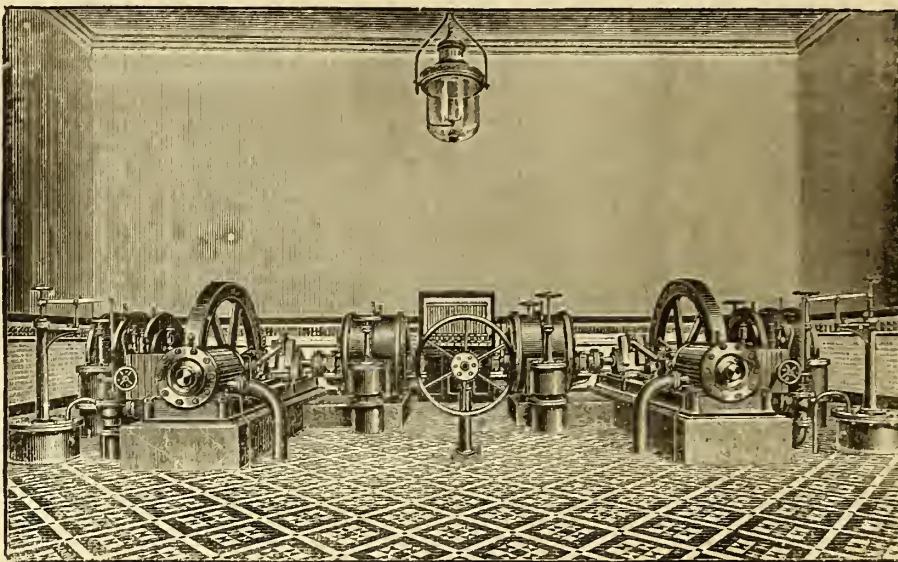
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Only Medal at the Liverpool International Exhibition, 1886, for Centrifugal Pumping Engines.

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The above Engraving shows Two Engines driving Four GWYNNE & CO.'S PATENT NON-FLUCTUATING EXHAUSTERS, to pass 200,000 cubic feet per hour (without the slightest oscillation), at the EFFINGHAM STREET GAS-WORKS, SHEFFIELD.

Can be made, when desired, on their New Patent principle to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

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Catalogues and Testimonials on application at the above address.

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Managing Director.

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JOHN ROMANS & SON, EDINBURGH. Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.

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GAS-WORKS of any magnitude leased, at premiums ranging from 5 to 10 per cent., according to the size of the Works. Gas-Works erected or re-modelled upon the most modern principles. Address GEORGE WELLER, Gas Engineer, St. Ives CORNWALL.

ADVERTISER desires an appointment as ASSISTANT, CLERK, INSPECTOR, FOREMAN, or in any place of trust. Thorough knowledge of Manufacture, Purification, and Distribution, and is a good Accountant. Young, energetic, and well connected. Good testimonials and references to several well known Gas Engineers. No objection to go abroad. Address 1650, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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WANTED, a Situation as Working MANAGER in Small Works. Thoroughly understands the Carbonizing Department, Reading Indices of Meters, Fixing Meters, Stoves, &c., Laying Mains and Services, and all Repairs attached to Gas Plant. Age 39, married, abstainer. Address No. 1630, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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WANTED, by a large Provincial Gas Company, a competent Engineering DRAUGHTSMAN. Must be able to make Original Drawings; calculate Strains; and get out Quantities, &c. A permanent engagement to a capable man. State experience and salary required to No. 1649, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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Make only the best quality of FIRE-CLAY RETORTS, BRICKS, TILES, & LUMPS. Also SPECIAL SILICA BRICKS, to stand great heats. All descriptions kept in Stock.

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[Telegraphic Address: "PRECISION LONDON."] Makers of Wet and Dry Gas-Meters, Station Meters and Governors, Photometers, and Gas-Testing Apparatus, Test Gas-holders and Meters, Registering and other Gauges, &c., &c.

** See Advertisement on Page III. of the Wrapper of this week's issue.

W. C. HOLMES & Co., Huddersfield,

ANN 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gas-holders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. A set for Collingwood's Regenerative Retort-Settings.

** See Advertisement p. 609 of last week's issue. Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

SULPHATE of Ammonia Lead Burner

and Chemical Works Plumber. Twenty six years' experience. Distance no object. Address P. J. DAVIES, 78, EARL'S COURT ROAD, W.

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TAR worth 30s. per ton for Burning. See and see and believe, or send for Burners complete, with Instructive and Descriptive Pamphlet, 16s. 6d.

Estimates given for Fixing and Starting, and satisfactory working guaranteed on application to THOS. BURTONSHAW, Gas-Works, CHIPPING NORTON.

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SECOND-HAND PLANT:—Six 12-inch Δ -shaped Retort Mouthpieces, with Ascension-Pipes and Hydraulic.

Set of 6-inch Pipe Condensers, with box complete. Small Scrubber, and Two 6-inch Byo-Pass Valves. Two 6 feet square Purifiers, with Valves and Connections complete.

About 2000 feet per hour Station Meter, with Byo-Pass Arrangement and Connections. Three 4-inch Slide-Valves.

Prices and full particulars to H. W. FALKNER, Gas-Works, Eye, SUFFOLK.

FOR SALE—A Station Meter, in round

case, to pass 12,000 cubic feet per hour, with Clock, Tell tale, Water-Level Indicators, Overflow and Filling Arrangements, and Byo-pass Valve all complete.

The Meter is being removed to make room for a larger one; and is in first-rate condition. Inspection invited.

For particulars apply to Messrs. JAS. MILNE & SON, Edinburgh (Makers) or to THOS. WHIMSTEN, Gas-Works, PERTH.

NEW ROMNEY GASLIGHT AND COKE COMPANY, LIMITED.

ISSUE OF 400 SHARES OF £5 EACH.

THE above Company, having to supply

with Gas the rapidly increasing watering place Littlestone-on-Sea, have been compelled to construct new Works, and are, in consequence, raising new Capital. Five per Cent. Dividend was declared for the year ending the 30th of April last. Applications for the remainder of the new SHARES to be addressed to

New Romney, Kent.

WM. ALLEN, Secretary.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased. 120 and 121, NEWGATE STREET, LONDON, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID for making SULPHATE OF AMMONIA of high quality and colour.

Highest References and all particulars supplied on application.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Acerrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitrol. References given to Gas Companies.

ACETATE OF LEAD BOOKS.

TEST Papers and Solutions for Gas- Works prepared by R. D. Gibbs, Summerfield Crescent, Birmingham. Analysis of Coal, Oxide, and all Gas Materials.

BOROUGH OF DARLINGTON.

THE Gas-Works Committee invite TENDERS for the supply of 10 tons of PER-OXIDE OF IRON for Gas Purification, delivered at the Darlington North Road Railway Station; delivery to extend over a period of Three months from the acceptance of tender.

Tenders to state whether the article tendered for is Precipitated Oxide or Natural Bog Ore; also the amount of moisture contained therein, and a guarantee that such amount will not be exceeded in the bulk.

Tenders, endorsed "Tender for Iron Oxide," must be sent to me not later than the 23rd inst. No pledge is given that the lowest or any tender will be accepted.

By order,
F. T. STEVENSON, Town Clerk.
Darlington, Oct. 5, 1888.

PATENTS, DESIGNS, AND TRADE MARKS ACT, 1883.

IN THE MATTER OF Letters Patent granted to ROBERT SOUTHWORTH LAWRENCE, residing at the Corner of 14th Street and Pennsylvania Avenue, in the City of Washington, District of Columbia, United States of America, for "Improvements in Carburettors and Gas Generators." Dated the 28th of December, 1886; No. 16,992.

NOTICE is hereby given that The Lawrence Automatic Gas Company, Limited, of 58, Lombard Street, in the City of London (Assignees of the said Letters Patent), have applied for leave to AMEND the SPECIFICATION numbered as above.

A Copy of the Specification as proposed to be amended can be inspected at the Patent Office, and particulars of the proposed Amendment were set forth in the "Official Journal of the Patent Office," issued on the 29th of September, 1888.

Any person intending to oppose the said application must leave notice of objection thereto (on Form G) at the Patent Office, 25, Southampton Buildings, London, W.C., within one calendar month from the date hereof.

Dated this 29th day of September, 1888.

(Signed) H. READER LACK,
Comptroller-General.
W. LLOYD WISE,
46, Lincoln's Inn Fields, London, W.C.
Patent Agent for the Applicants.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 16, 1888.

WATER GAS AUXILIARY TO COAL GAS.

IN commenting last week upon the proceedings at the meeting of the Commercial Gas Company, we referred briefly to the remarks made by Mr. H. E. Jones respecting the advantages of some of the water-gas processes which he found in use in the United States, regarded from the point of view of an English gas manager. The mention of this matter recalls the position taken up some two or three years ago by the JOURNAL with respect to a cognate subject—the disposal of coke in the form of fuel gas. At that time there was a glut of this residual—all the gas-works of the country being choked with unsaleable stocks; and while the consumption of gas was everywhere increasing, there did not appear to be any outlet for the additional weight of coke that was being thrown upon the market every year. It began to look as if

the point of saturation had been attained in respect of coke, while the absorption of gas was still progressive; and in many places the increase of gas consumption, ordinarily hailed with satisfaction by Gas Companies, was positively dreaded by engineers and managers responsible for disposing of the superfluous coke. We have reason to know that in several instances gas managers had already commenced making inquiries as to the possibility of converting their coke into fuel gas for consumption in the immediate vicinity of their works, when the tide turned, and the stocks of coke began to shrink as unaccountably and irresistibly as they had accumulated. When Mr. Jones talks about the possibility of water-gas processes being useful auxiliaries in British gas-works, therefore, he is not speaking of something that has never been thought of before, although the office which he thinks these might fill is different from that already discussed. Water or generator gas processes, as means of getting rid of a surplus stock of coke, having dropped out of sight, together with the condition with which they were evoked to deal, we are left free to discuss them again with reference to the particular application referred to by Mr. Jones.

It is unnecessary to disclaim at the outset any intention of recommending water gas as a substitute for coal gas in any country, much less in the natural land of coal gas. Our position with regard to this matter is the same as ever. Water gas cannot be made here so economically as common coal gas, even at the present low price of liquid hydrocarbons suitable for carburetting. At the same time, it is probable that in most places throughout the United Kingdom it could be made as cheaply as the canal gas which it would equal in illuminating power. In the United States, as is well known, coal and water gas have divided gas engineers into hostile factions, whereof one could not say anything good of the other. The coal-gas men arrogated to themselves the name and position of gas engineers, and would not allow to their enemies any other titles than those of schemers, pirates, and similar terms of opprobrium. The scorn was returned with interest; the water-gas men having a special press "organ" which heaped on the coal-gas party all the flowers of American journalistic satire. The coal-gas people, as the first in the field, naturally regarded the others as interlopers; and the peculiar nature of American institutions favoured the growth of competition between the two systems of gas supply, until their rivalry grew to such a height as to be recognizable on all sides as an unmitigated nuisance. There is not a coal-gas company of any note in the United States that has not been driven to defend itself, sometimes by serpentine methods, against water-gas speculators; and the result of this chronic state of "private war" in the country is that both systems are discredited. The coal-gas companies, while, on the whole, the more stable and respectable of the two orders, have kept up the selling price of gas in order to make their capital secure in the shortest possible time, and also to provide themselves with large "fighting funds" against the inevitable day of conflict. The water-gas systems, ingenious and valuable as some of them are intrinsically, have only too often been made to act as blinds to speculative trickery which the most complaisant admirer of native "smartness" has found it difficult to condone. Financial considerations have accordingly so confused the issue, that until very lately it was practically impossible to say positively what either coal or water gas could and could not do for the lighting of American towns. It was as difficult to glean trustworthy data respecting this, the great gas question of the United States, as to pick up satisfactory political information from the opposing newspapers of the country. One party simply painted itself white, and the other black; and there was the end of it. Latterly, however, gas matters have been gradually settling down. The coal and water gas men have begun to talk sensibly between themselves; and there has been a good deal of exchanging of interests between them. In some places the water-gas people have bought out the coal-gas interest; while in others the reverse process has been effected. In very many instances all feeling and prejudice on both sides have been obliterated, and the only remaining interest has been to do a paying business by selling the most profitable commodity. In this way both water and coal-gas have been brought to their bearings in different localities.

Roundly speaking, the American choice between water and coal gas, when untrammelled by external influences, is determinable by the same kind of considerations that have effected the existing difference between English and Scotch gas. Water gas is indicated, as a physician would say, by

certain considerations, mainly geographical. There may be localities so awkwardly situated with respect to the gas coal-fields, that for them it is a case of water gas or nothing. Such considerations cannot be ignored; but we are free to maintain that dwellers in such places are to be pitied. We are not going to argue the old question of whether lighting gas containing more than 10 or 15 per cent. of carbonic oxide should be permitted by law to be sold. There is a great deal to be said for and against the employment of a useful, but poisonous gas, supposing that nothing better can be obtained at a reasonable figure. At the same time we maintain that the distribution throughout a town of illuminating gas containing upwards of 40 per cent. of carbonic oxide is a course which, however recommended by purely commercial considerations, is open to the gravest objections of another kind, which need not be specified in detail. Fortunately, the cost of the article is a sufficient guarantee that it will not be manufactured for sale in the United Kingdom so long as existing conditions prevail.

Poisonous and costly as it is in its normal state, however, it is easily imaginable that water gas has its special attractions for the gas engineer. To begin with, its production is almost ideal gasification. No handling of the raw material—simple tipping into a hopper; and the production of gas almost illimitable at will. On a corner, 14 or 15 feet square, of a retort-house will stand a gas-generator capable at any time, upon a few hours' notice, of yielding 30-candle gas at the rate of 3 million cubic feet per day. Many of the Gas Companies of the States that have acquired water-gas processes, use them wholly for times of emergency. The existence of a spare generator of this kind in the works is worth to the manager an additional holder and half-a-dozen settings of retorts. The fuel and gas-making material is in the coke-yard; and the carburetting oil can be stored in a tank until it is wanted. In a dozen United States cities the gas consumers never know when they are burning plain coal gas, or the same with a strong dash of water gas. If water gas is ever naturalized in British gas-works, it will be in this way, as an auxiliary to the ordinary process of manufacture; and the advantages of such a resource must be ascertained, in every proposed case, with regard to local conditions. It is impossible to lay down a hard-and-fast rule on the subject, to the effect that water gas either can or cannot be profitably used in a British gas-works. It must depend upon considerations which will require to be stated and satisfied in every individual case. What might answer the purpose in London need not necessarily be convenient for Manchester; nor need Birmingham lead Edinburgh, or Glasgow Liverpool. All that has to be insisted upon for the present is that here is a matter that should not be lost sight of.

THE MEETING OF THE NORTH OF ENGLAND ASSOCIATION OF GAS MANAGERS.

THE North of England Gas Managers' Association met on Friday last at West Hartlepool, under the presidency of Mr. Thomas Bower, Engineer and Manager of the West Hartlepool Gas and Water Company. There was a good attendance of members; and the meeting was in all respects successful. The technical portion of the business comprised the presidential address, which will be found in full in another column, and a paper by Mr. J. Wright, of Stockton-on-Tees, upon increasing gasholder storage by telescoping. One of the most valuable suggestions offered by the President was with reference to the desirability of standardizing particular kinds of gas plant, which is a matter that has already been discussed in the JOURNAL and elsewhere. Nobody seems disposed to make a practical move in the direction of reform, however; and therefore the subject remains open for other Presidents of District Associations to deal with in their turn. Possibly in the course of time something may be done in this matter. Mr. Bower also had a suggestion to make upon the position of District Gas Managers' Associations with regard to The Gas Institute. It is not necessary to agree with everything that is said upon this subject in order to be glad that the attention of engineers and gas managers in different parts of the country is directed to it at this critical time. The paper by Mr. Wright will be of use to gas managers when studying the problem of gasholder extension, as it gives figures applying to the cost of telescoping, such as are not always easy to obtain when wanted. Of course, the paper could not finish without a reference to the Rotherhithe experiment, and to the proposals now in the air for dispensing with the whole or a part of the outer guider-framing of gasholders. As these matters did not enter into the scope of the paper, however, they could not be profitably

gone into. The members afterwards went for a steamboat trip round the port, to inspect the harbour improvements; and finished with a dinner at which they were entertained by the Directors of the Gas and Water Company—eventually separating well pleased with the day.

MR. N. H. HUMPHRYS ON DISTRICT ASSOCIATIONS OF GAS MANAGERS.

MR. NORTON H. HUMPHRYS is Secretary of an important District Association of Gas Managers, and is otherwise well qualified to speak upon the subject which he treats in an article that will be found in another column. Mr. Humphrys remarks truly enough that a short time since there was a flagging in the spirit and vitality of Gas Managers' Associations; but it does not follow that this deplorable manifestation is no longer to be discovered because several fresh Associations have recently been founded. Mr. Humphrys is too sanguine on this point; but whether his optimism is justified or not, it may at least be said that he has gone the right way to work to help Secretaries and Committees of such societies to escape from the reproach of dulness at their meetings. He takes up the theme which we broached when recently discussing the subject of District Associations in general and the new Eastern Counties organization in particular, and lays down the broad proposition that good discussions are the ultimate object and test of the success of the meetings of such societies. In this few will be disposed to disagree with him. He endeavours to set forth the conditions under which good discussions may be expected; arriving at them by the negative process of distinguishing the causes that ordinarily operate to prevent them. It is unfortunately the fact that comparatively few Englishmen, from whatever grade of society they may be taken, are ready public speakers; and the worst of it is that those who might have the most to say are often the most difficult to make talk for other people's benefit. They are apt to take their revenge later, by confidentially informing a few particular friends that they could have said a good deal of a very surprising character if they had so chosen. Hence it is impossible to regard their silence as "golden," according to the proverb. On the other hand, men who have the gift of talking about anything and everything are generally to be found in every society; and very great bores they are. A Gas Managers' Association may be looked upon as in some respects a debating society; and the curse of all debating societies clings to it—that the lion's share of the speaking is left to a small percentage of members. In some Associations this evil is reduced to the minimum by the President asking all the company in turn to offer their opinions upon the subject under discussion; but still it is as idle to attempt to make some men open their mouths as it is to induce others to shut theirs. The article contains references to many other points of interest to members of Gas Managers' Associations, such as the influences which the author calls the "recreative" and the "trading" elements. There is no disguising the fact that many of the members of these Associations do not in reality take the slightest interest in the business for which they are ostensibly called together. It is unnecessary to go further than The Gas Institute for proof of this. How many of the members who journey to these meetings are ever reasonably regular attendants at the sittings for the reading and discussion of papers? Then with regard to the trading element, the subject only needs to be mentioned to show what evils this influence is likely to cause, and as a matter of fact does bring upon all Associations in which it is allowed to get the upper hand. This is a matter with regard to which the sentiments of gas managers in general have undergone considerable change of late years. It is with no want of respect to members of trading firms as individuals that we say that they as a class are better away from gas managers' meetings; and the majority of the well-intentioned among them fully recognize the fact. We do not intend to discuss this matter at length now, however, as a better opportunity for doing so may arise before long.

HOW TO GET AT THE SMALL CONSUMER.

WHEN the Manchester District Institution comes to discuss Mr. James Dalgliesh's paper on the competition of oil and other illuminants with gas, Mr. William Woodward, the Engineer of the Bury Corporation Gas-Works, should be able to make an interesting contribution to the debate. One of the problems of the day is how to get the ordinary artisan household to become a consumer of gas, and keep him when he is once secured. Various methods for attaining this end have been suggested, and some are being tried in a

tentative way. Perhaps the most feasible of these schemes is that of the more frequent collection of rentals, of which great things are hoped, and which, if it can be economically and profitably worked, may bring about a revolution in the ordinary supply of gas. Mr. Woodward seems, however, to be in a fair way to solve the problem on his own account. Last week he was able to gratify the members of the Town Council by informing them that an enormous number of meters which had been standing for six or seven years have recently been connected anew with the service-pipes; and that the consumption of gas was, consequently, largely on the increase. These, we take it, are the results of manufacturing gas economically, and selling it at the lowest possible price. Bury is able to boast of the cheapest gas in Lancashire, and almost in the country; and the Gas Committee find that their labours in this direction lead to an increased consumption, and the bringing back to them of some customers who possibly had abandoned the use of gas in favour of its rival—oil. Mr. Woodward will confer a favour on his brother managers by taking the opportunity we have suggested for enlarging on the subject, and explaining in detail the methods by which the increased sale of gas, particularly to occupiers of small tenements, has been brought about.

GAS TESTING POPULARIZED.

ONE of the French journals devoted to the gas industry has been making merry over a decision come to a few months ago by the Municipal Council of Paris, by virtue of which the public laboratory is thrown open to anyone who is desirous of having his gas tested. The Municipality have already patronized the peripatetic photometer; but this last freak strikes our French contemporary as being particularly ridiculous. As a matter of fact, however, we should be disposed to regard such a resolution as certain to remain a dead letter. It has probably been promulgated with the object of currying favour with the gas-consuming public of the capital, who are chronically aggrieved at the unholy compact between the Gas Company and the Municipality for the division of profits—an arrangement that ought never to have been permitted; but it is obviously only one more of the theatrical *tableaux* in which the Municipality have appeared to be chastising the Company with one hand while holding out the other for the usual subsidy. The announcement of the opening of the municipal laboratory to all consumers who are discontented with the quality of their gas is published in the official municipal *Bulletin*, which also gives, for the first time, the results of the tests made by the regular Examiners. According to this statement (which comprises the results of four testings made during the month of June), the gas sent out by the Paris Company scarcely varied throughout the month; its specific gravity only changing from 0.563 to 0.564. The illuminating power is not given. The average proportion of carbonic acid in the gas was 2 per cent., which accounts in some measure for its density being so high for what is generally understood to be its illuminating value. Heavy hydrocarbons, 3 per cent.; carbonic oxide, 9 per cent.; marsh gas, 43 per cent.; hydrogen, 28.38 per cent.; nitrogen, 14.62 per cent.—these figures complete an analysis which, as *Le Gaz* (the journal above alluded to) ironically remarks, will be of great service to the Paris shopkeepers when they accept the invitation of the Municipal Council to have a sample of gas tested specially for themselves at the public expense. Our contemporary imagines that the idea of the Council in thus throwing open their laboratory to the public may be to dispense with the peripatetic photometer, by inducing consumers from different parts of the city to bring their samples of gas to be tested at the central establishment, just as they do with suspicious comestibles. The whole thing is scarcely worth discussing seriously, save as an example of the troubles of a Continental Gas Company.

It may be mentioned, as a testimony to the originality of Mr. W. Gadd's spiral guide-framing for gasholders, that his application for a patent for this system in Germany, where, as our readers may be aware, the rules are very rigid, has passed the examination for novelty without a single citation or comment.

In the programme of the tenth series of lectures to be delivered before the members of the Chartered Accountants' Students' Society of London during the autumn session, we notice one on the 6th prox. by Mr. Ernest Cooper, F.C.A., on "What is Profit of a Company?" and one on Dec. 4 by Mr. Alfred Lass, F.C.A., on "The Accounts of Gas Undertakings," with especial relation to depreciation, reserve, insurance and sinking funds, and the legislation affecting them.

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(FOR STOCK AND SHARE LIST, see p. 694.)

WITH an easier condition of the Money Market, and less apprehension with regard to a run upon gold, the general tendency of the Stock Exchange Markets has been to make a recovery. Foreign affairs, too, are regarded with complacency; aiding the general firmness. Railways, however, have been subject to fluctuation. Business in the Gas Market has been exceedingly quiet, and variations in quotations are few and slight. The Metropolitan Companies are better than they were the week before. Transactions have been fewer; but the prices have been firmer. Taking Gaslight "A," it has been done steadily throughout the week at middle figures; the price never ranging much above or below 250. The "H" stock was in somewhat better favour, and a couple of transactions were marked in it; the quotation showing an advance of 1. A little was also done in the debenture and preference stocks, at about average prices. South Metropolitans furnished a little business early in the week; but afterwards were quite neglected. The prices marked were not very good. Hardly anything has been marked in Commercial; but the stocks are in very good favour (regarded by the light of the latest accounts), and there is a growing disposition to buy. Among the Suburban Companies, Brentford furnishes the only item of interest. After a period of stagnation there has been an inquiry for it; and the old stock has changed hands two or three times at good marks. The quotation shows an advance of 2. Some of the Foreign undertakings have not been doing quite so well as lately. Imperial Continental has sustained a slight check to its advance, and has receded 1. Oriental, too, has had a relapse. San Paulo, on the other hand, has advanced; and Monte Video has been firm. The Water Market is very flat; and the disposition to a fall which was observable the week before has been realized in fact. New River dropped suddenly to 340 on Thursday. Lambeth were in equally bad odour; and the 10 per cents. and 7½ per cents. receded 5 and 6 respectively. Grand Junction is put 1 lower; but the other Companies have so far maintained their position.

The daily operations were: On Monday, business in Gas was very restricted. South Metropolitan "A" was the most dealt in, and at middle prices. Oriental fell ½. In Water, nothing was touched but Grand Junction; and that declined 1. On Tuesday, Gas business was more brisk; and many issues were moderately dealt in. The only variation was a fall of 1 in Imperial Continental. In Water, the only transaction was one in West Middlesex, at top price. On Wednesday, the business in Gas was reduced to almost the smallest proportions, and quotations stood unchanged. Water began to fall—New River receding 2½; Lambeth 10 per cents., 2; and Lambeth 7½ per cents., 3. On Thursday, there was a little more activity in Gas; and Brentford old advanced 2. Water was again very flat. Both the Lambeth issues fell 3; and New River buyers were 5 lower. Friday's Gas business was extremely restricted; and prices underwent no change. Water was quiet; but showed no sign of recovery. Saturday's business was of the usual moderate character. Very little was done in Gas; and nothing at all in Water. All quotations closed without variation.

ELECTRIC LIGHTING MEMORANDA.

AWARD OF THE VOLTA PRIZE TO M. GRAMME—STATEMENT BY THE ANGLO-AMERICAN BRUSH COMPANY—PROMISED REAPPEARANCE OF THE SUN LAMP—AN AUDACIOUS STATEMENT.

IN 1882 a French ministerial decree was promulgated relative to a competition which closed on July 31, 1887, ordering that a reward, entitled the "Prix Volta," should be bestowed upon the author of "the discovery which shall render electricity fit to be employed economically in one of the following applications—a source of heat, light, chemical action, mechanical power, means of transporting despatches, or treating the sick." A Commission, nominated by the Minister of Public Instruction, was charged with the duty of selecting, among the authors of recent discoveries in the domain of electricity, him who had the best claim to such a prize. The Commission was composed of 19 eminent French men of science, who have at length decided, "having inspired themselves with the motives which directed the initiative of the Government," to award the prize to M. Zénobe Gramme, for the progress made by him in the construction of dynamo-electric machines. The report presented by M. Mascart, in the name of the Commission, setting forth the reasons for the selection of M. Gramme for this distinction, was published in a recent issue of the *Journal Officiel*. It is herein stated that M. Gramme, then a carpenter by trade, was chosen in 1860 by M. Van Malderen as a modeller for the Alliance Society. He set himself to master the nature of the strange machine at which he worked; and went two years later into Rhumkorff's workshops, where he was employed in mounting electrostatic machines upon wood frames. At this time Gramme bought an elementary treatise upon physics, which he read by the aid of a dictionary, and discovered that many of the hypotheses with which he thus became acquainted were like those he had already imagined in his own mind. This was an encouragement to the worker-student to persevere. His first patent was dated Feb. 26, 1867; and it had reference to improving the alternative-current machine. But want of means hindered him from proceeding with his invention, and he was anticipated by the communication of Wheatstone to the

Royal Society of the principle of the auto-excitation of these machines. The following year M. Gramme constructed in London his first continuous-machine, which did not succeed very well. In 1869 he made a new machine, which was more satisfactory, and contained the first true "Gramme ring," of which so much has since been heard. Lacking means to take out a patent, the inventor applied to M. Breguet, renowned for benevolence as well as for skill in mechanics. M. Breguet pooh-poohed the whole idea; but gave Gramme the 100 francs required for taking out his patent. The notion of this invention had to a certain extent been anticipated by M. Paccinotti in 1864; but M. Paccinotti was a professor at Pisa who had no notion of turning his discovery to practical advantage. Moreover the Commission do not believe that Gramme ever had the chance of reading the obscure memoir in the *Nuovo Cimento* in which Paccinotti's notion was buried. At all events, to Gramme is due the credit of surmounting the material difficulties, the absence of resources, and the incredulity of competent men which combined to obstruct his efforts. In 1869, Gramme designed four types of machines; in 1871, his four-pole machine was presented to the Académie des Sciences by M. Jamin, and was exhibited at work by Messrs. Mignon and Rouart. He followed up, point by point, the study of the construction of these machines; obtaining possession of formulae for proportioning their parts to suit special requirements. Then came his great triumph. From 1854, MM. Christophle had been trying without success to adapt magneto-electric machines for electro-plating, in place of the cumbrous and unhealthy batteries; and hearing of M. Gramme's work, they set him a problem in this line in 1871. Within three months the ex-carpenter delivered a machine that fulfilled the conditions; and the future of electro-deposition of metals was revolutionized. As the report says: "The discovery of Volta was resting in the laboratories. Its industrial applications were very limited, in spite of all the efforts and hopes that arose from Faraday's discovery. Since the labours of M. Gramme, electricity has taken its place in industry beside steam, and its part expands from day to day." It is another striking story of a man who has risen, and will figure in the collection of a successor to Mr. Smiles.

A curious statement, in the nature of an interim Directors' report, has been issued by the Manager and Secretary of the Anglo-American Brush Electric Light Corporation, Limited. It is ostensibly circulated in view of the many important events which have happened during the past few months, but looks very like a device for inviting the confidence of the proprietors in advance of the publication of the usual report and statement of accounts. The principal topic of the circular is the passing of the Electric Lighting Act Amendment Bill, which is patronisingly accepted as better than nothing, although falling short of what the Board would have liked. Such as it is, however, the Act is cited as the justification for the creation of the Chelsea Electricity Company, in which the Corporation are interested as contractors for the generating plant. The goodwill of the public is bespoken for this venture. It is stated that the Company propose to put down plant in the first instance for supplying 6000 lights. The electricity generated at the central station will be conveyed by underground wires to sub-centres, where accumulators, to be supplied by the Electrical Power Storage Company, will be charged thereby. From these storage stations the current will be distributed to the surrounding buildings—if the residents like it. The Brush proprietors are also cheered up by the statement that the Directors have made arrangements for establishing central stations at Bournemouth and other places; and also that the negotiations with the Commissioners of Sewers for the electric lighting of the City of London have been resumed with every hope of a satisfactory issue. From all which we shall be rather surprised if the accounts, when published, are not such as to call for a further exhibition of patience and hopefulness on the part of the shareholders.

It is stated in an electrical contemporary, that after having been subjected to an eclipse of altogether unnatural duration, the *lampe soleil*, at one time tolerably well known in this country under its literally translated title of "Sun Lamp," will shortly reappear in the electrical firmament. This is the arc lamp in which the light is obtained, not exactly from the points of the opposed carbons themselves, but from a block of marble interposed between them, which becomes incandescent, with a very pretty effect. The light is a much better colour than that of the naked arc; but, as originally introduced, the lamp named after the luminary of day was rather a caricature of the steadiness of its fancied prototype. Now, however, it is admitted that all kinds of electric lighting appliances have been much advanced since the last "Sun" lamps shone more or less unsteadily before the eyes of a critical public; and the gear of the lamp itself is said to be so much improved that its reappearance is expected to be something of a triumph. Unfortunately, all this recommendation in advance only reminds one of the common practice in trade by which the successor of a bankrupt shopkeeper, if he intends to carry on the same kind of business, is careful to announce that on a certain day "this establishment will be reopened under entirely new management; and the proprietor hopes by strict attention," &c., &c. At all events, we are by no means disposed to worship the rising sun until, like the moon in "A Midsummer Night's Dream," it can be truly described as "shining with a good grace."

A contemporary records the thrilling fact that 150,000 arc lamp carbons are burnt daily in the United States, of which 100,000 are made in Cleveland, Ohio. Six years ago, all the carbons required for the country were made in a single room in Boston. Now there are 20 carbon-furnaces in Cleveland alone. There is nothing like

a good round figure for striking the average newspaper reader. We fancy, however, that our esteemed electrical contemporary must have unwittingly turned up an old story, for we distinctly recollect having met with the same statement before—a year or two ago. If so, to correct it should require the duplication of the principal figures, after the plan hit upon by Talbot Champneys, in "Our Boys," for bringing the vital statistics of Mesopotamia up to date. How singular, a student of these "facts for the times" might exclaim, that the consumption of electric carbons in a vast region like the United States should work out to such handy even figures; so convenient for the memory, too! Sure to come in suitably in a speech at a meeting of an electric light or gas company. Let us conceive a parallel to it which will be just as authoritative. "It is asserted that exactly 5 million matches are struck every day for lighting the gas-burners required for lighting, cooking, and heating in the United Kingdom. Of these about one-half go out before they can be used; but as, again, an equal number are made to light two or more burners, the average of one match to a gas-burner is restored. Twenty years ago not more than one-half the number of matches were required for this purpose. (N.B.—Matches and gas were then both dearer.)"

A NEW COMBINED SYSTEM OF GAS LIGHTING AND VENTILATION.

At the new establishment of Messrs. W. Sugg and Co., Limited, Westminster, there is now on view an interesting system of gas lighting combined with ventilation, which should be seen by all who desire to keep abreast of modern progress in the utilization of gas. This exhibit should also be specially attractive to custodians of libraries, picture galleries, public halls, churches, and, in short, of all such places in regard to which the electric light is generally prescribed on account of its possession of those qualities of not heating or altering the normal composition of the air, which cannot be claimed for gas as ordinarily employed for lighting. The admitted costliness of electric lighting is commonly excused on the score of its supposed superiority to gas in the matters of cleanliness and healthiness. It is, therefore, with considerable satisfaction that we are able to cite Messrs. Sugg's present display as something which people who are tempted to patronize electric lighting, notwithstanding its expense and unreliability, should make a point of seeing before finally making up their minds to abandon gas. The system in question is due to the joint labours of Mr. John Methven, universally known in connection with the invention of the photometrical standard of light which bears his name, and Mr. W. Sugg. It has been under the process of incubation for a long time; but now it is considered perfectly fit for general use, a protracted series of experiments having shown what difficulties may be expected in its application, and also how to overcome them. The foundation of the system is the discovery of Mr. Methven that the moisture ordinarily present in atmospheric air is prejudicial to the illuminating power of gas burnt by the aid of such air. It does not need much argument to show that, in such a climate as that of the British Isles, this consideration is frequently likely to be a very serious one. As a matter of fact, we believe the air of these Islands usually contains so much aqueous vapour that, according to Mr. Methven's experiments, drying it will improve the illuminating power of gas-flames burnt in it by from 10 to 15 per cent. Generally speaking, therefore, the greater the proportion of aqueous vapour present, the worse the light of gas burnt without artificially drying the air; and, conversely, the greater benefit is derivable from this process. The deteriorating effect of aqueous vapour upon the illuminating power of gas must be due to the capacity of the vapour for heat, resulting in lowering the temperature and correspondingly diminishing the brilliancy of the flame with which it is brought in contact. Thus it would appear that damp weather has a depressing effect upon gas-flames, just as it undoubtedly has upon human beings. If this conclusion is accepted, however, it follows that artificially-dried air can only be supplied to gas-flames when these are protected from the raw external atmosphere by hermetically closed glasses. We are brought face to face, therefore, with a condition of things which requires to be thought over. Supplying gas-flames with dried air means that the gas must be burnt in close globes; and, more than this, that the air supply to the interior of these globes must be conveyed through pipes just in the same manner as the gas itself.

It cannot be denied that at the first glance this will be admitted to be rather a "staggerer," as Mr. Richard Swiveller would say. One has encountered so many improved systems of gas lighting depending upon a special supply of air; and these have all done so badly in the long run, that one is decidedly inclined to regard this requirement in the Methven and Sugg system as something prejudicial to its success. The objection fades, however, upon closer study of the circumstances of the new system. It may be at once conceded that if all the paraphernalia of a separate air supply delivered to the point of combustion through pipes were required merely for increasing the illuminating power of a gas-burner by from 10 to 15 per cent., the prospects of such a system of improved gas lighting would be poor indeed. There is much more than this difference of duty between whole classes of gas-burners actually in use for public and private lighting; and the fact does not prevent a huge business being done in the less efficient burners. It is evident, therefore, that if this was all that could be claimed for the new system, it would be idle to expect that any number of consumers would think it worth while to obtain it at the expense of a second set of pipe-fittings

and an air-blower. Here, however, comes in the second clause of the invention, which has reference to ventilation. The dry-air supply can, of course, do good service in connection with any kind of burner; but as it depends essentially upon a question of temperature, those burners that display the effect of raised temperature most conspicuously are naturally those to which the Methven system is most applicable. These are the regenerative burners. Not only are burners of this class best adapted for showing the economy of heat due to drying the air required for combustion, but they also lend themselves very conveniently to being supplied with air by some special means. They ordinarily take their air at a certain point, and through small holes in a plate well up out of the way of the light; so that it is no trouble, nor does it interfere one iota with the general appearance of the lamp, to cover the air-holes with a chamber in connection with an air-supply system. How material this consideration is, may be perceived by referring to the case of ordinary open Argands and flat-flame burners, and trying to hit upon a plan for supplying these with air delivered from a pipe, without spoiling their appearance. Similarly also, the regenerative lamps are, as it were, made for emptying their products of combustion through chimneys communicating with the outer air. The simple, but, under ordinary circumstances, frequently the insuperable difficulty in the way of rendering this class of gas-burners self-ventilating, lies in ensuring a constant, sufficient, but not excessive draught from the point of combustion to the outer point of discharge. Large and expensive flues, laid with all possible regard to the demands of the effluent gases, do not always succeed in inducing them to go in the way desired. Sometimes it is all right; but it is often very much the reverse—and what is a greater trouble than a ventilating burner that obstinately refuses to ventilate? Here comes in the great utility of the separate air supply. The air is delivered to the point of combustion at a very little above the ordinary atmospheric pressure. There is nothing like a blast, which therefore distinguishes this from previous attempts to which it may be superficially likened—such as the Clamond or the Lewis system. Slight as the increase of pressure may be, however, it is a positive constant impulse which, coming as it were behind the heated gases escaping from the burner, irresistably pushes them forward and out at the appointed outlets. The effect of this is seen in the fact that the tubes conveying the waste products of combustion from the most powerful regenerative burners may be laid almost anyhow and taken anywhere, with the sole proviso that a drain shall be made for the escape of the water of combustion, which rapidly condenses in the flues. The ventilating burners must act properly; no back-current being possible, because of the steady push of the fresh dry-air supply. The result of all this is that in a library or public hall the pure, abundant, cheerful, and reliable light of gas may be obtained without involving the contamination or over-heating of the atmosphere by the products of combustion; and this without running any risk of a reversal of the currents, though a hurricane might blow outside. Natural ventilation—that is to say, ventilation by means of exhaust flues—may answer very well sometimes; but where it will not serve (which is often) what is to be done that can be called better than this? Here we have a combination of perfect ventilation with an additional 10 to 15 per cent. of light thrown in.

Of course, there are many ways in which the supplementary air supply can be obtained. In most great public buildings there is steam or gas-engine power to blow the bellows of an organ or perform other work; and this can be made to supply air for the Methven-Sugg system of lighting at but nominal cost. Where neither steam nor gas power is available, a water motor can be easily fitted up for this service. At Messrs. Sugg and Co.'s factory the system is shown working in a cellar, which is brilliantly illuminated by Cromartie lamps, and would soon become unbearably hot but for the complete ventilation. Here the air is driven forward by a pair of alternating bellows worked slowly by a water motor, which arrangement is very suitable for general shop or warehouse use. It is quite automatic. Turning off the lamps causes stoppage of the motor, which starts again as soon as any air is drawn off for the lamps. A large Cromartie lamp gives a most brilliant light, with a consumption of 20 cubic feet of gas per hour; the duty being after the rate of 11·37 candles per cubic foot when burning with undried air. Supposing the improvement of light due to the drying of the air to be only 10 per cent., this lamp would give a duty of 12·50 candles per cubic foot. As, however, carbonic acid as well as moisture are arrested by the Methven system, it would be probably safe to say that, with such a large lamp as the above, the improvement would be at least 15 per cent. on an average, which would raise its duty to 13·06 candles per cubic foot with nominally 16-candle gas. This we believe to be an unparalleled result. Air is supplied to these burners at the rate of 10 cubic feet to the cubic foot of gas. Supposing every 10 cubic feet of air to contain 2 cubic feet of oxygen and 8 cubic feet of nitrogen, it will become apparent how great must be the difference to any gas-burner between receiving this supply, including so much useless diluent, pure and dry, instead of damp and foul. At the factory, every facility is afforded for following the course of the air and gas and waste products. Meters and pressure-gauges are fixed to the two services, so that an observer may make his own tests, and draw his own conclusions upon the results. It should be remarked that one essential point in the success of these experiments has been the governing of the air as well as the gas at the point of combustion. Air, of course, has no self-propelling power that can take it, like gas, to every part of a complicated

system of pipes. It must be propelled by sufficient power behind it, so that the air-pipes may show a pressure of 2 or 3 inches near the bellows, which only gives about a tenth at the last burner. Hence all the burners must be governed. We understand that the system is to be exhaustively tried on a large scale in several places, notably in the Crystal Palace theatre, where it is expected to realize considerable economy as well as greatly increased comfort and security behind the footlights. It goes without saying that the first cost and working expense of the system are both much below that of any system of electric lighting, with which alone it can be properly compared. It should be stated that although the system only contemplates in the first place the ventilation of the gas-burners, it is only a question of enlarging the air-propelling part of the plant to enable it to supply fresh air, heated or cooled according to the season, to any part of an auditorium or other interior. All these advantages require to be fairly weighed when the prospects of the system are investigated.

SERIOUS ILLNESS OF MR. G. W. STEVENSON.—The professional friends of Mr. George Wilson Stevenson will be grieved to learn that he is now completely laid aside from work by a complication of disorders, prominent among which are congestion of the lungs and heart disease. Upon inquiry at Mr. Stevenson's offices yesterday, we were informed by Mr. E. Herbert Stevenson, who has been for about five years associated with his father, that no favourable change had taken place, and that his condition was such as to preclude the hope of his ever being able to resume the position in the gas engineering world which he has hitherto occupied.

PRESENTATION TO MR. W. R. CHESTER.—On the occasion of Mr. Chester visiting the Bradford Road works of the Manchester Corporation last Saturday, for the purpose of introducing the new Manager (Mr. S. Barratt, of the Rochdale Road works, who will henceforth have charge of the two stations) the *employés* took the opportunity of presenting him with a handsome tea-urn and an illuminated address. Mr. Tatton, the assistant, in presenting the testimonial, referred to the great esteem in which Mr. Chester was held, and the regret the workmen felt at parting with him. He said he was a pre-eminently truthful man, and he would have the truth from those that served under him; and they all hoped he would be long spared to render the same valuable services to Nottingham that he had done to Manchester. Mr. Chester, in reply, said the handsome piece of plate and the testimonial containing so many signatures were more than he expected or deserved. If there had been any shortcomings on his part during the years he was with them, he hoped they would overlook them. He had always tried to do his best between man and man, his employers and the *employés*. He would always look back with pleasure to his association with them, especially with regard to their Mutual Aid Society, to the funds of which he would still contribute. He concluded by thanking them all for the kind wishes they had expressed for himself and family.

THE GLASGOW CORPORATION AND THE PARTICK, HILLHEAD, AND MARYHILL GAS-WORKS.—As will be seen from the report in another column, the proposal to transfer the works of the Partick, Hillhead, and Maryhill Gas Company to the Glasgow Corporation Gas Commissioners came formally before the Town Council last Thursday, but was considered with closed doors. The negotiations in connection with the transfer have been going on since February last year; but in quite an informal manner. Eventually, however, the two parties to the negotiations were enabled to arrive at a common understanding on the matter; the result being the presentation to the Town Council of the report which is given in full elsewhere. The minutes embodying this report formed the basis of the discussion *in camera*. A full statement was made by the Lord Provost (Sir J. King); and the Town Clerk (Sir J. Marwick) read a report which had been received from Mr. T. Hawksley as to the value of the works of the Company as a going concern. He also submitted a report on the same subject from Mr. W. Foulis, Engineer-in-Chief to the Gas Commissioners, who made a comparison between the terms agreed upon in the negotiations and those paid to the Glasgow Gaslight Company and the City and Suburban Gas Company, when the gas supply of the city and suburbs passed into the hands of the Corporation in 1869. Whereas the price paid to the two Companies in that year was about £35 per million cubic feet of gas manufactured, the price agreed upon with the Directors of the Partick, Hillhead, and Maryhill Company is only about £23 or £24 per million. Some opposition to the terms mentioned was offered by Bailie McFarlane, a prominent member of the Gas Committee, who held that the price was £60,000 in excess of what it ought to be. As stated elsewhere, no resolution was come to; the desire being to have a full and unfettered discussion of the matter in all its bearings. The question will, however, come up again next Thursday at an open meeting of the Council, when it is anticipated that a decision will be arrived at so far as the Gas Commissioners are concerned; but, of course, it will have to come before the Company's shareholders. The subject was freely discussed during last week, both on 'Change and by the citizens generally; the prevailing feeling among the members of the Council being to accept the proposals of the Sub-Committee by whom the negotiations were conducted. In the event of the forthcoming Boundaries Extension Bill being passed, and the purchase proposals being carried through, the works will at once become the property of the Gas Commissioners; but it is not expected they will be kept in their present state for more than a couple of years.

Notes.

AN INSTANTANEOUS BOILER.

MM. Serpollet Frères have introduced an instantaneous boiler for steam raising, which was described by M. Lesourd at a recent meeting of the French Society of Civil Engineers. The idea of the makers of this particular form of boiler was to prevent overheating and priming; and to this end they squeeze between two heated surfaces the globular drops as fast as they are formed, and so to bring them into immediate vaporization. For this purpose they employ a cylindrical tube of iron of convenient diameter and considerable thickness, which is passed through rolls at a temperature just below the melting point of the metal, so that it is flattened out, and the internal surfaces are brought as closely as possible together. The open space which is left in the interior of the flattened tube appears in cross section as a black line of the thickness of a hair. The tube thus prepared may be bent into any shape most convenient to the space in which it is to be heated—as circular, square, or oblong spiral—each end being connected to a tube, the one an inlet for water, and the other an outlet for steam. The boiler is then complete and ready to work. It is heated up to about 250°C ; and when water is forced into one end, steam is collected at the other under a pressure, and with a degree of dryness, according to the temperature. The water-feed is supplied by a small force-pump, and it is stated that any matters dissolved in the water are reduced to an impalpable powder, and expelled with the steam. The arrangement for the feed water is made to regulate itself, which it does easily, and apparently with a very methodical utilization of combustible, which, however is admittedly a question to which M. Lesourd must return when further experiment has determined the necessary data. The maintenance and supervision of the boiler will be reduced to nothing, since it does not contain any riveted joints or a safety-valve. In the extreme case of rupture of the tube, there would not be any projection of the tube or its contents, because the steam exists in too small a volume to possess any projective power. In recent trials made before the *Ingénieurs des Mines*, the tube was not ruptured, although the steam-pressure was pushed to about 800 atmospheres. For small and domestic motors, this type of boiler is claimed to possess many advantages, as it will make steam machinery as safe and easily looked after as gas-engines. For small boilers of from 0.5 to 2 horse power, the tube before flattening is 55 millimetres in diameter and 11 millimetres thick. After rolling, the internal water space measures 0.1 or 0.2 millimetres in width. A 1-horse power boiler, when finished, is a tube 2 metres long, 0.105 metre high, and 0.022 metre wide, weighing 32 kilos., and offering a heating surface of 0.48 square metre. Its internal capacity is only a few cubic centimetres; and the whole arrangement, with its furnace, weigh 130 kilos. This model evaporates 20 kilogrammes of water per hour with a fuel consumption of 3.750 kilos. It is intended to fit up these boilers and furnaces with engines and dynamos on one base-plate for small electric light installations.

THE COMPRESSIBILITY OF GASES.

M. Amagat has communicated to the *Comptes Rendus* some observations upon the compression of gases—comprising oxygen, hydrogen, nitrogen, and air—to pressures reaching 3000 atmospheres. The author remarks that his results differ considerably from those published by Natterer, since for the same reduction of volume of the gases observed, he has generally found the pressures to be very much greater than those given upon Natterer's authority—a result which he ascribes to the probable and even inevitable errors of the processes adopted by that experimenter. M. Amagat finds that at a pressure of 3000 atmospheres, and at a constant temperature of 15°C ., a volume of the following gases which is equal to unity at the ordinary temperature occupies the following spaces:—Air, 0.001401; nitrogen, 0.001446; oxygen, 0.001235; hydrogen, 0.000964. Under extreme pressures, oxygen, nitrogen, and air have nearly the same compressibility, which is according to the room occupied by the liquids. At 3000 atmospheres it is about equal to that of alcohol under the normal pressure. The compressibility of hydrogen is much greater—nearly double, in fact. At 3000 atmospheres it is nearly equal to that of ether at about the normal pressure. The densities of these gases when compressed to 3000 atmospheres are given as follows by M. Amagat, water being taken as unity:—Oxygen, 1.1054; air, 0.8817; nitrogen, 0.8293; hydrogen, 0.0887. These values have been determined by assuming the number generally admitted for the compressibility of the glass envelopes of the liquids.

THE HARDENING OF MORTARS AND CEMENTS.

In an article recently published in the *Engineer*, the hardening of hydraulic cements is discussed from the chemical point of view. It is remarked that many of the substances commonly known by this description are mixtures of considerable complexity, and that the most reasonable method of investigating their behaviour in regard to setting or hardening is to examine every constituent or individual compound separately, in order to discover how the combination of these constituents acts when they are all mixed together. Plaster of Paris is the simplest of this class of substances, consisting as it does of baked or burnt gypsum, setting into a hard mass when mixed with water. The only chemical change effected in gypsum by heating is deprivation of the water which it contains in its native state as a stable crystalline form of hydrated calcium sulphate. In the process of setting, the particles of

plaster which come into actual contact with the water are immediately converted into particles of gypsum, which dissolve in the water; but the water very soon becomes supersaturated with gypsum, and consequently crystallization suddenly takes place, with deposition of the gypsum in a peculiar form of crystal, and setting free more water to take up more gypsum to be crystallized out in turn. These crystals assume the form of extremely attenuated needle-like prisms, which unite to constitute little spherical groups. These groups of very fine crystals fulfil all the conditions for forming a hard mass of gypsum out of the plaster and water, inasmuch as they expose a great surface for extensive adhesion, and permit of much interlacing. The next cements in order of simplicity are aerial cements and mortars, consisting of mixtures of slaked lime and sand. Neither slaked lime nor sand undergoes any chemical change when mixed with water by itself; but some change is produced when they are mixed together in the presence of water. Little or no chemical change takes place under the circumstances. The hardening of these cements is attributed in the first instance to mere desiccation; the sand acting simply as a binding material to prevent crumbling and cracking. Aerial mortars undergo in time a second hardening, due to the action of the carbonic acid of the air, which results in the formation of carbonate of lime. The action of hydraulic cements and limes and puzzolanas is a much more complicated matter. In mere mixtures like the aerial mortars, silica and lime neither combine with one another nor act under water; but in hydraulic cements they do both—showing that they exist in the latter in other conditions. The great difference is that, whereas in aerial mortars both the lime and the silica are in the free state, in hydraulic cements these substances exist in chemical combination as silicates of lime. The setting of cement depends upon the liberation of calcium hydrate and the formation of hydrated silicate, which does not decompose in the presence of the calcium hydrate, but goes through the various changes culminating in the production of extremely attenuated prisms, exactly as in the case of plaster of Paris.

THE MANAGEMENT OF THE HALIFAX GAS-WORKS.—There were 38 applications for the post of Gas Engineer and Manager to the Halifax Corporation, rendered vacant by the resignation of Mr. W. Carr. These were reduced to four; and last Friday the Gas Committee made their final selection—Mr. Thomas Holgate, F.C.S., Manager of the Batley Gas-Works, being appointed.

THE TOWN CLERKSHIP OF SALFORD.—Mr. S. Brown, Town Clerk of Rotherham, has been appointed Town Clerk of Salford at a salary of £1000 per annum, in succession to Mr. John Graves, who, it will be remembered, has absconded. There were 72 applicants for the appointment; and these were reduced, by a Special Committee, to three, whose names were submitted to the General Purposes Committee. After a sitting of two hours, they selected Mr. Brown.

AWARDS AT THE BRUSSELS EXHIBITION.—Among the awards to the British exhibitors at the Brussels Exhibition we notice the following:—Gold Medals: Doty Lighting and Heating Company, Limited, for petroleum-lamps; the Fourness Regenerative Lamp Company for gas-lamps; the Wenham Company, Limited, for gas-lamps. A diploma of honour has been awarded to Mr. S. Lee Bapty, who has had the entire supervision of the British Section of the Exhibition, which, it may be remembered, was the first to be completed.

ACCOUNTS OF GAS COMPANIES AND CORPORATIONS FOR 1887-8.—Just before going to press we received a copy of the "Analysis of the Accounts of Gas Companies and Corporations for 1887-8," published by Mr. John Allan. Of course, we have not had an opportunity of verifying the accuracy of the figures; and can therefore only say that the accounts of thirty-four of the principal Gas Companies and Corporations are dealt with, and that in general appearance the book is similar to that issued last year, of which a notice appeared in the *JOURNAL* for Sept. 20 (p. 535).

THE BIRMINGHAM ELECTRIC LIGHTING SCHEME.—After the election of the Mayor and the transaction of ordinary business, the annual meeting of the Birmingham Town Council on the 9th prox. will be made special, to consider a notice given on behalf of Messrs. Chamberlain and Hookham of their intention to apply to the Board of Trade for a Provisional Order empowering them to supply electricity for public and private purposes in the area within the jurisdiction of the Council, to determine whether the Council shall consent to or oppose the grant of such Order, and to authorize the General Purposes Committee to take measures for carrying out the decision of the Council.

AMERICAN GASLIGHT ASSOCIATION.—As already announced in the *JOURNAL*, the annual meeting of this Association will take place at Toronto this week—the proceedings opening to-morrow with the Inaugural Address by the President (Mr. T. Turner, of the Charleston Gas-Works), and extending till Friday, which day will be devoted to a drive round the principal parts of the city and suburbs. In addition to the papers mentioned in the preliminary programme of the arrangements for the meeting issued by the Secretary (Mr. C. J. Russell Humphreys), and noticed in the *JOURNAL* for Aug. 28 last, a communication on "Enriching Gas with Naphthalene," by Mr. A. Kitson, will be presented; and the latest forms of Herr Lux's gas-balance will be exhibited and described. The offer of a prize of \$25 by the Association for the best paper on "Naphthalene" will be a special feature of the forthcoming meeting.

Communicated Articles.

DISTRICT ASSOCIATIONS OF GAS MANAGERS.

By NORTON H. HUMPHREYS, Assoc. M. Inst. C.E., F.C.S.

It is only a short time since that a flagging in the spirit and vitality of Gas Managers' Associations appeared to be prevailing. A feature at almost every meeting was a complaint from the Chairman as to the difficulty of obtaining papers; and many persons formed an opinion that every debatable topic in connection with our industry had been talked to death. But lately a change has been noticeable. Not only have existing Associations shown signs of vigorous existence and growth, but there has been a growing sense, both in Europe and the United States, in districts unrepresented by the Gas Managers' Association, as to the desirability of remedying this defect. The result has been the formation, within the space of a year or so, of the North of Ireland, of the Eastern Counties, of the South-West (U.S.A.), and of other Associations. The writer has been brought very intimately in contact with the working of a Gas Managers' District Association for several years past, and proposes to note in this article a few ideas thereon that have occurred to him as the result of his experience.

The main, indeed one might almost say the sole object of District Associations, is the holding of meetings. Incidentally, they are capable of discharging other useful offices, as circumstances may necessitate from time to time; but the meeting is the chief idea. It may therefore be taken that the prosperity of the Association as a body will be influenced by the success of the meetings. If we ask, What constitutes a successful meeting? the answer will be, "Good discussions." The Gas Managers' Association is not a medium for the advertisement of innovations or new processes, although everything in the way of advancement most appropriately forms subject-matter for the meetings. Papers of a historical or instructive nature are usually preferred in print, as they can be studied at home at leisure; and it is not worth while to incur the expenses and loss of time attendant upon a journey of 50 miles or more merely for the sake of hearing papers read which will afterwards be published. So the chief attraction in the proceedings must necessarily centre round the discussions, though it occasionally happens that a member is in a position to contribute an interesting paper, usually bearing on some little "wrinkle" that he has originated, and which does not admit of, or call for discussion. A paper of this nature may appropriately be called a "communication;" and there is a very general disposition to regard the papers read at District Association meetings as communications, rather than as the openings of discussions. So much is this the case that even the substitution of the term "Mr. will open a discussion" in place of the well-worn "Mr. will read a paper" in the programme has proved to be of but little avail in removing it. Yet it is generally recognized that the object of a paper is the commencement of a discussion. The very common intimation in the opening of a paper to the effect that a good discussion is hoped for, and is likely to prove of greater value than the paper itself, is more of an honest statement of opinion than a conventional expression of modesty.

Although the prominent place occupied by "the discussion" is generally admitted, it is very seldom that a really good discussion takes place. In a meeting of about, perhaps, 50 members, the number of speakers, even on every-day subjects to gas engineers, will frequently not exceed half-a-dozen. Let us refer to the proceedings of The Gas Institute, and speculate upon how often the number of speakers in a discussion exceeds (say) 5 per cent. of the number present. Pursuing the subject further, it will be found that there are very few "speakers" in gas engineering circles. Those who habitually take part in discussions belonging to more than one, or perhaps more than two Associations; and therefore contribute to several discussions, perhaps a dozen or so, in the course of the year. So that if we take out the names of speakers, and compare them with the number of names on the members' lists, it will be found that a very large proportion of the whole are literally silent members, and the gas circles generally are indebted to an exceedingly small body—numerically speaking—for the maintenance of the discussions at our several District Association meetings. The reason of this is not very far to seek. The nature of the occupations and habits of life followed by gas engineers are not such as are likely to develop freedom of speech in public. Yet it is impossible not to regret the loss of much useful information, and of increased interest to the proceedings, that is caused by this general reticence. I would say to those silent members, who really appreciate the value of District Associations and the work done by them, that one of the best things they can do to further their growth and prosperity is to make a determined effort to come out of their shells, and take part in the discussions. Look over the proceedings beforehand, and make a few notes bearing upon any items of interest that may occur to you, in connection with the various subjects that have come within the range of your experience. A set speech is not expected. Only a few plain statements, preferably of facts. Which is the most interesting, half-an-hour's speech from a windy member, or the same period of time divided amongst ten speakers, averaging three minutes each?

A very prevalent drawback in the discussions is a lack of freedom. Members who are known to have an intimate acquaintance with the subject under debate, on being subsequently questioned as to the reason of their silence, confess that their experiences do not support the views set forth in the paper; and they do not wish to take up an aggressive attitude. The reader is a friend of theirs;

and they seem to labour under the belief that anything in the way of adverse criticism will in some way detract from the prestige attaching to the paper. But this is a mistake. The reader of the paper would certainly not wish to limit legitimate discussion; and if the experiences of each gas manager ought to agree on all points, where is the use of these Associations. Yet it often happens that a large portion of the so-called discussions consists of vapid compliments to the author of the paper. The more freedom about the discussions the better, provided, of course, that the personal element is left out. Personalities are not wholesome for the Association, notwithstanding the fact that they are by far the most efficient means of drawing a good attendance. Let it be known that a determined and eloquent attack is to be made upon someone or other, and the room is sure to be crowded; and this without any prominent notice of the fact upon the *agenda* paper.

Another benefit supposed to be afforded by these Associations is that of obtaining aid in difficult matters. It has always been a favourite idea with promoters that any member who is troubled with a knotty point in the course of his every-day practice should be able to submit the same at the next meeting, and receive useful information thereon. This is scarcely ever applied in England, though it finds great favour in the States, where the "question-box" is an important feature at each meeting. A member sends his question written to the Secretary; and at some convenient period, usually after the papers have been read and discussed, the President takes the list of questions submitted, and puts them to the meeting *seriatim*. If he is aware that any particular member is specially familiar with the subject under consideration, he calls upon him for a reply. But it is as difficult in England to get anything for the question-box as it is to promote *impromptu* discussion, should an unexpected hitch in the proceedings leave a portion of time in the meeting to be filled up somehow or other.

The responsibility of providing a programme or *agenda* that will occupy the whole time allotted for the meeting in the most profitable manner possible, devolves upon the Committee of Management. This is usually compiled and issued to the members in advance, and is of considerable importance, as the *agenda* is taken in a sense as a forecast of the quality of the proceedings, and as such influences the attendance. The more promising the items, the greater the inducement to put in an appearance at the meetings. Consequently, the proceedings must follow a set form and order. Free conversational discussions and absence of formality are very good things in the abstract, but the members look for the *agenda* paper; and this, of course, controls the order of proceedings in some degree, and occasionally necessitates the application of the "closure" from the presidential chair.

A great deal might be said as to the form of paper most likely to "take" at a District Association meeting. Anything in the way of a communication is limited only by the importance of, or interest attaching to the subject dealt with; but a paper put forth in the hope of arousing a discussion must, in order to be successful, follow more definite lines. It will be sufficient, in order to illustrate this point, to take a copy of the last issue of the "Proceedings of District Associations," select any paper that aroused a fair average discussion, and then underline or otherwise mark each paragraph or sentence that came for notice. We should find that the opening historical *résumé* had better be conspicuous by its absence. If admitted at all, it should be very brief. Then there need be no attempt at exhaustiveness. A fragmentary character is no drawback at all, provided the facts are plainly set forth. Indeed, any attempt to raise the paper to the level of a finished literary production will usually tend to tire and bewilder the listeners, on account of unnecessary diffusiveness. Ornaments of composition, finished and rounded paragraphs, and other things that are looked for in a review or a magazine article, are out of place in a paper intended to be listened to rather than to be read. Many papers err in attempting to cover too much ground. One or two points, concisely but clearly set forth, are more likely to attract attention than a large number of suggestions thrown out broadcast in the hope that one or two of them will take root and bring forth a good discussion. Diagrams or tables are a great help in discussions. They are usually fixed before the commencement of the meeting; and therefore receive attention at odd moments before the paper is read. But in this item, as in the matter of the paper, care should be taken to avoid overloading. While a good discussion is looked for, it must be remembered that anything like a long one is rarely desired.

I regard it as essential, either that the paper should indicate the tone of the discussion, or else that the President or the first speaker should undertake this office as soon as the paper is read. A good practical paper often falls flat on the meeting, simply because the audience do not clearly understand the points they are called upon to discuss. An awkward silence follows, only broken by a simple inquiry, or a few commonplace remarks, thrown in to the gap by somebody, in response to a request from the Chairman. On the other hand, it will often be seen that a discussion will be aroused, after an obviously deficient paper, by a few skilfully put remarks from the chair or from an experienced speaker. The line of thought taken up by the first two or three speakers will often determine the extent and direction of a discussion with greater force than the paper itself; so it is a good plan to get one or two members ready primed to follow on briskly immediately after the paper is read. Yet after every precaution, it is extremely difficult to forecast the length or character of a discussion. In the first place, the gentleman best qualified to take part may happen to be unavoidably absent. But with everybody present, the sense or pulse of the

meeting varies from minute to minute; and it does not follow that, because a paper is passed over with scant notice, it is necessarily deficient in some way or other. On account of some inexplicable reason, it may not suit the passing humour. The meeting may be heavy, dull, sleepy, over-exhausted by the previous topic, or expectative and reserving of force in anticipation of something that is to follow. So those who find that their efforts to promote a discussion are practically a failure may appropriately take comfort in the fact that it by no means follows that the best papers lead to the best discussions.

So far it has been assumed that the object in view, on the part of each member, is that of assisting in the proceedings at the meetings. But now we have to face the fact that a good number, perhaps one-half of the whole, or more, are not sufficiently interested, or do not feel themselves competent either to contribute papers or to take part in the discussions. This leads to another point—viz., that these Associations are hampered by two growths of a parasitical character, which, unless kept under proper control, are liable to sap the vitals of the whole. These I will call the recreative element and the trading element respectively. As regards the first-named, it must be admitted that the proverb "All work and no play" applies with great force to Gas Managers' Associations. The act of attending the meeting, and possibly taking a journey over new ground for the purpose, is of itself a pleasing recreation—a break in the monotonous round of duty which is the usual lot of the gas engineer. Then the gathering affords an opportunity, which does not occur in many cases at any other time, of meeting kindred spirits, and enjoying the congenial society of "brother chips." Therefore the social and the recreative elements should be allowed a fit and proper place in the affairs of the Association. Yet it must be remembered that these things always show a tendency to encroach. It is such a simple matter to adjourn the meeting half-an-hour before time, in order to enable a visit to be paid to a place of interest in the neighbourhood. Perhaps a paper must be postponed in consequence, or taken as read. Well, it will appear in the proceedings, or there will be plenty of time to take it at the next meeting. Or perhaps a little bit of sophistry to the effect that the members will be better able to deal with it at the succeeding meeting is brought in. Unless kept in check, the recreative element may get the upper hand, and cause the real objects of the Association to be obscured and lost sight of.

As to the second "parasite," the District Associations proper have very wisely exercised considerable vigilance in keeping traders out of their members' lists. I say "District Associations proper," because I regard The Gas Institute as being practically analogous in constitution to a District Association. Notwithstanding its change of name, it remains to all intents and purposes an Association of Managers. This class remains its chief support; and the aid extended to it from other sources is too evanescent to be of much real good. Incidentally it has been able, by the medium of the influential names included in its list of members, to render useful aid to the gas industry at large; but the main object and interest continues, as in the District Associations, to centre round the proceedings at the meetings. It grows, if one may use the expression, upon the same kinds of food as are conducive to the development and welfare of the District Associations, and conditions that prove disadvantageous in the one case are found to be so in the other. The heads of firms of structural engineers and contractors, who undertake the erection of gas-works complete, would no doubt derive great assistance and benefit from the proceedings; but manufacturers of tools, wrought-iron pipes, meters and gas-fittings, vendors of coals, oxide, paint, and other commodities required at the gas-works, cannot be interested in them in any other than a general way. The District Association is, to them, an indirect advertising medium; and their object in attending the meetings—and I do not say it is not a legitimate one—is the pursuit of business. The presence of the trading element to any considerable extent, simply means that a considerable portion of the time nominally devoted to the proceedings and interests of the Association, will be occupied in other ways. The member who expects to include two or three business interviews of a more or less important character in the same day's work with the Association meeting, is neither likely to derive much benefit himself—that is, of the kind that his membership is supposed to afford—nor to assist the progress of the Association. The proceedings will be disturbed by the continuous exit of those who have not time to sit out the meeting, and the entrance of others who could not manage to be present at the commencement.

No doubt there are many members whose engagements and circumstances prevent them from taking an active part in the meetings; but there are others who merely join from a hazy sort of notion that the Association is a good thing, and ought to be kept up, or because the periodical outing to attend the meeting is an agreeable change, or possibly because they regard the matter in a business sense, and find the Association a means of combining business with pleasure. Whatever the reason, they are, of course, gladly welcomed; as their countenance and subscription assist in the support of the Association. But unless there is an inner circle who take higher views than this, and are willing to do what they can in the way of contributing papers, joining in the discussions, inducing others to attend the meetings, &c., no Association can hope to go on and prosper. I have for some time observed that views of this nature appear to present themselves to those who pass the presidential chair. Looking round upon our Associations, it will be found that the Past-Presidents are always much to the fore in reading papers, joining in discussions, &c. Another reason

for this is that the presidential chair is a sure cure for natural timidity and reticence. Having once been compelled to brace up courage to take the awful plunge and address the meeting, there is quite an "at home" feeling in doing so afterwards. I am inclined to think that natural timidity is a greater drawback than one would suppose, and that if it were possible to hit upon some plan, by virtue of which every new member would be compelled to address the meeting, impromptu, for five minutes, repeating the process at each gathering until it was found that he could do so with perfect comfort to himself, a great impetus would be afforded to the discussion department.

There are several questions connected with District Associations that are purely of a local nature; and therefore cannot be treated of in a general way. The geographical circumstances, and means of travelling will, of course, affect the attendance at the meetings. Some districts are fortunate in possessing one or more good centres, easy of access from all parts, others are not so fortunate in this respect. The area of the district is also a matter of importance. It may be 300 or 400 square miles; and it may be ten or twenty times as much. All these things have to be considered in fixing upon the periods between each meeting, the time and length of the meetings, &c.

THE GUIDE-FRAMING OF GASHOLDERS.

FOURTH ARTICLE (concluded).

In finishing this series of articles, it is the author's intention to briefly refer to the class of

INDEPENDENT COLUMN GASHOLDERS.

Example I.

We will take a treble-lift gasholder having cast-iron columns 3 feet diameter, and three tiers of wrought-iron trellis girders, braced with light-ties, all of best workmanship and design, and subject to ordinary inland wind pressure

$$D = 150. \quad d = 105. \quad N = 18.$$

Now, to apply the formula $\frac{D \times d^2}{N \times C}$, we must first determine C. (See rules in present article.)

For three lifts and three tiers girders =	300
Add one-fifth for diagonal ties =	60
Add stiffness of cups, &c., one-tenth =	30
	<hr/>
	390

Deduct for shallow girders unbracketed, one-fifth	60
	<hr/>
	330 = C.

The bending moment is therefore,

$$\frac{150 \times 105 \times 105}{18 \times 330} = 278 \text{ foot-tons.}$$

The moment of resistance of a cast-iron column 3 feet diameter, $1\frac{3}{8}$ inch thick, by the rule

$$\frac{A d}{1.6} = \frac{150 \times 3}{1.6} = 281 \text{ foot-tons.}$$

which is practically what is required. But to allow for inaccuracies in casting, contraction strains, &c., it would be as well to make them (say) $1\frac{1}{2}$ inches thick at the base.

Example II.

If the same size gasholder as the last be constructed with 18 wrought-iron framed standards (I shape), instead of cast-iron columns, C in the formula must be reduced to 300, to allow for the flexibility of the standard sideways, &c. This will increase the bending moment to 306 foot-tons. Now, supposing the standard to be 5 feet deep from back to front, we have $\frac{3}{8}$ " = (say) 61 tons strain on one flange, which, at 5 tons per square inch, gives at least 12 square inches required. This may be met by a 12-inch by $\frac{3}{4}$ -inch table plate, and two angle-irons 4-inch by 4-inch by $\frac{3}{8}$ -inch, which together would give, after deducting rivet-holes, &c., about 12 square inches effective area.

NOTE.—The only objection to I shape standards is that they lack lateral stiffness. Diagonal bracing should, therefore, be adopted; and either the distance from tier to tier of the girders should not be too great, or the bracing between the standards should be double. Standards should also be strutted to the girders horizontally.

T-shaped standards are much in favour, because they are very stiff sideways. The front member does its share of the work, and relieves the diagonal ties of much strain. In fact, the standard becomes a double one, so to speak. It offers resistance both radially and tangentially; and in determining R, the resistance of the two members, both front and back, must be added together. But in doing so, only half of the theoretical resistance of the front member should be taken as effective.

CONCLUSIONS.

Having now given the method of determining the strength, or, in other words, the stability of a gasholder, and illustrated it fully by examples, we are in a position to answer for the safety of any existing structure, or, on the other hand, to design any gasholder having one or several lifts, with either partial or complete guide-framing.

The height to which the guide-frame must extend, we find does not depend upon considerations affecting the guide-framing itself; but it is limited rather by the bell or floating part of the holder.

We find that, as regards the guide-framing itself, it might very well stop short at the outer lift of any gasholder, no matter what size or how many lifts, because, when we leave out of consideration the help it receives from the stiffness of the curbs, cups, &c., of

the bell, the strain on the guide-framing is the same *theoretically* as it would be if the frame extended to the full height of the gas-holder. Practically, however, there is more liability to distortion; and consequently the rules given in the third article made provision for this. We may conclude that, as far as strength is concerned, it is not the guide-framing itself that draws the line for the reduction of its height; but it is the holder or bell working within it which decides the question.

As demonstrated in the second article, when treating of the bell, it is not safe to have more than one lift free in a three-lift holder, unless the curbs, cups, and sheeting are made abnormally heavy, to meet the severe racking strains, let alone the flexibility of the structure.

But apart from the question of mere strength and safety, there is that of expediency. Although we have determined that it is quite possible, under certain conditions, to reduce the height of the guide-framing as much as two lifts out of three, yet we must still ask, Is it practicable or workable? and, Will it pay?

The following are amongst the most serious objections:—

1. The extra weight of iron required both in the bell and the guide-framing would in all probability exceed the weight of the part of guide-framing done away with.
2. It is taking away weight from the still, stable guide-framing, and throwing it into the moving and working part of the holder. The delicately-adjusted light series of cylinders are then called upon to resist all the strains; and must therefore be converted into a heavy, stiff, framed girder, trussed wherever needed to make up for the abolition of external support.
3. The increased weight of the floating holder will give much greater back pressure upon the exhauster—a constant expense.
4. Racking and twisting strains are brought to bear upon the holder which it never suffers when the guide-frame reaches to the full height.
5. There is also much extra strain on all rollers, axles, and working parts, detrimental to its free easy working, and increasing the wear and tear.
6. The top curb must resist all distorting strains without assistance from the guide-framing, and *vice versa*.
7. Perfect adjustment of rollers, both inside and out, is an essential condition; and they must be maintained hard against the guides. This not only means extra trouble and expense periodically; but if neglected, it endangers the whole structure, and this means so much more anxiety for the manager of the works. In the old style of gas-holders, an inch or two of play would not be so dangerous as $\frac{1}{8}$ inch would in the new.
8. The thrust of rollers against the guides in the outer lift would be very great; necessitating stronger guides, rollers, &c., and outside rollers on the outer lift.
9. A gasholder having guide-framing the full height is much more handsome in appearance.

Many of the objections stated against the reduction of guide-framing by two lifts apply (although in a less degree) to its reduction by one lift. There would be no danger, however, if constructed properly; and it is a matter of calculation only as regards economy. The curbs, cups, sheeting, axles, carriages, &c., being increased and stiffened to suit, are set against the saving (if any) in the guide-framing, and possibly less labour in erection. The workmanship and erection must be very carefully watched, as so much depends upon perfect adjustment of all the parts.

In any case there would appear very little advantage to be gained by reducing the guide-framing; because the extra risk and anxiety, and constant costly examination necessary, would counter-balance much of the possible economy in the first instance.

To sum up then—

1. Each lift in any holder must exceed one-seventh of the diameter in depth.
2. It is not possible to make a reliable, healthy, and cheap, holder of three lifts, with two of them 'free.'
3. It is possible to make a three-lift holder with one lift free, and it may be cheaper; yet we find there are many drawbacks.
4. Gas-holders with guide-framing of less height than that of the outer lift (fig. 40) do not bear consideration in the light of the principles set forth in these articles. They must, therefore, be struck out of the category of practical engineering altogether.

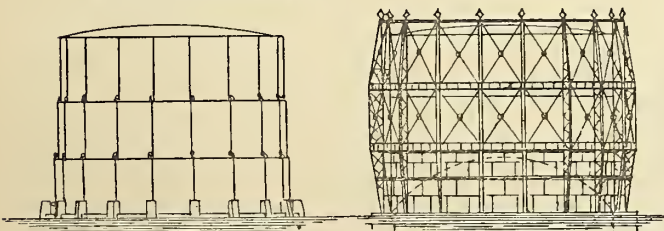


Fig. 40.

Fig. 41.

The following should be particularly noted:—If it were not for the buckling and distorting tendency of the gasholder and its framing, the columns or standards could be made very light

indeed—in fact, the sectional area of each would only need to be a few square inches; and as far as strength goes, it would be immaterial whether we made the guide-framing a simple cylinder of sheet iron, very thin, or divided the cylinder up into posts (standards) and connected these posts together with bracing of sufficient strength to make up for the absence of the thin sheet-iron web. The more we approximate to the merely theoretical requirements, the nearer we approach the simple thin cylinder, which, if we made the gasholder several hundred feet diameter, would answer the requirements of the ordinary formula for strength of cylindrical cantilever, if made the thickness of drawing paper! Of course, if it were not absurd from a practical point of view to act upon this, we should then have but little need of guide-framing at all—provided absolutely perfect workmanship and exact fit could be relied upon—because the gasholder bell itself would be excessively strong for the purpose, and a few feet of guide-frame, just to hold it in position, would be all that would be required. (See fig. 40) But we all know such a thing would not—to put it mildly—be very good engineering; and for one simple reason. No allowance is made for the buckling and distorting tendencies; and in all, especially in large structures, this becomes a very important item. It has been treated as such in these articles.

It may be asked, Why cannot the floating holder itself be so stiffened up internally and externally with vertical stays, strong girder rings, ties, &c., as to make external support (beyond a few feet at the base) unnecessary? As far as mere theoretical strength is concerned, it *could* be so; but it would be very impracticable for many reasons.

1. Because of the excessive weight to be thrown into the holder. It is, in fact, putting the weight of the usual external guide-framing into the framework of the holder, in order to resist distortion, &c.
2. The material is not so well disposed; having no base to stand upon.
3. The elasticity and variation in length of iron, &c.—leaving out other reasons—make it *impossible* to attain the absolutely necessary conditions of *perfect fit* and *perfect rigidity*.

These are only a few of many reasons, which have already been advanced in former articles against such a proposal.

It is perhaps necessary to remark that, although the force of wind to which a structure may be exposed cannot be given exactly, yet this does not affect in any way what we have done. All the doubt which may be expressed concerning the wind pressure acting on a gasholder is equally applicable to the wind pressure on a bridge, or any other large and exposed structure. The force of wind has to be met in both cases; but on that account we need not assume that it is impossible to determine the strains on either the one or the other. All we have to do is to determine the strains due to what we consider the maximum uniform wind pressure that is ever likely to come upon it. This may be 20, 30, or 40 lbs., whichever we please; it makes no difference to the method. In our case we have taken about 30 lbs. as the maximum, and constructed all the formulae accordingly; and, of course, if the structure defies the maximum, we need not trouble ourselves about the lesser strains—they are covered by it. It is a very simple matter to modify the formulae to suit any desired wind pressure.

In conclusion it has been the author's endeavour to accomplish the following:—

1. To show, in the simplest possible manner the principles relating to strength of gasholders, and the manner in which they are affected by varying the design.
2. To give ready rules for determining the strains on the guide-framing for gasholders under different conditions; also the floating holder, as far as it is affected by alteration in the guide-framing.
3. To show the extent to which the present guide-framing can be modified as regards height; and the advantage or disadvantage likely to result from such practice.

*** Note on Mr. Gadd's Gasholder.*—It is, of course, evident that the method of determining the strains demonstrated in these articles, refers to gasholders having *vertical* guides. Since these papers were written Mr. Gadd has proposed to construct gasholders with *inclined* guides. This is a radical departure from all previous practice, and involves a somewhat different method of treatment; it being asserted that, with inclined guides, the base of the holder will always be maintained in a horizontal position and may be considered as "fixed."

We have received from the Secretary of the Institution of Civil Engineers (Mr. J. Forrest) a list of the subjects suggested for original communications to be read and discussed at the ordinary meetings of the Institution in the forthcoming session. Among them are the following, in which our readers are specially interested:—"The Best Combined System of Warming, Ventilating, and Lighting Large Buildings." "Central Station Electric Lighting." "The Sale of Water by Measure." "The Effect of Wind upon Structures, as influenced by (1) their Superficial Area, (2) the Form or Position of the Exposed Surfaces, (3) the Shelter of Adjacent Bodies, and (4) the Dynamic Action of Sudden Gusts." "The Petroleum Engine and its Applications." "The Application of Electricity to the Purification of Water and Sewage." For approved papers, the Council of the Institution award premiums, arising out of special funds bequeathed for the purpose.

Technical Record.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

The Twenty-third Half-Yearly Meeting of this Association was held last Friday, in the Offices of the West Hartlepool Gas and Water Company. The PRESIDENT (Mr. T. Bower, Engineer of the Company) occupied the chair; and there was a good attendance of members and friends.

The HONORARY SECRETARY (Mr. W. Hardie, of Newcastle-upon-Tyne) having opened the proceedings by reading the notice convening the meeting,

Mr. FISHER, the Chairman of the Hartlepool Gas and Water Company, said he would not detain the members long; but he craved their indulgence for a few minutes in order that he might say a word or two. On behalf of the Company, he had very great pleasure in according to them a cordial and hearty welcome. He remembered their last visit to the town, which, he supposed, was about seven years ago. Many changes had taken place since then. Old faces had passed away; and new ones appeared among the members. On the occasion of their previous visit, they selected for their President their much respected and esteemed friend Mr. Trew-hitt, the Secretary; and there was associated with him one who had passed away—his lamented friend Mr. Mossman, the Engineer. He was very pleased to find that they had this year done honour to their Engineer (Mr. T. Bower), by selecting him as their President. Mr. Bower was one who, although comparatively new to the district, had already won golden opinions. West Hartlepool had made considerable progress during the last seven years. Many of those who were there before would have noticed that the town had very much extended, and that the gas-works were also a great deal larger. The two were very much bound up with each other. Prosperity to the town meant prosperity to the Company; and *vice versa*. The town was restricted on the north-east; but on the south and west it had extended very much. It had also improved its standing. They had now attained the dignity of a borough and a Corporation. Their first Mayor—a Jubilee Mayor—was now presiding over the town. They would probably not have an opportunity of meeting with him; but he was sure the Mayor would have extended to them on behalf of the town, as he (Mr. Fisher) did on behalf of the Company, a very hearty welcome. He thanked them again for choosing West Hartlepool as their meeting place.

NEW MEMBERS.

The following gentlemen were admitted to the Association:—As Members: Mr. Herbert Lees, of the Workington Gas-Works; and Mr. E. W. Smith, of the Cockermouth Gas-Works. As Associates: Mr. W. Frazer, of Messrs. Frazer and Son, Newcastle; and Mr. E. F. Wallace, of the Trindon Colliery.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—I thank you most heartily for the honour you did me, at your last meeting, in electing me your President for the ensuing year. I have some doubts as to being able to fulfil the duties of the office in the manner they demand; and, while fully sensible of the great compliment you have paid me in placing me in this position, I am also deeply impressed with the duties and responsibilities of the office, following as I do the worthy men who have occupied this chair before me. I shall, however, endeavour, with your assistance, to carry out the objects of our Association; and I trust that, if we are not able at the expiration of my term of office to report much progress, we may at least have witnessed no retrogression. I trust, too, that each member will avail himself of that interchange of opinion and practical knowledge which is a chief feature of our meetings, by bringing forward, either by means of a paper or discussion, any subject that may be of interest to the members, or of service in the further development of the business with which we are all associated. I would especially ask this of the younger members of our profession, who will find that they are not only benefiting their fellow-members by imparting to them their experience, but that they themselves obtain much information in the discussion arising thereon that could not possibly be procured by a position of isolation.

We may fairly congratulate ourselves on the progress of the gas industry during the past year. Increased consumption has taken place in most towns throughout the country; and this fact is all the more encouraging when we consider the number of rivals which gas has to face, and the great competition that now exists both in public and private lighting. I am of opinion that the present year will be even more prosperous than the past; and so far as the North of England is concerned, I believe we are entering upon a term of trade prosperity, when considerably more gas will be required both for domestic and commercial purposes. Although the gas undertakings in charge of the members of this Association at present represent a capital of nearly five millions sterling, making 7200 million cubic feet of gas, and using over 710,000 tons of coal annually, I have no doubt that, as a greater demand arises, the necessary capital to meet it will be readily provided by the public, in whose favour gas stock seems to become more popular year by year as an investment.

Of late years much has been said of the electric light as a competitor with gas. I do not now intend to say much on this matter, further than this—that I think any diminished consumption of gas due to the introduction of such light has been fully compensated for by the increased consumption that has taken place through the public now having a desire for more light than they had prior to

the introduction of the electric light; and while admitting that there are special purposes for which the latter may be more suitable than gas, I feel sure that, for general lighting, gas has yet a bright future, and will long maintain the premier position it now holds. While, however, putting aside any fear of diminished gas consumption through the introduction of the electric light, I am not at all insensible to the fact that in paraffin oil we have a competitor that is likely to some extent to interfere with increased consumption. More especially will this be the case in small towns, and towns where the population is of a migratory character. I feel convinced that, unless the greatest facilities be given to the working classes to encourage the consumption of gas, that the use of oil, should it remain at its present value, will still further extend. And not only for domestic lighting will this be the case, but also for manufactories—such as iron, engineering, shipbuilding, and other large works, where of late the Lucigen light has been much used; it having in many instances in the North of England been substituted both for gas and the electric light. I think, however, that a great deal of the increased lighting by oil is due solely to the very low price of this commodity—a state of things resulting from the recent discoveries of such enormous and almost unlimited quantities of oil, the better facilities for its shipment to this country by the adoption of special tank steamers in preference to the usual system of shipping by barrels, and the keen competition that has arisen between the Russian and American petroleum districts. But although its cost is so very low, the disadvantages and risks attending its use are, as you know, very great; and almost every day this fact is prominently brought before us by the frequent occurrence of deaths from burning caused by the upsetting of petroleum lamps. There is besides the constant trimming of such lamps, the breaking of chimneys, &c. (which is a very great annoyance compared to the simple turning of the ever-ready gas-tap), to say nothing of the constant obnoxious smell arising from its use. All these points considered, I am of opinion that, if gas companies still continue to supply gas at the lowest possible price, diffuse a knowledge amongst the public of the conditions under which gas may best be consumed, and offer every inducement for its economical consumption, even the competition from cheap oil may be overcome, and the day is far distant when gas lighting will be materially affected by any of its competitors.

For purposes of cooking, heating, and motive power, much may yet be done to extend the use of gas; and we ought not to rest content until we can report that our customers for these purposes are quite as numerous as those for lighting. I look forward with hope that the day is not far distant when, not only cooking and heating stoves will be established things in all well-regulated households, but that small gas motors will become general, both for domestic and trade requirements, and that the consumption of gas for such purposes will become as great, if not greater than that for lighting. Without, however, waiting for such uses of gas to develop itself in the course of events, gas companies should provide all possible facilities that will tend to urge on its speedy introduction; let the public know and see the advantages to be gained by using gas for these purposes, and provide apparatus of the best kind either on hire or purchase. Especially would I recommend the hire system as one that ought to be adopted by all companies and corporations who have not yet introduced it; and should it still be necessary to advance any argument in favour of taking this step, I would point to the great success that has attended its introduction in almost every case—our own being no exception to this rule. Some sixteen months ago an exhibition of gas apparatus was held; and since then upwards of 300 stoves of all descriptions have been fixed—resulting in an increase to our business for this purpose alone of something like 6 or 7 per cent. on our total make of last year.

In the introduction of gas-engines, I am not sure that gas companies themselves have done all they might to extend their use; for, notwithstanding the fact that in the smaller sizes they have been proved both convenient and economical, we find in many gas-works that steam is still employed in preference to gas. This ought not to be the case, as the public very justly look to us for example. Gas-engines are, however, daily becoming more popular; and there are now some 28,000 of the "Otto" type alone in use. In several towns as many as one per 1000 of the population is in use; and when the advantage in the saving of boiler space, attendant's wages, diminished nuisance from smoke, and all the minor nuisances from steam, are considered, these alone are points of sufficient importance to recommend their employment. But even in the working cost, gas-engines with a consumption for many purposes not exceeding 20 to 25 cubic feet of gas per indicated horse power per hour will be found more economical than the cost of working many steam-engines, some of which were found by Sir Frederick Bramwell, in his recent tests at Birmingham, to be consuming as high as 20 lbs. of coal per indicated horse power per hour. I know this is a very high estimate, compared with the splendid results that have been attained by many noted makers of modern steam-engines on a large scale. But in small engines of more recent make, and such as are used for light trade purposes, it is no unfrequent occurrence to find the consumption of coal per horse power even much in excess of what I have already stated; and in these cases, in addition to the convenience before mentioned, gas-engines will be found a very economical substitute for steam.

Although the fall in the value of residual products during the past few years has been so rapid, and resulted in greatly diminished revenues to gas companies from this source, it is, from a consumer's point of view, matter for congratulation, that, in very few cases

indeed, have companies thought it necessary to increase the price of gas; such reduced receipts having been met either by the gas companies drawing upon their reserve fund, where any existed, or being content where none did exist to declare smaller dividends. This is a point that ought not to be overlooked by the public, should the value of residual products so far recover as to admit of better dividends.

Throughout the past year the value of tar and its products have shown considerable improvement, and will, I believe, still continue in an upward direction. Quite recently an offer was made to one of the largest chemical manufacturing firms in the kingdom to purchase the whole of the tar products produced at their works during the year 1889 at present market prices; and although there may be an element of speculation in such an offer, yet to some extent it indicates that the parties most intimately connected with the business have confidence in existing prices being maintained. I trust, however, that both buyers and sellers will abstain from making long forward contracts on what may seem favourable terms, as, however pleasant it may be for companies to receive for the time being prices for their tar far in excess of its market value, such a condition of things cannot tend to cultivate a healthy state of trade, as it must be equally unpleasant, as well as disastrous, to chemical manufacturers to have to pay for tar a price far in excess of what its products will realize.

Sulphate of ammonia, which commenced the year at £12 10s. per ton, has continued to average a little under that price down to last weeks' quotation of £11 10s. per ton; and at this figure the market is very firm. As the manufacture of sulphate becomes more general among gas companies, I should anticipate that a greater demand for it will arise, as each company will, I feel sure, use all possible means of bringing before farmers, in their own immediate district, the value of sulphate of ammonia as a fertilizing agent, and thereby create a better local demand. Farmers, too, in these days of better technical and scientific education, should not be slow to avail themselves of such facilities, as in purchasing sulphate direct from the producers they will be far more likely to get full value for their money than by purchasing in the open market manures that are not always free from deleterious substances, and in very many cases do not contain the proportion of ammonia stated by agents anxious to effect sales; whereas, on the other hand, gas companies will desire to secure local reputation and will at least see that the farmer gets what he bargains for.

Plant for working on the continuous, in preference to the intermittent system is now being generally adopted, as tending not only to reduce the cost of producing sulphate, but also to deal with much larger quantities of ammoniacal liquor in a given time. The elimination of the sulphur from the waste gases arising from such manufacture has of late received much attention, with the result that the Claus patent sulphur recovery plant is becoming much more used. This, I think, is a step in the right direction, as, even if the plant is not found very profitable, it will convert into a commercial commodity what has hitherto caused more or less nuisance. On this ground alone, it is worth our consideration; as every effort should be used to carry on our business with as little annoyance to others as possible. Later on you will have an opportunity of seeing a new sulphate plant, on the continuous process, recently put down for my Company by Messrs. R. and J. Dempster, and in conjunction therewith one of the Claus sulphur recovery plants erected by Messrs. C. and W. Walker. In consequence of the short period they have been at work I am unable now to give many particulars of the cost of working, but may at some future time have the pleasure of placing before you the results of a more lengthened experience.

The demand for gas coke has of late been very brisk, resulting in most of the old stocks being cleared out, and better prices realized. This demand I attribute partly to a revival in the home trade, causing a larger consumption, and partly to the increased quantity that has recently been sought after for export. Both for domestic and trade purposes, coke ought to be much more extensively used, were its advantages thoroughly understood and appreciated by the public. It is not generally known, I believe, by the owners of small steam-boilers that, by the use of coke under such boilers, steam can be raised quicker than by coal, and in many cases at much less cost. For smiths' purposes, too, it has been found very serviceable, and in a large number of shops is now almost exclusively used in place of coal. The extended use of coke would also tend to assist in solving the vexed question of smoke abatement, and reduce the enormous loss resulting from the dense volumes of smoke which now issue from the chimney stack, besides clearing the atmosphere of such smoke, and thereby assisting to make life more pleasant in our populous towns.

A movement has recently been started in the north by the Worshipful Company of Plumbers, to establish local centres for the registration of plumbers. This is a movement which should in all towns receive the hearty co-operation and support of all gas managers and gas companies. It is unnecessary for me here to dilate upon the many annoyances that gas consumers have to put up with through defective plumbing; and any steps that will tend to place plumbers' work on a more scientific basis will, I feel confident, be accepted as a great boon by the general public, who must necessarily have greater confidence in the work executed by registered plumbers, who are known to be men of ability for their work, than in the work done by indifferent workmen who are not registered. To plumbers themselves, this system will be very advantageous, as it will ensure competent men only being sent out to first-class work at better wages; thus giving to those who have served a

proper apprenticeship, and who, by careful attention to their work, have thoroughly mastered the details thereof, better remuneration for their labour than the careless and indifferent workmen whose labour in this particular branch is too often found to be dear at any price.

I am afraid, however, that many of the annoyances gas consumers have to contend with are not due altogether to careless plumbing, but in many cases may be traced to consumers themselves, who will persist in purchasing the cheapest of everything they can find connected with gas-lighting—articles that in the end often cost very much more than those of a better class, to say nothing of the constant annoyance arising from the use of such fittings. One of the aims of the Plumbers' Company is to endeavour, in the erection of new houses, to prevail upon the builders and architects thereof to omit the plumbing work altogether from their specifications, and to set apart such a sum as will enable this to be done in a satisfactory manner by registered plumbers, at such rates as may be found remunerative for better class work; thereby avoiding to some extent the great competition that now exists in plumbing, and the scamped work arising from such competition and low prices. It will be necessary in doing this that some schedule of prices shall be adopted for the different classes of work to be carried out; but it also occurs to me that, before such a system could be satisfactorily adopted, it would in the case of gas and water fittings be necessary also to have a schedule of standard sizes, which all registered plumbers must be compelled to work to; and although this system is already in existence in some towns, it must, to ensure success, and its universal adoption, be enforced by some legal and acknowledged authority, such as parliamentary power, or, failing that, instructions from a Joint Committee composed of members of the Plumbers' Company, who would have control of all registered plumbers, and members of The Gas Institute acting on behalf the gas companies throughout the country.

Referring as I have done to the necessity of standard sizes being adopted in gas-fitting, leads me for a short time to the consideration of the adoption of this system to gas plant generally—a subject which, to my mind, deserves more attention than it has hitherto received either from gas managers or the makers of gas apparatus. Some time since Mr. Whyte, of Seaham Harbour, brought this matter before our Association. Although in his paper he dealt chiefly with retorts, I am of opinion that the principle may be extended to most apparatus connected with gas-works with very considerable advantage to both makers and users of such; and I feel quite sure that this fact will be admitted by all who know the great benefit arising from the adoption of Whitworth standard sizes of threads, and standard sizes for meters, &c. There is perhaps no part of the apparatus employed in gas making which permits of greater scope for reform in this direction than retorts and retort-fittings. To describe all the different sizes and shapes of those in use would be a work far too tedious for this meeting, and one that I shall not attempt; but I would ask how often do we find, in works of only moderate size, three, four, or more, different sizes and shapes of retorts in use on one bench, separate patterns for all of which have had to be made—thereby incurring additional expenses, which must be borne by the users of these articles, either directly or indirectly, to say nothing of the confusion that arises through so many different patterns being in use. Take, for instance, the Δ -shape retort—a form that is very extensively used—it will be found that almost every engineer has some particular preference both in size and shape. It is surprising the number of different shapes that are in use of this form of retort of even the same size. Some have sharp square corners; others are a little round; while in other cases they are so round that it is difficult to distinguish them from ovals. Then, again, in others the top part will vary; while others differ in the number of bolt-holes. If all these shapes be made in six, eight, or as many as ten different sizes, you would readily see that the cost incurred therein must be enormous; and the matter becomes one of greater importance than we are apt to attach to it.

Many manufacturers have given it as their opinion that, were standard sizes adopted, a saving of at least 10 per cent. might be effected; while in retort-fittings almost as great a saving might also be made. And this is not the only advantage we should gain by the adoption of standard sizes. Many, if not all of us, have at one time or another suffered some inconvenience and annoyance through delay in the delivery of retorts at a time of the year when makers have been pushed to execute in a short time more orders than they were able to do; and some of us also remember having had retorts sent that had been taken from the kiln long before they were sufficiently well burned. This might to a great extent be overcome if makers knew the sizes likely to be required, and could put into stock a number of each size, which could be made at a time of the year when they had few, if any, orders in hand, to be kept until the busy season, or for cases of emergency arising from accidents or other causes, when they would be ready for despatch at once. Then for purposes of comparison of the make of gas per mouthpiece at different works, how much simpler it would be were standard sizes universal?

In the case of valves, how seldom do we find two makers having the same size of flange, or having the same centres for bolt-holes; and, again, in flange-pipes the same thing occurs, often resulting not only in extra cost for patterns, but in considerable delay to get special sizes; whereas in standard sizes they might often be kept in stock and ready for use at once. There are many other advantages I could name in favour of the system I advocate, all of which point

in one direction—viz., a considerable saving in cost, as well as the great convenience arising therefrom to both makers and users; but I think I have said sufficient to justify some steps being taken to bring about this change in gas apparatus. I am aware that many difficulties and prejudices would arise before such a change could be brought about; but I am also of opinion that, with hearty co-operation on the part of makers (which I feel sure will be readily given), all such difficulties might be overcome, and a recognized standard of sizes adopted, which, while giving sufficient scope for improvement and *bona fide* progress, would reduce the cost of apparatus, and tend to still further cheapen the cost of gas. I would suggest that the consideration of this subject is of sufficient importance to be relegated to a Special Committee, composed of members from all the District Associations, to collect information and report thereon as to the practicability or otherwise of its adoption; and I feel sure much good would result from the labours of such a Committee.

The better technical education of young men about to enter the gas profession, is a question that has of late received much attention; and some good suggestions on this subject have been offered by our older members, which will no doubt not only prove serviceable, but tend to direct more particularly the attention of young men to the great necessity for them to give this matter the most careful attention, as it must be patent to all that those who in the future combine scientific attainments with practical experience are those most likely to come to the front. The spread of scientific and technical education should lead to the introduction of new and improved appliances for both the manufacture and distribution of gas, and with it will also arise the question of how best to stimulate and encourage the use of such improved appliances. It is well known that the preliminary expenses necessary to be incurred in experimenting with new apparatus, previous to its introduction to the public, often deters the adoption and proper working out of new inventions, which might otherwise be of much value; and until some scheme of dealing with such matters—either by means of Research Committees appointed by The Gas Institute, or otherwise—is determined upon, I would strongly urge upon directors of gas companies and gas committees to allow their managers every reasonable facility and help to work out any new idea that may be likely to benefit not only themselves, but the industry generally.

The question of gasholder construction is one that is just now receiving much attention; and should the experiments recently made by Mr. Livesey still continue to prove successful, and the views of Mr. Gadd be brought into satisfactory practice, we are likely soon to witness great changes in the method of construction of this part of our apparatus, which will tend to lessen a cost that is now one of the chief factors in our capital charge. I hear, too, that our friend Mr. Ashmore, whose long experience in gasholder construction well fits him for such a duty, is perfecting some scheme with a view to this end. As we are to have a paper to-day upon gasholders, however, I will not at present say more on this subject.

In conclusion, I would add a few words with reference to the resignation of members of the Council of The Gas Institute which has taken place since our last meeting. I am forcibly reminded of what Mr. Newbigging in his address seemed to foreshadow, when presiding over the twenty-first annual meeting at Manchester—viz., that the meeting then being held might perhaps mark a crisis in its history. It would almost seem that such was to be the case; and if the Institute is to be of that service to the members in the future that it has been in the past, it will be necessary that the greatest care and judgment should be exercised in future proceedings. In Mr. Woodall, the President, we have a gentleman likely to command the confidence of a great majority of the members, whose hearty support I have no doubt will be given him in any scheme of reorganization he may submit. I would point out how desirable it is, in the vacancies that have to be filled up, that gentlemen from all parts of the kingdom should be elected, and not too many from any particular locality; as by this means the whole of the members would be brought into closer contact with the Council, through their representation thereon. I would suggest, as a step in this direction, and in order also that the District Associations may become more in touch with the Parent Association, that the President for the time being of all District Associations should be a member of the Council.

The PRESIDENT, in calling upon Mr. J. Wright, of Stockton-on-Toos, to read a paper on "Modern Methods of Increasing Gasholder Storage," said it was at his own special request that Mr. Wright had kindly consented to contribute this paper. It occurred to him that it might be desirable to have a paper on this subject, following up the remarks upon gasholder construction which they had from their President last year; and he had no doubt that Mr. Wright would place before them particulars of gasholder construction which would be interesting to them all.

Mr. WRIGHT then read his paper, as follows:—

MODERN METHODS OF INCREASING GASHOLDER STORAGE.

There cannot be two opinions among people engaged in gas manufacture or gas engineering as to the absolute necessity of finding out the cheapest and best methods, either of laying down now gas-works or carrying out extensions of old ones. More especially is this necessary when looking at the competing interests which gas meets at every turn. These interests are so palpable to everyone here present, that it is unnecessary and almost unwise to particularize them. Hence it is, Sir, that, when I received your

invitation to prepare a paper specially for this meeting, I responded with some alacrity; feeling sure that on the subject of "Modern Methods of Increasing Gasholder Storage," I could indicate a course, and supply figures which, I trust, will be of interest to those engineers who are hampered in that direction.

A modern gas-works is so much a centre of "Light and Leading" that no matter how rural a site is chosen for its location, you no sooner see it established, than the speculative builder puts in an appearance; and in a very short time, the works are closely environed by streets of houses and their usual accompaniment—a dense population; making extensions of site very costly and well-nigh impossible, owing to considerations connected with the outlay of capital.

Gasholders are a trouble to many gas managers. They take up so much space, there is so much risk in the construction of new tanks, and opinions differ so widely now as to what is or is not an absolute necessity for the construction of the gasholders both inside and outside, that it is putting it mildly to say that to the ordinary gas manufacturer, they are an unsolved problem. In a short paper of this description it is impossible to go into the *pros* and *cons* of either the old system of gasholder construction or of all the "fads" that are now bulking so largely before the gas world. It is a still greater impossibility to attempt to give any rules or descriptions of gasholders which would make them and their treatment more familiar to the average gas manager. I must, therefore, content myself with taking one specific branch of gas engineering—viz., that of doubling or trebling existing holders, and indicate what has been done to relieve pressing cases for increased storage, without having to go into questions connected with extension of site, re-arrangement of mains, &c.

It is desired to make this paper of interest and profit to all members of this Association, whether they are interested in large or small concerns; and I have therefore made the tables of dimensions and costs (Nos. 1 and 2) sufficiently extensive to meet the cases of small and large works. These are the central points of my paper, and are before you.

TABLE I.—New Holders and Tanks.

No.	Capacity Required.	Diameter of Tank.	Cost of Tank.	Cost per 1000 feet Capacity of Holder.	Diameter, Depth, and Description of Holder.	Cost of Holder.	Cost per 1000 feet Capacity.	Total of Tank and Holder.	Total Cost per 1000 feet Capacity.
	Cubic Feet.	Feet.	£	£	Feet	£	£	£	£
1	55,000	62	900	16.36	60 x 20 Single	750	13.64	1650	30.00
2	75,000	72	1200	16.00	70 x 20 "	900	12.00	2100	28.00
3	110,000	82	900	8.15	60 x 20 Two-lift	1000	9.09	1900	17.28
4	150,000	72	1200	8.00	70 x 20 "	1350	9.00	2550	17.00
5	200,000	82	1400	7.00	80 x 20 "	1900	9.50	3300	16.50
6	250,000	82	1650	6.60	80 x 25 "	2100	8.40	3750	15.00
7	300,000	92	1500	6.00	90 x 24 "	2500	8.33	4300	14.33
8	400,000	102	2250	5.62	100 x 26 "	3000	7.50	5250	13.12
9	500,000	122	2500	5.00	120 x 24 "	3500	7.00	6000	12.00
10	750,000	122	2500	3.30	120 x 24 Three-lift	5250	7.00	7750	10.30
11	1,000,000	143	3000	3.00	140 x 24 "	6500	6.50	9500	9.50

TABLE II.—Cost of Doubling or Trebling Existing Holders.

Reference Letter.	Capacity Required.	Approx. Dimensions of Holder added.	Cost of Telescoping.	Total Cost per 1000 feet gained.	Total cost per 1000 feet from Table I.	Saving per Cent.
	Cubic Feet.	Feet.	£	£	£	
A	55,000	60 x 20	650	11.80	30.00	60.75
B	75,000	70 x 20	865	11.50	28.00	59.00
C	110,000	80 x 22	1155	10.50	17.28	39.20
D	150,000	90 x 24	1250	10.00	17.00	41.18
E	200,000	100 x 27	1900	9.50	16.50	42.43
F	250,000	120 x 25	2250	9.00	15.00	40.00
G	300,000	130 x 24	2550	8.50	14.33	40.70
H	400,000	150 x 25	3200	8.00	13.12	39.00
J	500,000	150 x 30	3750	7.50	12.00	37.50
K	750,000	160 x 38	5250	7.00	10.30	32.00
L	1,000,000	180 x 40	6000	6.00	9.50	36.75

Table I. gives the average dimensions, capacities, and costs of ordinary brick or concrete tanks, together with their gasholders of ordinary construction. I do not propose to try your patience by reading through all the figures of either of the tables, but may explain that, taking case No. 1 in Table I., where it is supposed that additional storage is required for 55,000 cubic feet, this is represented by a single-lift gasholder 60 feet diameter by 20 feet deep. The diameter of the tank to contain the holder is given in the second column. The cost, exclusive of mains, in the third. Then you have in the fourth column the cost of the tank per 1000 feet of additional capacity gained. Then, in the order named, you have the dimensions of the gasholder; cost of ditto; cost per 1000 feet of storage gained; total cost of tank and holder; and in the last column the total cost for combined tank and holder per 1000 feet of storage gained, which in this case, runs out to £30 per 1000 feet. You will please observe that I have not included the cost of land or of mains in any of my figures.

I will now suppose that you have built holders and tanks on every available yard of the gas-works; and it becomes a question with you how to get 55,000 cubic feet of storage. Table II., example "A," shows what I call the cheapest way of accomplishing it—viz., by telescoping the gasholder. You have the capacity in the second column; dimension of holder in one lift to contain the gas in the third; the cost of telescoping in the fourth; and the

total cost per 1000 feet in the fifth. Then, for the purposes of comparison, I bring the figures per 1000 cubic feet from the last column in Table I., and place them alongside the cost shown by Table II. for doubling or trebling; and the last column exhibits the enormous saving of 60·75 per cent. in favour of telescoping. This may be regarded as an extreme case, and it undoubtedly is; for it may be noted that, by using a small telescopic holder, and building a much smaller tank, considerable cost may be saved. I have not gone into this question, because very small telescopic holders are troublesome, and because the difference is clearly shown lower down the table. Take, for instance, case No. 3, where the required capacity is 110,000 cubic feet. The cheapest way to obtain this by a new tank and gasholder is to build a 62 feet tank, and put in it a two-lift holder 60 feet by 20 feet. By following through the figures, you will see that the increased capacity of the gasholder reduces the cost of the tank per 1000 cubic feet to £8·13 instead of £16·36; and the total combined cost of the tank and holder is reduced to £17·28 per 1000 cubic feet. The parallel case to this in Table II. is that indicated by the letter "C." To gain a capacity of 110,000 cubic feet by telescoping would need a single-lift 80 feet diameter by 22 feet, added to an existing one. This can be done, as shown by the table, at a cost of £10·5 per 1000 cubic feet, as against £17·28, or 39·20 per cent. in favour of telescoping.

	Cubic Feet.	Per Cent.
Case D in Table II., 150,000 capacity shows a saving of		41·18
" E "	200,000	42·43
" F "	250,000	40·00
" G "	300,000	40·70
" H "	400,000	39·00
" J "	500,000	37·50
" K "	750,000	32·00
" L "	1,000,000	36·75

It ought to be added that example "C" represents the actual cost of a holder dealt with in this way. Case "F" is the average of six two-lift holders which were converted into three lifts for one Corporation. Instance "G" is an average of four holders telescoped. Case "J" also represents the actual cost of a contract executed.

If any criticisms should be offered as to my figures being too high or too low, my reply is that the costs in Table II. are estimated on the same basis as Table I.; so that the differences are in the same ratio. Therefore my deductions or percentages will be the same. The figures generally are based on the assumption that the first holders have been constructed with a view to telescoping. It is, however, to be feared that many holders have been erected without the necessity for their extension having been apparent at the time of their construction. In such cases as these, it will be necessary to put a new holder altogether inside the old one, by cutting away as much of the top sheets as is necessary, to make room for the new inner lift. This will probably increase the total cost, as given by Table II., by 10 or 15 per cent.; but my figures give sufficient margin to allow for this increase, and leave ample justification for what I will call a "telescoping policy."

I must not, and do not, desire to ignore the difficulties that lie in the way of so many gas engineers in following the policy I have described. For instance, you may have only one gasholder, and may consider it unsafe (so to speak) to have all your "eggs in one basket." To a member so circumstanced, I would say: By all means build another holder and tank before adopting the policy indicated. Another may have a guide-framing to his holder unsuitable for extension, or possibly incapable of standing as it is; and the only resource here is to dispense with the old and substitute new. Columns which are now small can be raised up and supported on stronger bottom lengths. Columns or standards that are large can be lengthened out, and braced by a system of girders and diagonal bracing. If it is inconvenient to adopt any of these ideas, we must not forget the important experiment which has been tried by Mr. George Livesey, at Rotherhithe, which points to the possibility of lengthening and increasing the capacity of gasholders without having to add to the columns or girders, where they are sufficiently strong. This will at once reduce the cost so as to make telescoping much more favourable than the figures shown in my tables.

It will, of course, be possible to effect still greater economies in telescoping gasholders, if the ideas which are now so much under consideration, of dispensing with guide-framing, are found to be practicable. As an item of interest in this connection, I may be permitted to state that my friend Mr. Ashmore, some weeks before the Doncaster meeting of the Manchester District Institution of Gas Engineers and Managers, patented an idea which will be effective without even the complication of fixing spiral guides in the tank. For obvious reasons, we cannot here go into the details of one or the other invention, as they are foreign to the subject of this paper, and are only mentioned to remind you that further developments of the science of gasholder construction may, and no doubt will, enable you to telescope holders very much below the favourable figures I have now laid before you.

Discussion.

The PRESIDENT said they must all have been interested by Mr. Wright's paper; and, apart from the interest that attached to the details which he had given, a very great point had been gained in the reading of the paper in his placing on record statistics in connection with gasholder manufacture and the working out of the cost of their construction, which were only known to manufacturers themselves. The placing of these on record would, he thought, be of very great service to gas managers who

were considering the question of increasing their storage. This was one of the main reasons why he invited Mr. Wright to read a paper upon this subject, because he felt that they had only individual cases recorded of the doubling or trebling of gasholders; whereas manufacturers like Messrs. Ashmore, Benson, Pease, and Co., who were constantly engaged on this sort of work, had details at hand which gas managers could not command, and which would be of much help. He trusted, therefore, that if any managers there were anticipating extensions, or would like to gather any information on the subject, they would not be slow to come forward in the discussion.

Mr. W. FORD (Stockton) observed that, before attempting to make any remarks upon Mr. Wright's paper, he might say that a gentleman was present who was much more accustomed to deal with actual manufacture than most of them; and he thought it would be interesting to hear what criticisms he might offer upon a paper like that, because they all knew that manufacturing firms who had leading men like Mr. Wright or Mr. Cripps, were very much more able to enter into details than ordinary gas managers, who were sometimes filled with hesitation on the subject.

The PRESIDENT remarked that he had intended to call upon Mr. Cripps, but thought it probable that a member of the Association would have spoken first.

Mr. F. S. CRIPPS (London) said he would offer a few remarks, but not by way of criticism on the paper. He agreed with Mr. Wright that, in the majority of cases, it was better to add a lift to a gasholder than erect a new one. Of course, there were circumstances which governed individual cases. They could not say: "I have a gasholder; and I will add another lift to it," without first considering whether the guide-framing was sufficiently strong, or whether, on other grounds, it was advisable to do it. He could not then go into the various things which one had to consider; but he might say that, in most instances, it was best to add a lift. He also quite agreed with Mr. Wright that, in designing a gasholder in the first place, provision should be made for telescoping in the future, either for adding a double or a treble lift as the case might be. Of course, it was very difficult, with an old-fashioned gasholder, with rickety guide-framing perhaps, to add a new lift to it, because they would be cutting through the framing, and incurring an increased expenditure, which would not have been brought about if it had been considered in the first instance. Regarding the abolition of guide-framing altogether, this was such a big subject that he could not enter upon it; besides, Mr. Wright had not advanced it in his paper. He understood, however, that the Rotherhithe gasholder was working very favourably; and it was his opinion that, in the case of gasholders where the guide-framing was sufficiently strong as it stood, and the ground lifts were very rigid, a new inner lift might be added without any danger. The Rotherhithe gasholder, they would say, proved it; but he believed a good deal of extra strengthening had to be made at the bottom before it was undertaken. He did not know that he could say anything else; but he would be very glad to answer any questions.

Mr. W. HARDIE (Newcastle-upon-Tyne) remarked that they had two gasholders at their Elswick works; and they had not room to put down another, so they telescoped the then existing ones. This was done two or three years ago; and the holders had worked very well. By telescoping these holders, they obtained extra storage at a very moderate price; but Mr. Ridley would be better able to give information about it than he was.

Mr. G. RIDLEY (Newcastle-upon-Tyne) said the telescoping of the two holders was a very great acquisition to the Company; for the simple reason that it increased the storage by one-third. Trebling gasholders he considered was the proper thing to do; and especially in the case of a growing town. When constructing a single-lift holder, why should they not make it a double one? They obtained a double or treble lift without the cost of an additional tank. All they required was the shell of the lift, and the cost of putting it in. They could easily see the immense gain of having a middle lift, without having to go to the expense of a tank or connections.

Mr. CRIPPS suggested that the question of pressure would have to be considered. If they put a new lift to a gasholder, they added to the weight; and this increased the back pressure. This caused extra expense; and it was worth consideration.

Mr. RIDLEY could not off-hand say that any additional expense was caused; for the simple reason that he kept a weekly record of the cost of manufacture, and he found that he could produce gas as cheap, or even cheaper, with extra pressure.

Mr. J. HEPWORTH (Carlisle) expressed the indebtedness of the members to Mr. Wright for the paper he had been good enough to read. He was very glad it was suggested to the author that he should tabulate for them the very interesting and valuable information which they saw in the tables now before them. The paper was mainly an argument for telescoping gasholders rather than erecting additional ones. He hoped the day was now past for any such argument to need very much enforcing. It was evident that, if there were no unfavourable circumstances, it must be much better and considerably cheaper to telescope a gasholder, by putting in a second or a third lift, than it would be to go in for a new holder. The only point worth considering was, he thought, how far it might be safe to do this; and some of them, though a long way off from Rotherhithe, had been watching with much interest the experiments in that direction which had been carried out there. So far as the figures in Mr. Wright's paper referred to it, and so far as the information which he possessed otherwise went, the experiments seemed to have been very

satisfactory indeed. Everyone who had to do with the designing of gasholders in these days, should be wise enough to prepare for the telescoping of the holders in the future. The cost of the tank was the same; and the expense of preparing to telescope the holder (say) ten years hence was very little. It therefore appeared to him to be almost folly to construct a gasholder without keeping this matter in view. The last few years he had constructed several gasholders; and in every case he made provision for telescoping, in the interests of those who should come after him, either for the addition of a second or a third lift. Of course, this subject was not new. Everybody knew that it was cheaper to telescope a gasholder than to start *de novo*; but it had been forced upon their attention recently very much more than previously by what had been done at Rotherhithe. With reference to the increase of pressure, there was no doubt that some extra cost was entailed; but this would be found to consist very largely, he should think, in the first outlay for the exhausters and the other plant necessary for overcoming this pressure. The actual working cost would be very little indeed.

Mr. C. SELLERS (York) said he was in the very happy position which had been referred to, of not needing to prepare for any increased storage of gas. They were pretty well provided for a considerable time. He had been much interested in the discussion, and felt that he could not add anything to it. He thought the case was clearly and strongly made out in favour of the proposition of Mr. Wright, to provide increased storage capacity by means of the telescopic principle; and all the arguments, he thought, in favour of it had been so clearly put before them, that he should say there would not be two opinions regarding what had been said for that principle. Especially, he thought, they would all agree with the prudence pointed out first by Mr. Ridley, and then made very clear by Mr. Hepworth, of providing for the future extension of the holder when first building. In doing this, the cost was, of course, a very strong argument; and the fact of Mr. Wright bringing the principle prominently before them that day would fix it in their mind, and he was sure everyone would reap considerable advantage from the paper. It was not a very debatable subject; but they would all be greatly benefited by the paper.

The PRESIDENT remarked that they had with them a prominent member of the Manchester District Institution of Gas Engineers—Mr. Booth, of Southport—who perhaps would like to make a few remarks on the subject before them. He (the President) might just mention that Mr. Gadd, who had recently figured very prominently in this matter, was a resident in Manchester, and probably Mr. Booth might tell them something which had been stated at the Manchester meeting.

Mr. BOOTH said that unfortunately he was prevented from attending the meeting of the Manchester Institution, when Mr. Newbigging described Mr. Gadd's invention and models were exhibited. He regretted very much indeed he was not able to be there, because, beyond what he had seen of the paper, he knew nothing; and he was looking forward with interest to the discussion which was to come on at their next meeting. With regard to the paper read by Mr. Wright, he might say that he heartily agreed with previous speakers. He thought that, as a rule, it was decidedly the best way of increasing gasholder storage. He was surprised to find that morning, on looking round the Stockton Gas-Works, that his friend Mr. Ford had put a third lift to his holder. He was not aware of this before. Mr. Ford, as they knew, was conservative in many things; but he (Mr. Booth) was glad to say that he had stepped out, and had not been afraid to advance in that line. He himself would soon have to increase the capacity of his holders; but whether or not he could adopt the principle advocated by Mr. Wright and other engineers he was not sure. It happened that they could not carry their tanks below the ground, as they met with quicksand when they got about two or three feet down. All their tanks were constructed above ground, so that with the tank alone they were 30 feet above the datum line, and the gasholder was towering up to a very great height. It would, therefore, be a matter for him to consider, in a future extension of gasholder storage at Southport, whether he should put up a third lift to his existing holders. As he had already stated, he concurred with all that Mr. Wright had said, and agreed with previous speakers.

The PRESIDENT, before asking Mr. Wright to reply to the criticisms which had been passed, said he would like to state that in the case of his Company additional storage was a matter which would shortly engage their attention. He had been down to Stockton to see what their friend Mr. Ford had done before commencing anything in their own case. He was rather afraid they were not placed in a similar position at all to Mr. Ford, who had two or three gasholders in addition to a large one. With them their large holder was practically the holder. They had another, a small one, but it would not be of very much service if the large one were thrown out of use for a considerable time. So he was afraid that in their own case the troubling of the gasholder would not be of much benefit to them at present. As Mr. Wright had said, it was not desirable for them to have "all their eggs in one basket;" and he thought that in their particular case they should almost be driven to the necessity of providing another gasholder. But he certainly thought that the advantages to be derived from doubling or even trebling were so great that, in all cases where it could be done—if there were no circumstances to prevent it—they ought to adopt this plan. He saw a short time since that either four or six holders had been trebled at Bradford. There they obtained a considerable increase of storage at a great

saving of cost; and had they not been able to get this increase without additional land being required for tanks, it might have been a very costly matter to obtain parliamentary powers for the acquisition of additional land. For a few years, at all events, this had been staved off by trebling their gasholders. As he had already said, they were all very much indebted to Mr. Wright for the valuable records he had placed before them. He (the President) knew very well that the members would give him their hearty thanks for his paper; and he would ask some one to propose a vote after Mr. Wright had replied.

Mr. WRIGHT said he was sure the remarks which had been made on his paper had been extremely kind; and he had really nothing to reply to. Any criticisms which had been passed had been answered by members who had taken part in the discussion. He could only thank the meeting for the very kind reception they had given him.

Mr. FORD said he had great pleasure in proposing a hearty vote of thanks to Mr. Wright. He had not taken any part in the discussion, because he felt that he could not have done justice to Mr. Wright's paper. If they had had the figures before them, and been able to digest them a little, they might have come forward with something satisfactory; and he should have been delighted to enter upon the subject from his own point of view. There was no doubt that he had successfully trebled a large gasholder, which had worked for three years in a way that was quite satisfactory to him. Unfortunately, it was not in the first instance arranged for trebling; and they had to put in operation the process of cutting and carving to some extent before getting in the third lift. But, with all the trouble and inconvenience attached thereto, they obtained an addition at a very moderate cost, which they would not have done by placing another tank alongside the existing one. Trebling a holder, he knew, was somewhat difficult; and he was glad to hear Mr. Cripps make the statement he did. He could not agree with Mr. Ridley that pressure was of no account. He had always found that pressure was of importance in a gas-works. Without going into the matter so as to lay it before them, as he might do some day, he must say that he had felt it to be a drawback, but nothing to correspond with the advantage to be gained by the trebling of a holder. Therefore he agreed with Mr. Wright's theory, and was at one with Mr. Hepworth in thinking that when holders were first built they should make preparation for trebling them. Since Mr. Wright came amongst them 16 or 17 years ago, he had been a friend to all gas managers, inasmuch as he was able to save them from much heartburning by giving them information which they could not otherwise obtain. He could assure those who did not know Mr. Wright except through his paper, that, if they had any difficulty, they would find him always ready to help them in every way.

Mr. R. BRIDGE (Doncaster), in seconding the proposition, said that he had great pleasure in doing so. They had all listened attentively to Mr. Wright, and would be much benefited by his paper. It was quite clear to him (Mr. Bridge), and it appeared to be so generally, from the way in which the matter had been received by the members, that telescoping was a very cheap form of increasing storage capacity, more especially in crowded localities. In his own case, he had a gasholder of very large diameter, but very shallow. It had been prepared for telescoping; and he had no doubt that the principle advocated by Mr. Wright might be applied to it. He did not know what was to be the future of gasholder construction. He had had the pleasure of seeing Mr. Gadd's models, and they certainly appeared to him to be a very great advance upon the present style of building these structures. If the thing could be carried out as they were assured by Mr. Gadd it could, it would be something like a revolution in gasholder making. However this might be, he was sure they were all much indebted to Mr. Wright for the paper he had brought before them.

The motion was carried unanimously.

Mr. WRIGHT, in acknowledging the vote, said he was always willing to do what he could to contribute to the success of their meetings.

Mr. ASHMORE remarked that he had recently taken out a patent for telescoping—doubling or trebling—gasholders; and he hoped at the next meeting to read a paper on the subject, and perhaps submit a model for erecting holders without framing at all.

M. PERRET'S DUST-FUEL FURNACE.

Mr. C. SELLERS (York) said it occurred to him that he might perhaps make a suggestion with regard to M. Perret's dust furnace. He did not know if anyone there had it in use; but about a month ago they had it fixed to one of their boilers at the York Gas-Works, and it had been of very great advantage. As they knew, he had always been much in favour of breaking coke, in preparing it either for domestic use or for slow-combustion stoves, which were now so common in all large towns; but there had been a drawback to the process, inasmuch as the breaking of coke created a certain amount of exceedingly small breeze, which was almost unsaleable—only fetching from 2s. to 2s. 6d. per ton. They were in the habit of riddling it, and getting perhaps 4s. per ton for a portion of it, to be used in greenhouse fires—a sort of nut coko. Perret's dust furnace would consume any combustible dust of any kind. It was so valuable in their case that, although it had been but a short time in use, from the calculations which he had made he had no hesitation in saying they would get back the whole of their capital in the first year's use. They had taken a tender for two furnaces—one for each of their boilers; but they

had only fixed one, as they intended to get a new boiler next year, when they would fix the second one. The result of the test of the first one was such that, as he had said, it would yield back to them the whole of the capital outlay in the first year—a capital of about £60, fixed complete. This was a suggestion which was worthy of the consideration of every gas manager; and it was on the lines of Mr. Wright's paper, and on lines of economy in gas management. Everything that tended to lessen cost in the conduct of gas-works was a decided advantage to gas companies, and also to gas managers, because the less capital they had to make profit to pay interest upon, the more easily they could do their work. It enabled them also to sell gas at a cheap rate; and the cheaper they sold gas, the safer would be their industry, and the more permanent would be gas investments. He had very great pleasure in submitting this matter for consideration; and he would be pleased to answer any question respecting the furnace.

Mr. J. HEPPORTH (Carlisle) observed that this sounded rather like an advertisement of the invention; but he had no hesitation in saying that whatever benefit might accrue to the inventor, there would also be great benefit to the user. He had employed the furnace himself. It was particularly valuable in his case, because he had three or four outlets for dust and what was worse than dust—the refuse from shale. He found that the furnace used these up most admirably.

Mr. SELLERS laughingly repudiated having introduced the subject for the purpose of advertising the furnace, or for the sake of getting a commission. (Laughter.) He did it solely for the benefit of his colleagues.

The PRESIDENT said he did not for one moment suppose that the view which had just been mentioned was taken of the question. He rather took it that it was a response to what he said in his address, when he asked members, if they did not read a paper, to bring before the Association such matters as had been referred to, so that gas managers, who were so much isolated from each other as not to be able to see every day the improvements that were taking place, might have an opportunity of knowing from those who had used new processes how they worked. A step in the right direction had been taken. He had not himself tried this furnace, though the patentee had been down to see him with reference to it. In his own case, all the breeze they made they used themselves, in preference to coke or coal, for their steam-boilers. In addition to this, they had a great demand for it in the town, though at present they were not able to sell any. They found it answer their purpose very well. At present they were using coke for their boilers because they had not sufficient breeze. For their exhaustor boiler, they found breeze to answer equally well, with a saving of 4s. or 5s. per ton. In places, however, where there was no demand for breeze, this furnace was a step in the right direction; and it would also tend to reduce the price of gas. He believed in introducing anything which would yield 10 per cent. on the outlay. If anyone could prove to him that an invention would realize 10 per cent. return upon the original cost, he was always ready to introduce it, or to consider its introduction, provided he saw no disadvantage in its use. In this case he thought the invention was one which might be used with considerable advantage.

VOTES OF THANKS.

Mr. R. BRIDGE (Doncaster) thought it was their duty to record their thanks to the President for his very able address that day, in which he had brought matter before them for their entertainment and for their future profit. He followed the address through with a great deal of pleasure; and he was sure that the seeds of knowledge which the President had sown would bear fruit, and that, too, in the not very distant future.

Mr. G. A. ALLAN (Willington) seconded the motion. In doing so, he advocated something being done with reference to the formation of a Committee to try and effect an undertaking about the sizes of gas-retorts. There was, he said, a great deal more in this matter than many gas managers seemed to think. If a maker had to produce some 40 or 50 different sizes and patterns of retorts in the course of a year, he could not keep a stock. Supposing a manager had one or two retorts broken when on the road to the works, and the maker had not any left, a bed was at once laid idle. Instead of merely making a suggestion, he thought something ought to be done. The President should name a Committee, so that they might consider the subject, and report at the meeting in May. There was, again, the subject of the consumption of gas in gas-engines. Gas managers often recommended gas stoves and engines to the public; but they did not use gas-engines themselves. If they required more power, they put in a boiler and steam-engine. Why did they not employ a gas-engine instead? They would find it a great deal cleaner and cheaper; and they could then urge it with more freedom upon people outside. He had great pleasure in seconding the motion, because a better or a plainer address to gas managers he had seldom heard.

The resolution having been agreed to,

The PRESIDENT expressed his great obligation to the meeting for their kindness to him. If, he said, they had asked him to design any part of a gas-works, he should have gone to work with a very much lighter heart than he did to write a presidential address. It was something altogether new to him; and if anything he had said that day had tended to interest them, he was amply repaid for the trouble he had taken in the matter by the vote of thanks which they had just accorded to him. He might say that, so far as the North of England Association was concerned,

and all other Associations, he should be glad to contribute what he could to the industry by which they earned their bread. What Mr. Allan had said about the employment of gas-engines embodied a view of the circumstances which ought to be taken more into consideration. As they would see, when they went round his works, he had a small gas-engine which blew the bellows in the blacksmiths' shop, and another gas-engine which worked a lathe and other machines in the fitters' shop. They had not gas power in the other parts of the works, for the simple reason that they were not prepared to throw out plant which was otherwise good in order to introduce gas; but when opportunity occurred, they should be glad to make use of gas.

Mr. HEPPORTH, on behalf of the Association, proposed a resolution acknowledging the kind reception which had been accorded to the members by the Hartlepool Gas and Water Company.

Mr. J. NICHOLS (Darlington) seconded the motion, which was unanimously adopted.

The PRESIDENT remarked that, as soon as he mentioned to the Directors of the Company that the Association intended to meet there, they responded with a desire to make the gathering as agreeable as possible.

Mr. FISHER thanked the meeting very warmly for their kind vote of thanks. The Directors, he observed, were extremely anxious that the visitors should have a pleasant day; and he himself hoped that, notwithstanding a little damp outside, some of them would enjoy the view of the works, and also would go out with the steamer and inspect the extensions which had taken place at the Hartlepool breakwater, and in the town.

This concluded the business portion of the meeting.

The company afterwards went round the gas-works, escorted by Mr. Bower. In the course of the inspection, one heard constant expressions of satisfaction at the substantial and well-appointed appearance of the works, and the perfect condition in which everything is kept by Mr. Bower. Most interest appeared to be taken in a small plant for working the Claus process, which had, however, been in operation, for too short a period to allow of results being stated. A very complete sulphate plant also claimed attention, as did also a retort-setting which Mr. Bower is at present putting in, in which the air passages are arranged with a view to giving some of the advantages of regeneration without going below the usual foundations; it being impossible, on account of water, to go down beyond 2 or 3 feet. The party afterwards visited the pumping station in connection with the water supply of the town. An engine pumping 150,000 gallons of water per hour, partly to cisterns adjoining the station, and partly to a reservoir four miles away, was seen at work. On leaving the water station, the Company drove through the extensive timber yards which are quite a feature of Hartlepool, to the docks at East Hartlepool, where they embarked, and were taken to see the extensive breakwater and seawall improvements of recent years. The short trip was very enjoyable. Landing at West Hartlepool Docks, the members and their friends repaired to the Royal Hotel, where, at four o'clock, they sat down to dinner, under the presidency of Mr. Bower.

A NON-EXPLOSIVE FOR BALLOONS WANTED.—The Council of the Balloon Society have received from Captain Campbell an offer of a prize of 100 guineas to the inventor of a non-explosive gas suitable for ballooning purposes. The Council have sent a copy of the letter to the various gas managers, inviting them to compete.

THE DINSMORE GAS PROCESS.—At the meeting of the Widnes Local Board on Tuesday last, the Gas Engineer (Mr. Isaac Carr), in the course of his report, referred to the Dinsmore process of coal carbonization, and said it had been in continuous operation at the gas-works since the end of July last, during which period upwards of 4 million cubic feet of gas had been produced. They were at present making from Aldwarke Main coal, without any canal, 13,000 cubic feet of gas per ton, varying in quality from 20 to 24 candles.

ELECTRIC LIGHTING IN MADRID.—The Madrid Correspondent of *Industries* says that the electric light installation in the Opera House is the most important in Spain. There are three boilers of 80-horse power, and four engines, each of 60-horse power, which are coupled direct to the dynamos. The interior of the building will be entirely lighted by Swan incandescent lamps. Of these there are altogether 2800; but it is not expected that more than 2400 will be used at one time. There will be five or six arc lamps placed outside the building.

THE METROPOLITAN BOARD AND GAS TESTING.—At the meeting of the Metropolitan Board last Friday, the references to the Works and General Purposes Committee of March 27, 1885, and April 22, 1887, on the subject of the legalization of gas-tests carried out with portable photometers, and of Aug. 5, 1887, on standards of light, were discharged. The Special Purposes Committee reported the resignation of Mr. C. N. Hake of his appointment as Gas Examiner, and recommended that the question of the appointment of a successor be referred to the Committee, with authority to submit the name of a qualified candidate for election by the Board. The Committee also stated that the new gas-testing place of the South Metropolitan Gas Company, at Woolwich, has been completed, and will shortly be ready for use, and recommended that the question of the appointment of an additional Examiner be referred to the Committee, with authority to submit the name of a qualified candidate for election by the Board. The recommendations were approved.

Register of Patents.

INTEGRATING THE FLOW OF LIQUIDS.—Deacon, G. F., of Liverpool. No. 12,627; Sept 17, 1887. [1s. 6d.]

This is a modification of the apparatus employed to record graphically the volume of the flow of water through a pipe or conduit at each and every instant, described in former patents of the same inventor—viz., Nos. 937 and 4264 of 1873, No. 50 of 1875, No. 105 of 1879, and Nos. 7679 and 8464 of 1886. The specification of the present patent is very lengthy; and an abstract of it could not be understood without reference to the nine sheets of drawings by which it is accompanied. The principal claims are: 1. In apparatus for integrating the flow of liquids, in which the physical position of a floater, disc, or other mechanical part in relation to a zero is or may be connected by a mathematical equation with the corresponding volume of flow, the substitution for such mathematical equation of a mechanical arrangement in which a device such as a cam, spiral, or their equivalent is introduced, and by which the corresponding volume is ascertained. 2. In such apparatus the combination of a disc operated by a clock, and an integrating-wheel driven thereby, and driving a counter; the planes of inclination of the integrating-wheel and time-disc being varied by the motion of the water through a water-way of a meter, through the agency of a cam, spiral, or equivalent. 3. The combination of a disc—operated by a water-wheel or its equivalent—and an integrating-wheel driven thereby and driving a counter; the planes of inclination of the integrating-wheel and disc being varied by the rise and fall of a floater by the agency of a cam, spiral, or equivalent. 4. The combination of a disc actuated by a clock, a paddle-wheel, or their equivalent, and an integrating-wheel driven thereby and driving a counter; the planes of the disc and integrating-wheel being varied by the motion or level of the water in such a manner that the counter registers the correct volume passed between any two observations. 5. In apparatus for integrating the flow of liquids in which the equation between the physical position of the meter, disc, floater, or equivalent part of the apparatus actuated by the water, and the volume per unit of time (either by varying the section of the water-way, or by introducing a cam, spiral, or its equivalent) is or may be caused to be the equation to a straight line, the combination of a disc actuated by a clock or by the water, and an integrating-wheel driven thereby; such integrating-wheel having its axis parallel to, and having a motion parallel to a radius of such integrating-disc in such a manner that, moving from the zero position at or near the centre of the disc to any given maximum position on the radius of the disc, the counter actuated thereby receives a motion proportional to the volume of flow.

REGENERATIVE GAS-LAMPS.—Marsh, T. G., of Lytham. No. 15,344; Nov. 10, 1887. [8d.]

This is a modification of an arrangement of lamp for which the present inventor applied for a patent last year (No. 2708), but subsequently abandoned it. In his application for this earlier patent, he made reference to a collar or ledge situated beneath the horizontal perforations in the burner so as to assist in steadying the flame and increase its luminosity. The patentee, however, found that, owing to the heat generated in the burner, the perforations were apt to become choked, and the collar or ledge became coated with carbonaceous or sulphurous deposits from the gas; thus injuring the form of the light. To obviate these defects, and to keep the burner and ledge sufficiently cool to prevent this injurious deposit, the lower part of the burner has now been prolonged, so as to transmit part of the heat in the burner to a point removed from the perforations; thus reducing the temperature at the perforations to a pitch which will not cause deposition. The collar or ledge is also insulated from direct contact with the foot of the burner to protect it from overheating. To effect this, an extension is screwed to the foot of the burner, and a washer or packing of asbestos, steatite, or other heat-resisting and non-conducting material or composition is interposed between the extension and the foot of the burner. The extension is so fashioned as to present the ledge or collar beneath the perforations; but owing to the non-conducting material between the extension and the burner, and owing also to the heat-absorbing prolongation beneath, the burner and collar remain comparatively cool. In a pendant lamp in which the gas supply comes from above, the extension may be prolonged downward toward the bottom of the glass shield; and it may be made conical or cylindrical, hollow or solid, have a fluted or corrugated surface, be provided with radiating fins, or any form best calculated to radiate the heat drawn from the proximity of the burner. In a lamp supported from beneath (upon a bracket or standard), and deriving its supply of gas from below, the prolongation from the burner is arranged in the form of a tube, either with or without perforations. When the tube is perforated, a supply of air enters from beneath, and, escaping in a heated condition through the perforations into the interior of the glass shield, unites with the heated air coming from the regenerative arrangement above, and assists to feed the flame. For convenience of lighting, the glass is carried upon a sliding gallery supported upon a helical spring. When it is wished to light the lamp, the shield is pushed down against the pressure of the spring; and on being released, the shield pushes closely against the upper part of the lamp, and maintains it in that position.

HEATING THE IGNITING TUBES OF GAS MOTOR ENGINES.—Abel, C. D.; communicated from the Gas Motoren Fabrik Deutz, of Deutz, Germany. No. 17,896; Dec. 29, 1887. [8d.]

This invention relates to apparatus for externally heating the tubes by means of which the combustible charges of motor engines are ignited; and it has for its object to effect such heating by the combustion of vapour produced by the volatilization of benzene or other volatile combustible liquid.

For this purpose a closed receptacle (of spherical or other shape) charged with combustible liquid is fitted at top with a tube reaching down inside it to near the bottom, and having an internal screwed thread through which is placed a rod, the lower end of which acts as a valve for closing more or less a small opening at the bottom of the receptacle, through which the combustible liquid can pass in regulated quantities into a pipe conducting it downwards to a point where external

heat is applied for volatilizing the liquid as it flows down. The resulting combustible vapour then passes through a continuation of the pipe to a nozzle or Bunsen burner, where it mixes and enters into combustion with the air. For heating the pipe, any convenient source of heat may be used—such as part of the heat produced by the combustion of the vapour itself, or the heat radiated from the motor engine; but, by preference, the necessary heat is supplied by forming round the small supply-pipe a small annular chamber, having at the top a number of jets, and communicating by a small hole (regulated by a screw-plug) with the interior of the pipe; so that a portion of the vapour generated passes into the annular chamber, and issues through the jets thereof. In order to produce the requisite quantity of vapour for supplying these jets in the first instance, a cup is fixed on the supply-pipe underneath the annular chamber, for the reception of a small quantity of volatile combustible liquid which is ignited. The apparatus may be used in combination with any form of Bunsen or other burner and igniting-tube.

GAS-BURNERS.—Mills, B. J. B.; communicated from C. S. Upton, of New York. No. 10,996; July 30, 1888. [8d.]

The invention has for its object the construction of a gas-burner in which a full supply of air is conveyed evenly both inside and outside of a circular gas-flame. The burner is constructed with an annular gas chamber connected with the gas-pipe, and through which gas passes to the jets. Outside this annular chamber, and between it and the chimney, air is supplied to the outside of the flame; its flow being moderated and directed by screens. The air passing up within the annular chamber is gathered into a perforated thimble, which fits the inner cylindrical wall of the chamber closely. A screen is also provided covering all the space under the burner, so as to moderate the flow of air passing to the burner.

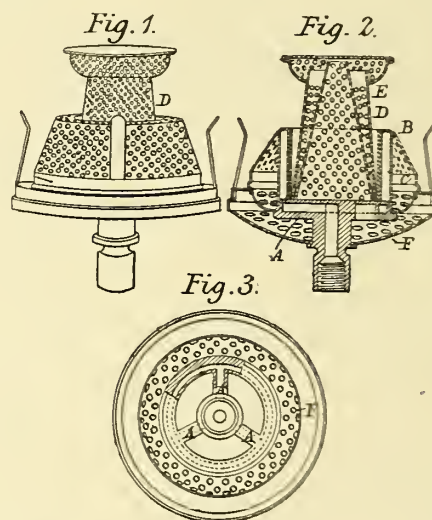
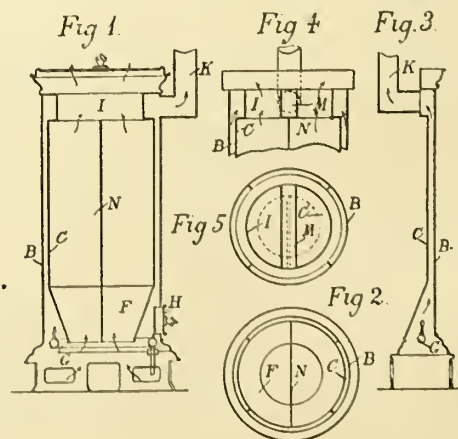


Fig. 1 is a perspective view of the burner; and fig. 2 a vertical sectional view of it. Fig. 3 is an under view; the lowest air-screen being removed and part of the gas-supply pipe broken away. The nozzle of the burner has three or more hollow arms A, which support the upper part of the burner, and supply gas to the annular chamber B with jet apertures at top. C is an air chamber. The chimney of the burner, resting upon the ledge, does not allow any air to be supplied to the flame from the side; and it is thus compelled to pass through the perforations, which are made of different sizes, so as to supply air evenly while interrupting its flow sufficiently to prevent the jets of air from striking the flame with such force as to cause it to flicker. The thimble D, which is preferably slightly converging, fits the inner wall of the chamber B, so as to take up all the air passing between the arms A. A second thimble E, within the first, is made with large perforations, so as to break the force of the air currents before they strike the outer thimble D. The latter is provided with smaller perforations, which supply the air evenly to all parts of the flame, and insure a complete and steady combustion. But to further steady the flow of air both from the inside and outside of the annular chamber, the shell F is provided, spreading from the burner nozzle to the chimney ledge, and containing large and numerous perforations.

GAS-STOVES.—Meidinger, H., of Carlsruhe, Germany. No. 11,157; Aug. 1, 1888. [8d.]

The arrangement of this gas-heating stove is shown in the accompanying engraving, in which fig. 1 is a vertical central section of the



stove (the surrounding casing being omitted); fig. 2 is a horizontal section of the lower part; fig. 3 is a vertical central section of a trifling modification; fig. 4 is a transverse section of the top portion of the stove; and fig. 5 is a horizontal section of this top part.

The stove rests on feet between which the air freely enters the inner space of the heater. By the outer cylindric side B and the inner cylindric side C is formed an annular slot-shaped passage. In order to maintain the two sides at the same distance apart, they are provided with radial ribs—four to eight in number being provided. The inner cylindric side C is connected at its lower extremity with a conical portion F, whereby the annular combustion chamber is formed. Within this chamber is arranged an annular gas-pipe G provided with numerous burners, the intervals between which are so small that the gas streaming forth from all the burners is gradually lit as soon as the jet of gas near the fire-door H is lighted. At its top, the inner cylinder terminates by a cylindrical portion I of smaller diameter, and provided with a flange that connects it to the outer cylindrical side B. In this manner an annular chamber is formed, where the cooled products of combustion collect before escaping through the smoke-pipe K. For the purpose of allowing the gases, which enter the portion of the collecting chamber opposite to the exit-pipe to flow directly to this pipe, a passage or tube M is provided inside the cylinder I. Within the cylinder C, which is open at its upper and lower extremities, are arranged one or more metal plates or sheets (as shown at N), extending from the top of the cylinder to the bottom edge of the conical portion F. On being heated, these plates add to the surface, which imparts caloric to the current of air continually passing through the cylinder.

Fig. 3 shows a modification of the stove, wherein both sides of it are kept apart at an unvariable distance, by means of vertical ribs formed on or suitably attached to either one side or the other, or partly to one side and partly to the other.

APPLICATIONS FOR LETTERS PATENT.

14,342.—BARTLETT, J. K., "Improvements in station gas governors, and in apparatus for varying the pressure of gas, either by hand or automatically." Oct. 5.

14,349.—AHEL, C. D., "Igniting apparatus for gas and oil motor engines." A communication from the Gas Motoren Fabrik Deutz. Oct. 5.

14,401.—HEARSON, C. E., "Improvements in motive power engines of the kinds known as gas-engines and vapour engines." Oct. 6.

14,405.—WILKINSON, J. M., and UPTON, G., "Improvements in or relating to gas-burners." Oct. 8.

14,416.—FITZPATRICK, H. D., and ROSE, G., "A new or improved portable compressed gas-lamp, applicable for either lighting or heating purposes." Oct. 8.

14,418.—RANSFORD, A., "Automatically lighting star-lights, gaseliers, and other gas-fittings." Oct. 8.

14,432.—HORN, J., "Improvements in furnaces for heating steam-boilers and gas-retorts, and for similar purposes." Oct. 8.

14,510.—BROUWER, J. DE, "Improvements in apparatus to be used in the manufacture of gas." Oct. 9.

14,634.—BROPHY, M. [M.], "Improvements relating to gas-heated hot-plates for cooking purposes." Oct. 11.

14,638.—WILLSON, C., and ROBERTS, G., "Check distribution arrangements for wet or dry gas-meters." Oct. 11.

14,648.—THORN, J., and SHAPCOTT, H., "An improved device or apparatus for controlling the supply of gas to gas-stoves according as required." Oct. 11.

PATENTS WHICH HAVE BECOME VOID.

[AFTER THE FOURTH YEAR.]

9532.—SCHNELL, J. F., and others, "Obtaining gas."

9559.—MC CRACKEN, T., "Burners for gas, &c."

9645.—WELCH, E. J. C., and another, "Gas-engines."

9774.—REID, T. A., "Gas-fired digester."

EXTENSION OF PUBLIC LIGHTING AT BECKENHAM.—In consequence of the reduction made in the price of gas by the Crystal Palace Gas Company, the Beckenham Local Board have decided to extend the area of their lighting district.

PROPOSED ELECTRIC LIGHTING OF HARROW.—Last Wednesday evening a meeting of the ratepayers of Harrow was held to consider the advisability of adopting electric lighting in the town. Mr. Russell Biggs presided. Mr. Frank Taylor expatiated on the advantages, from his point of view, of the electric light; remarking that this light was bound to come sooner or later, and that the time had arrived when it could be supplied as cheap as, or cheaper than gas. He did not, however, cite Barnet as an instance of the successful introduction of the system of illumination he advocated. Mr. W. F. Taylor gave some figures as to the relative cost of the electric light and gas; stating that the former had the advantage to the extent of 4s. per 1000 hours of lighting per burner. After some discussion, it was resolved to ask the Local Board to investigate the matter.

THE NORTHERN COAL TRADE.—The activity in the coal trade of the North has been further increased by the apprehensions of strikes in Yorkshire. In such an event, it is probable that the Humber coal trade would be seriously interfered with, and that vessels would go to the Tyne and Durham ports instead. The steam coal trade has decidedly stiffened under the belief that this is probable; and a considerable number of orders have been given out; so that the prospect for the winter is better than for several years—that is, as far as the bulk of trade is concerned. In gas coal there is great activity, and most of the collieries yielding this class of coal are now actively at work. For additional orders, the full price has to be paid; and, indeed, one or two of the gas collieries shipping at Sunderland now ask 7s. 3d. per ton for coal. The miners were working rather better last week; but the demand took away the coal rapidly—some users desiring to stock in case of possible suspension of work in some of the coal-fields. Manufacturing coal is steady at the advance; and there is a fuller inquiry for coking coal. Thus, all round, the coal trade seems brisker, and with a full production and a fair demand there is the prospect of a good winter's trade, which labour troubles elsewhere may cause to be even better. As yet there is no advance in prices in the Northumbrian district in consequence of the difficulties; but it is quite probable that such an advance may be declared soon, unless there should be a settlement of the disputes.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

MR. HELPS'S PIPE EXTRACTOR.

SIR,—I have read with some amusement your remarks in the JOURNAL for the 25th ult. (p. 542) on Mr. Helps's patent, seeing that about 33 years ago I made a similar machine for the same purpose. It was tried with 4-inch pipes, but did not save much, if anything.

West Ham Gas-Works, Oct. 11, 1888.

E. H. THORMAN.

MODIFICATIONS OF HARCOURT'S COLOUR TEST.

SIR,—I thank Mr. Leicester Greville for his courteous letter in the last number of the JOURNAL. I am sorry that there should have been a mistake in my letter in the issue for Oct. 2, for by some means 20 c.c. was converted into 70 c.c. of water. As a matter of fact, if gas normal solutions are used, 10 c.c. of solution is sufficient; and if Mr. Greville will try the experiment described in my letter with 20 c.c. instead of 70 c.c., he will find that what I said was quite correct.

Ramsgate, Oct. 12, 1888.

W. G. HICKS.

GAS SUPPLY IN JAPAN.

SIR,—In your last issue there was a paragraph, headed as above, in which it was stated that Mr. Watson Smith, Lecturer in Chemical Technology at the Owens College, Manchester, had heard from his friend Mr. W. Newbigging, Manager of the Tokio Gas Company, that the President of the Company (Mr. Shibusawa) has recently been enabled to announce that a substantial reduction in the price of gas will take place—viz., from 3 to 2.70 yen per 1000 cubic feet, with discount; and he gives Mr. Newbigging a side-winded compliment for his skill and management. I should not have noticed the matter, only a very short time ago another paragraph appeared in the JOURNAL eulogizing the Tokio Gas Manager for his great skill, &c., &c., before he had had time to look about him after arriving in the country. Taking into account that the mines are convenient to, and that the coal is stored in the Tokio Gas-Works at about \$4 per ton, and that they pay their stokers \$10 per month, the gas still runs high in price—10s. 9d. per 1000 cubic feet as reduced. I, however, cannot give any opinion as to Mr. Newbigging's skill and management; but if your information of the latter is derived from as good a source as that from which you learnt that the Japanese yen is equal to about 2s. 9d. of English money, very little credit can be placed on it. There is no Japanese coin equal to about 2s. 9d. of our money; a Japanese yen is equal to 4s. 2d. English—a 5-yen piece being equal to our sovereign.

Dungannon, Oct. 11, 1888.

R. ROSS.

SETTLEMENT OF A LONG-STANDING GAS ACCOUNT.—Mr. C. Sellers, the Engineer and Secretary of the York Gas Company, has received a letter from a distant anonymous individual, enclosing, as the writer states, "five £1 orders for an account I have owed for many years, and interest, and to pay for an answer," in a newspaper.

GAS EXHIBITION IN KENDAL.—An exhibition of gas appliances was opened in the Market Hall, Kendal, last Tuesday night, by Mr. W. H. Wakefield, Chairman of Quarter Sessions. It was arranged by the Kendal Gas and Water Company, and included all kinds of appliances for the consumption of gas for illuminating and domestic purposes.

ROTHERFIELD AND CROWBRIDGE GAS COMPANY, LIMITED.—This Company are issuing a prospectus in which they state that they have secured an eligible site; the Marquis of Abergavenny having granted a lease for the requisite land on which to erect their works at Crowbridge, Sussex. The capital is £6000, in 1200 shares of £5.

THE CAPITAL OF THE FAVERSHAM GAS COMPANY.—The Faversham Gas Company are going to liquidate, in order to pay about 30s. in the pound to the shareholders. The capital of the Company is small; but the plant and business are valuable. As a consequence, there is to be a re-arrangement by which each shareholder will get £150 worth of stock for £100 worth of shares.

PROPOSED ADOPTION OF ELECTRIC LIGHTING AT HENDON.—Encouraged, doubtless, by the success (?) of the electric lighting of Barnet, a member of the Hendon Local Board—Mr. Yule—has notified his intention of moving, at the next meeting of that body, that the Solicitor be instructed to apply to the Town Clerk of Barnet for particulars as to the price paid for electric lighting there, with a view of ascertaining whether a saving of the ratepayers' money might be effected by the adoption of the new light at Hendon.

THE MANSFIELD IMPROVEMENT COMMISSIONERS, AND THE WATER-WORKS.—At the meeting of the Mansfield Improvement Commissioners last Friday, Mr. James gave notice of a motion to refer to arbitration the question of the terms on which the Commissioners could acquire the undertaking of the Mansfield Water Company. He reviewed the past proceedings in the matter, and remarked that, inasmuch as there was only £6000 difference between the amount already offered by the Commissioners and that asked by the Company, the matter should be settled in the manner suggested.

REDUCTIONS IN PRICE.—The Brentford Gas Company have given notice of their intention to reduce the price of gas to private consumers from 3s. 2d. to 3s., and for public lighting from 2s. 10d. to 2s. 8d. per 1000 cubic feet, from the close of the quarter ending at Christmas next. This will mean a saving of upwards of £260 per annum to the Board.—As reported in another column, the Carlisle Town Council have decided on reducing the price of gas from 2s. 6d. to 2s. 3d. per 1000 cubic feet as from the end of the year.—The Whitworth Vale Gas Company have reduced the price of gas 2d. per 1000 feet as from the 1st inst. The price will now be 3s. 9d. per 1000 feet.

IMPROVED LIGHTING IN ST. JAMES'S.—At the meeting of the Vestry of St. James's, Westminster, last Thursday, the Lighting Committee recommended that it should be referred to them to take into consideration the advisability of fixing street lanterns of improved construction throughout the parish where necessary, with a view to the full benefit being derived from the recent increase in the size of the burners. This was agreed to. One of the members said he had just returned from a tour in the smaller towns of Germany, and he did not hesitate to say that in any second-class city in Germany the lighting was superior to anything found in the Metropolis. London, as a city, was very badly lighted; and St. James's, Westminster, was the worst lighted portion of it.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

The Chief Gas Examiner for the Metropolis (Dr. Williamson, F.R.S.) has presented his report on the quality of the gas supplied by The Gaslight and Coke, the Commercial, and the South Metropolitan Companies, during the quarter ending Sept. 30. The following is an abstract:—

I. With respect to Illuminating Power.—The average illuminating power, in standard sperm candles, at each of the testing stations, was as follows:—

The Gaslight and Coke Company—	
Jewry Street, E.C.	16.4
Kinghorn Street, E.C.	16.7
Dorset Buildings, E.C.	16.7
Ladbroke Grove, W.	18.0
Devon's Road, E.	16.6
Carlyle Square, Chelsea	16.6
Camden Street, N.W.	16.3
Graham Road, E.	16.5
Kingsland Road, E.	16.9
Spring Gardens, Charing Cross, S.W.	16.3
Grove Gardens, Regent's Park, N.W.	16.6
Lambeth Road, S.E.	16.4
Hornsey Road, N.	16.2
Millbank Street, S.W. (cannel gas)	20.8
Commercial Gas Company—	
Wellclose Square, E.	16.5
Parnell Road, E.	16.6
South Metropolitan Gas Company—	
Hill Street, S.E.	16.5
Foster Place, S.W.	16.3
Stoney Lane	16.4
Lewisham Road, S.E.	16.4
Blackfriars Road	16.2

It will be seen from these results that the average illuminating power at all the testing stations was higher than the parliamentary standard. At the Millbank Street and Lambeth Road stations of The Gaslight and Coke Company, the minimum illuminating power was equal to the requirements; and, with the exception of certain deficiencies in the lighting power at the Jewry Street, Camden Street, Spring Gardens, Hornsey Road, Wellclose Square, and Parnell Road testing stations, the minimum was either equal to or above the requirements of the Acts of Parliament at all the testing stations.

II. As regards Purity.—Sulphuretted hydrogen was not present in the gas at any of the testing stations. The average amount of sulphur present in the gas has been considerably less than the quantity permitted at all the testing stations. With the exception of the Jewry Street station (where on four occasions during the quarter slight excesses were reported), the maximum amount present in the gas has been well within the limit at each station. Excepting the City of London testing stations, ammonia was generally present in the gas more or less frequently during the quarter, but only in slight quantities, at all the stations.

THE CHARGES IN CONNECTION WITH THE HALIFAX GAS COAL CONTRACTS.

The following correspondence, bearing upon the impending proceedings arising out of the charges of fraud in connection with the Halifax gas coal contracts, has been forwarded to us for publication. On the 11th inst., Messrs. Cobbett, Wheeler, and Cobbett (Mr. Emor G. Wrigley's Solicitors) wrote to the Town Clerk of Halifax, Mr. Keighley Walton, in reply to a letter addressed by him to Mr. Wrigley on the 4th inst., as follows:—"Having regard to the character and means of Mr. Fox, we have advised our client not to take legal proceedings against him, but to treat his allegations with contempt. We are instructed to state on Mr. Wrigley's behalf that he denies that he has fraudulently substituted another and inferior coal to that which he contracted to supply to the Halifax Gas-Works, or that he has been guilty of malpractices in connection with the Halifax Gas-Works; and he is willing, and hereby offers through us, to render any assistance in his power or give any desired information to the Corporation for the purpose of proving that such charges are false." A copy of this letter was forwarded by the Town Clerk to Messrs. Godfrey Rhodes and Evans (Mr. Fox's Solicitors), who on the next day replied as follows:—"We are obliged by the copy of letter received by you from Messrs. Cobbett, Wheeler, and Cobbett, written on behalf of Mr. Wrigley, and hasten to reply to the base insult and insinuation therein contained, reflecting upon Mr. Fox. If either Mr. Wrigley or Messrs. Cobbett, Wheeler, and Cobbett have any charges to make against our client's character, and will put them into writing, our client will be prepared to meet his accusers face to face in the witness-box, and will not be as long in issuing his writ as Mr. Wrigley has been. Mr. Wrigley and his advisers no doubt would be very glad to escape the exposure consequent on his going into a Court of Law; but in order that the excuse as to our client's means put forward by them may be discarded, we may say that our client will be prepared, within 24 hours after being served with any writ by Mr. Wrigley, to deposit with the Mayor the sum of £1000, provided Mr. Wrigley will deposit a similar amount, and to be held by the Mayor to provide for the result of Mr. Wrigley's action. Our client cannot boast of any large possessions; but if he had adopted the same means of making money which, from information in our possession, Mr. Wrigley appears to have followed, he would no doubt have been worth considerably more. We shall be glad if you will kindly ask Messrs. Cobbett, Wheeler, and Cobbett to state what charges they have to make against our client's character. We may say, in reference to the offer on behalf of Mr. Wrigley to render any assistance in his power, or to give information to the Corporation, that, so far as our client is concerned, and we venture to think so far as the general body of ratepayers of Halifax are concerned, no information he may give will be satisfactory, unless given upon oath, and unless he subjects himself to cross-examination in the witness-box." The draft indemnity to be given to Mr. Alderman Riley by the Corporation will, it is expected, shortly be submitted to the Mayor and Town Clerk for approval.

LEEDS CORPORATION GAS SUPPLY.

ALLEGATIONS BY MR. ELLIS LEVER AS TO THE COAL CONTRACTS.

At the Meeting of the Leeds Town Council last Thursday—the Mayor (Mr. Alderman Searr) in the chair—a discussion took place on the subject of certain communications which had been received by his Worship from Mr. Ellis Lever in reference to the Corporation coal contracts.

Mr. GILSTON, Chairman of the Gas Committee, in moving the approval of the minutes of the Committee, called attention to the following statement contained therein:—"The Mayor attended (on Aug. 1) and read to the Committee telegrams and letters received by him from Mr. Ellis Lever upon the subject of coal contracts. Resolved—That, having heard the Mayor's explanation of his reason for desiring the subject to be considered by the Committee, they are of opinion that there is no sufficient reason

for withdrawing the resolution accepting the coal tenders from the minutes to be approved by the Council to-day." He said that the Mayor received from Mr. Ellis Lever letters intimating that amongst the people tendering for coals were men who were not particularly truthful and honest in their dealings, and wishing to caution the Committee against entering into any contract with people of this kind. Inasmuch as Mr. Lever did not indicate the persons to whom he referred, and the Committee did not know them, they declined to withhold the tenders they were prepared to recommend to the Council for acceptance. They did this, however—they appointed the Mayor, the Town Clerk (Sir G. Morrison), and himself to meet Mr. Lever, and hear what he had to say in the matter; agreeing that if anything substantial to the disadvantage of the men referred to were laid before them, they would not fail to take notice of it. Mr. Lever had not found it convenient to make arrangements to meet them; and he (Mr. Gilston) apprehended that he had nothing to say against any person with whom contracts had been entered into. The Gas Committee, however, were not disposed to leave the matter where it was. They were determined that, sooner or later, Mr. Lever should be asked to meet a deputation of the Committee, in order that he might justify the charges made against one or more of the people referred to.

Mr. DYSON seconded the motion.

Alderman GAUNT reminded the Council that Mr. Lever had already been engaged in one action in regard to coal contracts, and had substantiated every word he had used; and he expressed a hope that the Committee would not, from any punctiliousness, refrain from receiving information from Mr. Lever or any one else. The Council were aware that in Leeds, only a year or two ago, they had coals of an inferior kind sent to New Wortley; and, in fact, that a lot of things were then going on that were very irregular—not that it was the fault of the Gas Committee, because the members could not be present to look after such things. He was quite sure that, if there was anything wrong, the Committee would do their best to get to the bottom of it.

The MAYOR said Mr. Lever had not refused to come and see them; he had engagements which prevented him coming now. However, he was under a promise to come when it was convenient; and therefore he (the Mayor) thought they had better not discuss the matter further at present. When Mr. Lever came, Mr. Gilston, Sir G. Morrison, and himself would hear what he had to say, and would communicate it to the Council or to the Gas Committee.

Mr. HENRY hoped the Council would not be uneasy in reference to this matter. Mr. Lever had not made any allegations against those with whom they had entered into coal contracts. He was aware that discounts had been deducted from accounts in cases where an inferior quality of coal had been sent in.

Sir E. GAUNT: That is a very improper thing.

Mr. HENRY replied that it might not be a proper thing; but if it were found that an inferior article was sent in, it was surely fair that a deduction should be made, and the contractor warned that if he sent any more coal of an inferior quality his contract would be broken. The Gas Committee were quite alive to the matter. There was very little irregularity; in fact, he believed there was none at all. The Council might rest assured that the Committee would not hesitate to probe to the bottom anything they found to be wrong.

Alderman TATHAM hoped the Gas Committee would feel their hands strengthened by the Council in thoroughly investigating these matters, because he believed the hateful practices alluded to were almost universal; and if they could be stamped out, it would be a good thing.

Alderman EMSLEY said the coal contracts of the borough amounted to £150,000 a year. It appeared to him that the Gas Committee had declined to go into the matter as the Mayor requested.

The Mayor interposed, saying he did not request the Committee to withhold the contracts from confirmation. There had been no definite charges made against any person; and the Committee thought it right to go on with the business—intimating that they would like to hear Mr. Lever after the contracts were confirmed. He might add that he did not think the Council need be alarmed in the matter.

Alderman BAKER said Mr. Lever had been urged to attend before the Committee to give any information he possessed, and the Chairman of the Committee had done all he possibly could in the matter; but Mr. Lever had sent a telegram to say it was not convenient to come. When coal of an inferior quality was persistently sent in, the contract was stopped; but when it was only one or two loads that were poor, deductions from the payments were made. The people employed at the gas-works were very cautious; and he hoped they would continue to be so.

Mr. ARNOLD LUPTON pointed out that there might be variations in the quality of coal without any intentional dishonesty.

Mr. GILSTON, in reply, hoped the Council would not suppose that either the Gas Committee or himself would attempt to stop Mr. Lever from carrying out the purifying process he had had in hand for some time. Every gas concern in the country was indebted to him for the exposures which he had made; but, while grateful to him, they must not forget the character of their own people. The Council need not be disturbed about the coal, as every Manager was responsible; and it was his interest to see that he was getting what he paid for. Besides, the coal was tested by an independent analyst once a month. If Mr. Lever could point out one man who had acted dishonestly, there was no member of the Gas Committee who would not be ready to investigate any charge he might bring against any contractor.

The motion was then put and carried.

THE SHEFFIELD CORPORATION AND THE GAS COMPANY.

THE DUTIES OF THE NOMINEE GAS DIRECTORS.—THE ISSUE OF NEW STOCK.

At the Meeting of the Sheffield Town Council on Wednesday last, the members were asked to elect three nominee Directors, to represent the Corporation on the Board of the Gas Company. Before proceeding with the business, Alderman Foster requested some information as to the duties of the Directors. Were they useful or purely ornamental? Mr. Booker replied that they were certainly not useful. The Mayor (Mr. Alderman Clegg) suggested that the votes should be counted before the question put by Mr. Alderman Foster was answered. The votes were then taken; the result being that Mr. Alderman Gainsford, Mr. Langley, and Mr. Franklin were re-elected. Alderman Gainsford, in answer to the question, said it was for the Council to judge of the utility or otherwise of the Directors. Alderman R. T. Eadon thought the Directors were useful, and mentioned instances when, but for their presence on the Board, there might have been ill-feeling between the Corporation and the Company. Mr. Franklin said the nominee Directors were placed on the Board by Act of Parliament. He did not think they were of any great use to the Council—in fact, the Law Clerk of the Gas Company (Mr. W. Wake), when asked what their particular functions were, replied that it was to make themselves disagreeable. He could not say that they had succeeded in fulfilling the idea of the Law Clerk. He believed they had been as successful as their limited powers would permit them to be in attending to the interests of the town. Alluding to the issue of a new class of shares by the Company, he said it

was a question which very seriously affected the town, and one which the nominee Directors took into their careful consideration; and he both spoke and voted against such issue. The Company had uncalled capital of something like £8000, they had large borrowing powers which they had not exercised, and they had uncalled capital on the "E" shares; but notwithstanding this, they had decided to issue new shares. He communicated with the Town Clerk (Mr. Pye-Smith), and ascertained his opinion; and he had also found from the Acts of Parliament that, although the Company had the borrowing powers, they would not be justified in exercising them. The Town Clerk said the question of issuing shares was one for the proprietors to decide, and that no outside authorities had any power to interfere with them. This was the state of the law; and, in his opinion, the interests of the town had not been so well looked after in the past as they might have been. He thought it due to the Council to give this explanation. Alderman Gainsford said he had mentioned the matter of raising new capital to the Law Clerk of the Company; and he clearly pointed out that Parliament had given them the power to issue new shares to the existing holders at their nominal value instead of at their market value. The Law Clerk explained that, at the time the Act of Parliament was passed, it was agreed that the Company should be limited to a 10 per cent. dividend on the one side, but on the other side that they should have the power of issuing new shares at the nominal value of £100 instead of the market value, which, he supposed, would now be about £250. The Law Clerk said that if they had not had the privilege of issuing new shares at their nominal value, they would have been allowed, as other gas companies were, to have gone beyond the 10 per cent. dividend. He pointed out that if the Company had wanted £50,000, they could have obtained it by issuing capital bearing a dividend of £4000 or £5000, instead of £12,000 as by their present plan. The Company, in what they had done, had acted entirely within the scope of their Acts. He mentioned this in order that the Council might understand both sides of the question. Mr. Langley said he was the only nominee Director at the meeting held on the 1st inst. (see *ante*, p. 639), and not one shareholder rose to ask what the money was wanted for. He bore testimony to the efficiency of the Company's works. A formal resolution was then passed re-electing the gentlemen above-named.

ARBROATH CORPORATION GAS SUPPLY.

THE PROPOSED EXTENSION OF THE GAS-WORKS.

A Meeting of the Committee of Management of the Arbroath Gas Corporation was held on Monday last week—Provost ANDERSON presiding—for the purpose of considering the remit from the Commission in reference to the carrying out of the proposed extension and improvement of the gas-works at a cost of about £8000.

Provost ANDERSON explained the object of the meeting, and detailed the steps which had led up to its being held. He afterwards remarked that the position at which the Commissioners had now arrived was either that the extension scheme contained in the remit ought to be carried out, or that the erection of new works should be faced. He had no objection to recede from the position he had taken up, provided those who favoured the new works could show how it could be financially accomplished; but he maintained that the time had now arrived when the Committee should either do the one thing or the other.

Mr. DICKSON said his idea was that the Engineer's (Mr. R. S. Carlow's) estimate for removing the old plant to a new site, and adding whatever additional plant was required, should be practically tested by asking local tradesmen to send in offers for performing the necessary work, and that a Committee of three should be appointed to look out for a site. His firm belief was that a new site could be procured without a penny of cost to the ratepayers. He admitted that Mr. Carlow's estimate might fall a little short; but the transference could, in his opinion, be effected for about £17,000, and as much would be saved annually as would meet the interest on a loan of this amount. He moved a resolution accordingly.

Mr. CARLOW, in reply to a question, said he had withdrawn his estimate for removing the works to a new site at a cost of £15,000, so far as the cost of the removal of the holder was concerned. There might be some difficulty in fitting up the old iron sheets, and also in excavating the whole of the stones of the holder; and he had therefore increased his estimate, so far as it concerned the removing of the holder, by £2000.

Mr. DICKSON said he had never understood until now that Mr. Carlow had withdrawn his estimate of £15,000.

Provost ANDERSON said it had been mentioned at least half-a-dozen times at the last meeting.

Mr. CARGILL remarked that Mr. Dickson's proposals were not so simple as they appeared. At the same time he did not disapprove of the suggestion that an inquiry should take place as to the cost of erecting new works.

Provost ANDERSON said his objection to Mr. Dickson's proposed inquiry was that they could place no kind of reliance upon estimates given by tradesmen who were not assured that the works for which they were estimating were going on. Besides, local tradesmen knew nothing about gas-works. If they wished for a reliable estimate, they must procure it from a gas engineer. If they would go the length of remitting it to such a man as Mr. William Foulis, Engineer and Manager to the Glasgow Gas Corporation, he should have no objection to such a course.

Mr. SANDEMAN held that no new arguments in favour of the extension had been advanced. He considered, therefore, that the Commissioners should consult their constituents at the November elections before doing anything further.

Provost ANDERSON said that he could not understand the position taken up by Mr. Sandeman, after he had consented to the Commissioners engaging Mr. Mitchell to report on the works.

Mr. SANDEMAN replied that he was entitled to change his opinion when he thought he was wrong. He maintained that the Arbroath Gas-Works were as good as any of their size in Scotland, and that the Commissioners therefore were not justified in spending £800 upon them.

Mr. CARLOW remarked that Mr. Sandeman had apparently forgotten that the small gasholder was completely done for.

Mr. DICKSON said he should support Mr. Sandeman's proposition, as a protest against the present site of the works.

After some further remarks,

Mr. CARGILL moved that the following should become the finding of the Committee:—"It was resolved that, before proceeding to carry out the remit made to them, the Committee recommend that a Special Committee, consisting of Provost Anderson and Messrs. Dickson and Cargill, should be appointed to look out for a suitable site for new works or alternative sites; and the Committee further recommend that the question of the proposed extension of the present works and new works should be remitted to Mr. William Foulis, Engineer, Glasgow Corporation Gas-Works, to consider and report."

A vote was then taken between the motion of Mr. Sandeman and Mr. Cargill's amendment, when the latter was carried by 15 votes to 2; Mr. Michie entering his dissent.

The Committee then resolved itself into a meeting of the whole Board, when the finding of the Committee was unanimously adopted.

STAFFORD CORPORATION GAS SUPPLY.

THE PROGRESS OF THE WORKS.

In the JOURNAL last week we briefly alluded to the visit recently paid by the members of the Stafford Corporation to the gas-works, by invitation of Mr. Alderman Dudley, the Chairman of the Gas Committee. On that occasion, this gentleman gave a short account of the improvements which have been effected in the gas-works during the past few years. In the course of his remarks he said: The first important alteration and extension made at these works since 1883 was the erection of two new lime purifiers and a new shed for slacking and storing lime; also a shed for spent lime. The gas is now passed through four oxide purifiers, each filled with hydrated ferric oxide. In these the whole of the sulphuretted hydrogen is eliminated from the gas; also a portion of the sulphur compounds. The gas is then passed through the new lime purifiers, which take out the carbonic acid, and further reduce the sulphur compounds—the chief benefit obtained by eliminating the carbonic acid being an increase in the illuminating power of the gas. The cost of altering the purifying arrangements was £1500; and we now have a very efficient system of gas purification. Further, the manual labour of emptying and charging the oxide purifiers is reduced to a minimum by means of an oxide conveyer. The next alteration worthy of note is the construction of new retort furnaces in No. 2 retort-bench. No. 1 retort-bench has been rebuilt; the length of the retorts increased from 18½ to 20 feet; and the retorts in this bench are heated by the Manager's (Mr. J. F. Bell's) own system of regenerative furnaces, which, I understand, is being protected in England and America. By means of this system, we can make upwards of 8000 cubic feet of gas per mouthpiece in 24 hours, against 5000 cubic feet in the ordinary settings. The importance of this will be at once perceived when I inform you that, unless a larger make of gas per retort had been made possible, the retort-house would have had to be speedily enlarged. The cost of this extension would amount to £5000, and is thus able to be deferred for some time longer. The cost of rebuilding No. 1 retort-bench and introducing the regenerative furnaces was about £500. Further, the coke used for carbonizing the coal is considerably lowered by means of the improved furnaces. A glance at the printed statement of the gas accounts at once shows this; for I find that during 1883, 2462 tons of coke were sold, and during 1888, 3513 tons, or an increase of nearly 50 per cent. Allowing for the difference in the quantity of coal carbonized—in 1883, 7648 tons, and in 1888, 8637 tons, the increase of coal used being 13 per cent.—and deducting this amount, gives a net increase of over 35 per cent. due to improved retort furnaces. The anxiety caused to the members of the Gas Committee when the serious depreciation took place in the value of residual products—tar and ammoniacal liquor—will be fresh in the minds of the members of this Council. To minimize the loss on residuals, the Committee decided to work up the gas liquor into sulphate of ammonia. I have repeatedly brought before you the advantage gained by the erection of sulphate works, and will now only add that the entire cost of them—viz., £1000—has been recouped by the additional profit made on the manufacture of sulphate. Our sulphate works have been inspected by a number of gentlemen from different parts of the country; and I can claim that they are among the most complete for their size. The obnoxious gases resulting from the manufacture of sulphate of ammonia from ordinary gas liquor are entirely decomposed; and we have here a sample of the sulphur recovered by means of the Claus sulphur-recovery process. Among the minor improvements have been the alteration of the hydraulic mains, and the introduction of new wrought-iron ascension-pipes, on two beds of retorts, so as to reduce the number of stopped pipes; also a new tar extractor has lately been fixed, which completely eliminates all the fine tarry particles from the gas before it is further treated for other impurities. So complete is this elimination, that if a jet of gas be allowed to impinge on white note-paper for 24 hours it will not stain it. For some time the Committee considered the advisability of altering the gas offices, which formerly were very inconvenient to our customers. The alterations speak for themselves; and no doubt will be appreciated by those employed therein and the general public. The total amount of money spent in alterations and extensions during the last five years has been upwards of £5000, the whole of which has been charged to the revenue account. The price of gas has been reduced 6d. per 1000 cubic feet, the meter-rents have been reduced, and the total amount of profit handed over in reduction of the rates during the last five years has been £7900 against £5700 applied in this way during the five previous years.

CARLISLE CORPORATION GAS AND WATER SUPPLY.

THE WORKING IN THE YEAR ENDING JUNE 30.

At the Meeting of the Carlisle Town Council last Tuesday, the Gas, Water, and Baths Committee presented a report on the working of these departments during the year ending June 30 last, accompanied by the usual financial statement. In both the Gas and Water Departments the profits were larger than the Committee anticipated. The amounts payable to the city and district funds were as follows:—City fund (gas profits), £8066 15s. 6d.; district fund (water profits), £4291 5s. 6d.—total £12,358 1s. Deducting the amount previously paid on account, £2000, there was left a balance of £10,358 1s. Having taken into consideration the probable results of the current year's working, the Committee recommended that, from Dec. 31 next, the price of gas should be reduced from 2s. 6d. to 2s. 3d. per 1000 cubic feet within the area of supply, and that the discount on the water charges should be increased from 2s. 6d. to 3s. 4d. in the pound.

Accompanying the Committee's report was one by the Gas and Water Engineer (Mr. J. Hepworth, Assoc. M. Inst. C.E.). In the course thereof he stated that there had been an increased consumption of gas, compared with the preceding year, as shown by the following statement:—

	Coal Carbonized.	Gas Made.	Gas Accounted for.	Gas Unaccounted for.	Per Cent.
	Tons.	Cubic Feet.	Cubic Feet.	Cubic Feet.	
1887	17,343	183,242,000	174,119,000	9,123,000	4.98
1888	17,308	186,916,000	179,371,750	7,544,250	4.03
—35	..	+3,674,000	..	+5,252,750	.. -1,578,750 = -0.95

It will be seen from the foregoing figures that in the past financial year, with a less quantity of coal carbonized by 35 tons, there was an additional production of 3,674,000 cubic feet of gas, an increase of 5,252,750 cubic feet accounted for, and a decrease of 1,578,750 cubic feet unaccounted for. The quantity of gas sold per ton of coal was 10,238 cubic feet; the illuminating power being equal to 19.26 sperm candles. On the subject of the reduction in price, Mr. Hepworth said that, with the figure kept at 2s. 6d., there would be, he estimated, a profit of £8500 in June, 1889, which would be subject to charges for interest, &c., to the extent of £2300; leaving a net surplus of £6200. A reduction of 3d. per 1000 cubic feet would entail a loss of revenue to the extent of £2175, which would leave a net surplus of £4025. The net profits of the Gas Department for the past year were equal to a rate of 9½d. in the pound. With regard to the Water Department, Mr. Hepworth reported that the works and mains had been kept in good order. The total quantity of water delivered in the year was 343,785,067 gallons; being equal to a daily average of 939,311 gallons, or 23.48 gallons

per head of the population. Of this quantity it is estimated that 17·60 gallons were consumed for domestic, and 5·88 gallons for all other purposes. The total bulk delivered in 1887 was 341,865,329 gallons, or 23·41 gallons per head daily for all purposes. He expressed the opinion that the profits for the current year will, in all probability, be equal to those of the year just closed; and in this event the net surplus profits will be £1790. The discount of 12½ per cent. on water accounts, first conceded in 1885, now amounts to £1000 per annum. The net profits for the twelve months reported upon are equal to a rate of 2½d. in the pound. From the accounts following Mr. Hepworth's report, we find that the sale of gas produced £21,763; the rental of meters, £647; residuals, £3691—the total receipts being £26,587. The expenditure on the manufacture of gas was £15,169 (coal costing £9559); on its distribution, £921; management cost £638—the total expenditure being £18,250. The balance carried to the profit and loss account was therefore £8337. The carbonization of 17,303 tons of coal and cannel produced, in addition to the above-named quantity of gas, 7980 tons of coke, of which 2468 tons were used; 207,696 gallons of tar, of which 101,706 gallons were used; and 185 tons of sulphate of ammonia. The water revenue was £6934; the expenditure, £2546—the balance, £4388, being carried to the profit and loss account.

Mr. FORSTER moved the adoption of the report, and also that the price of gas be reduced on the 1st of January next from 2s. 6d. to 2s. 3d. per 1000 feet. He said he considered the results most gratifying, especially in view of the depreciation in the value of the residual products. The increase in the profits must be attributed to good management. There had been 3½ million cubic feet more gas made with 35 tons less coal.

Mr. CREIGHTON, in seconding the motion, said the result, upon which the citizens of Carlisle might be congratulated, had not been obtained by good luck, but, as Mr. Forster had stated, by good management. The leakage only came to about 4 per cent., which was probably the smallest amount in any town in the kingdom; and the quantity of sulphur in the gas was only 9 grains, whereas they might, under the sanction of the Legislature, have 17 or 18 grains per 100 cubic feet. The receipts for tar had been very much reduced—having been only about £180 last year; but they had turned the tar to good account by using it as fuel. He thought the consumers were entitled to the proposed reduction, which might hereafter be still further increased. At the same time the ratepayers were entitled to some advantage from their magnificent property, and the reduction proposed was, he considered, a fair balance between them and the gas consumers.

Mr. SROX congratulated the Committee upon the improvement which had taken place since last year; dwelling specially upon some of the items in the accounts, to show where the improvements had occurred.

The motion was agreed to; and it was further resolved that the discount on the water charges be increased from 2s. 6d. to 3s. 4d. in the pound from the 31st of December next.

THE PROGRESS OF THE BOLTON CORPORATION GAS AND WATER UNDERTAKINGS.

Last Thursday, the borough of Bolton celebrated the Jubilee of its incorporation. The charter was granted on Oct. 11, 1838; so that Bolton was among the first places to take advantage of the Municipal Corporations Act, passed in the session of 1835-6. The Town Council recognized the occasion by having a special meeting, at which they passed a resolution congratulating the borough on its progress. In connection with this event, a digest of the work of the Corporation during its half-century of existence has been prepared by the Town Clerk; and from this document we extract a few details in regard to the gas and water works undertakings.

So far back as the year 1818, the Great Bolton Gaslight Company offered to light the town with gas or oil at the same figure which it was costing the Trustees to illuminate the straggling streets with oil-lamps. This offer was accepted by the Trustees; the Company agreeing to pay £31 10s. annually, in consideration of the Company breaking up the streets, putting the roads and pavements in good condition and repair again, and also having a light fixed upon a pump in the Market Place equal to four ordinary gaslights. The first Engineer of the works was Mr. Ralph Spooner, then connected with the Preston Gas Company; and under his directions the necessary buildings were erected in Gas Street. The first public lamps in the town were lighted by gas on the 1st of May, 1819; the new illuminant being watched with some apprehension by the inhabitants, who had a fear of the invention. The Company made steady progress; and in 1824 a notable event occurred in its history. In that year Sadler, a well-known aeronaut, ascended from the gas-works in his balloon, and was killed in his descent at Whalley. A successful ascent was, however, made, from the works some two years later, when Miss Spooner, daughter of the Gas Engineer, accompanied the aeronaut Green in his balloon. When the town was incorporated in 1838, the Gas Company was a very successful concern; the quantity of gas made being 3½ million cubic feet, or only 1·18th of the present manufacture; the Manager at this time being Mr. James Green. As the town developed, the works at Gas Street were found insufficient to cope with the demand, and, as a result, new ones were erected at Lum Street, these being completed in 1853. In the following year the Company extended its supply to the Bolton Union; and built spacious offices at a cost of £12,000. It was not until 1871 that the Corporation finally decided to take over the gas undertaking; the terms being as follows:—A perpetual annuity of 10 per cent. on the 3909 old, and 6½ per cent. on the 7466 new shares, free from deduction for income-tax, with a bonus of £2 on each share; the total amount of bonus being £22,750. In 1872 this agreement was confirmed by the Bolton Corporation Act. The sale of gas at the time of the transfer was 304½ million cubic feet; now it is about 596 millions—an increase of practically 96 per cent. In 1872 the gas-rental was £51,725; it is now £80,596. The tons of coal carbonized in 1872 were 31,687, as against 62,438 now. The storage capacity has been increased by the erection of a large holder capable of containing 2½ million cubic feet of gas. The total holding capacity of the six holders on the gas-works is 6½ million feet. The gas department is a most profitable concern for the Corporation, for at the last making up of the accounts an amount equal to a reduction of 7d. in the pound on the rates was handed over, besides providing for all contingencies; the total amount paid in relief of rates since the Corporation came into possession being £125,189. The price of gas, too, was reduced a short time ago from 3s. 4d. to 2s. 6d. per 1000 cubic feet. The present Chairman of the Gas Committee is Mr. Alderman Miles.

In 1847 the Corporation took the water-works into their own hands. The old Company had invested in the undertaking £141,928, and they disposed of it for a yearly rent-charge of £4500. In 1863 steps were taken to increase the supply of water, and works were completed in 1876 which raised the capacity of the reservoirs to 7 million gallons per day. The daily consumption of water when the works were taken over by the Corporation was 800,000 gallons; it is now 5,000,000 gallons. The cost of the new works was £338,199; and the total amount of capital now invested in the water undertaking is £773,479. The revenue last year was £49,676, of which £10,000 was applied in aid of the general rates.

PROPOSED PURCHASE OF THE PARTICK, HILLHEAD, AND MARYHILL GAS-WORKS BY THE GLASGOW CORPORATION.

At the Meeting of the Glasgow Town Council last Thursday—the Lord Provost (Sir J. King) in the chair—a recommendation of the Gas Committee, as to the purchase of the undertaking of the Partick, Hillhead, and Maryhill Gas Company by the Corporation—a matter to which several references have lately been made by our Glasgow Correspondent—was brought forward. At a special meeting held on the 16th of August, the Gas Committee had before them a memorandum setting forth the negotiations which had taken place between the representatives of the Corporation and of the Company; and, after a long discussion, it was unanimously resolved to recommend the Corporation as Gas Trustees to conclude an arrangement with the Company for the acquisition of the undertaking, subject to the following conditions:—

1. The price of the undertaking to be as follows:—(1) The holders of the 5½ per cent. preference stock of the Company, amounting to £30,000, to be paid the amount of their stock and 10 per cent. premium. (2) The holders of the ordinary stock of the Company, amounting to £99,300, to be paid the amount of their stock, less 10 per cent. discount. (3) The Gas Trustees to assume the debenture debt and the other current liabilities of the Company, conform to schedule to be subscribed as relative hereto, and to be entitled to all the Company's assets except as after-mentioned.

2. In the balance of the accounts of the Company for the year ended June 30, 1888, before estimating profits, £3000 to be carried to depreciation, less £500 for vested interests.

3. The balance of net profits for the year ending June 30, 1888, amounting (after setting aside the said sum of £3000 and paying dividends, &c.) to £552 16s. 9d., to belong to the Company.

4. The foregoing arrangement to be conditional on: (1) Confirmation by the Corporation, acting as Gas Trustees, and by the shareholders of the Gas Company. (2) The sanction of Parliament being obtained to an extension of the boundaries of the city, in terms of the report by the Boundaries Commissioners, so far as the districts supplied by the Company are concerned; and also to a Bill to be promoted by the Corporation, acting as Gas Trustees, giving effect to the proposed purchase, and conferring on the Corporation, as Gas Trustees, and the Gas Company the requisite powers for carrying the same into effect, and which Bill the Company engage to support as far as in their power.

5. The foregoing arrangement, when confirmed by the Corporation and by the shareholders of the Company, to be binding on both parties till the 15th day of August, 1889, by which time it is hoped the requisite parliamentary authority shall have been obtained for the extension of the boundaries of the city and for the purchase by the Corporation, as Gas Trustees, of the said gas undertaking. In the event, however, of its being found practicable only to obtain, previous to the said 15th day of August, 1889, an Act for the extension of the boundaries of the city, as aforesaid, the foregoing arrangement for the acquisition of the gas undertaking shall remain operative, and the Corporation, as Gas Trustees, shall be bound in the immediately succeeding session of Parliament to promote a Bill to obtain parliamentary sanction for the purchase; and on such sanction being obtained, the transfer of the gas undertaking shall be carried into effect.

6. In the event of Parliament not having authorized the extension of the boundaries of the city previous to the said 15th day of August, 1889, or if, after having so authorized such extension, Parliament shall not in the succeeding session sanction the transfer of the gas undertaking, then the foregoing arrangement and the purchase therein contemplated shall absolutely terminate, unless with the express consent of both parties.

7. Till the said 15th day of August, 1889, or such postponed date as may be afterwards agreed upon between the parties, the gas undertaking of the Company shall continue to be managed by the Directors of the Company and the officers appointed by or acting under them; all the revenue charges, including the fees of the Directors and the salaries of the several officials and employees of the Company, as these have hitherto been paid, being continued and charged, and the Company being entitled to proceed with the additional gasholder at present under contract, and any other capital expenditure already intimated. Should any further capital expenditure be necessary in consequence of extension of business, it shall be subject to the approval of the Gas Trustees; and on obtaining their approval, such expenditure shall also be charged. The Company shall further charge in their accounts during the said period the sum of £3000 in respect of depreciation of plant for the current year; and they shall also, out of revenue earned during the said period, pay (1) the interest on the debenture debt, (2) the dividend on the preference stock, and (3) a dividend not exceeding 4 per cent. per annum on the ordinary stock of the Company, provided that the surplus revenue of the Company, after meeting the several other charges above specified, be sufficient to meet the said dividend. Any surplus, after making the above payments, to belong to the Gas Trustees, who shall defray the expense of carrying out the arrangements and of winding up the Company.

If the foregoing conditions are approved of by the Directors of the Company and by the Corporation, acting as Gas Trustees, the proposed sale shall be submitted as early as possible to the shareholders of the Company for their approval; and, if so approved, shall be embodied in a formal agreement, which shall (so far as they have power to make it binding) be binding on both parties.

At a special meeting of the Committee held on the 2nd inst., they expressed the opinion "that it was desirable that the Corporation, *qua* Gas Trustees, should be in a position to take over the Partick, Hillhead, and Maryhill Gas-Works, in the event of, and as soon as, the boundaries of the city have been extended; and they accordingly agreed to recommend the Town Council, if they approve of the arrangement embodied in the minute of the 16th of August last, to promote a Bill in the ensuing session of Parliament for powers to carry the same into effect, and to authorize the Law Agent and Engineer to take such preliminary steps as may be necessary in connection therewith."

It was decided not to consider the proposal in open meeting; but at the close of the business, the Council discussed the matter privately. No resolution was passed, as the Committee's report will come before the Council at a meeting to be held next Thursday.

THE LAWRENCE GAS COMPANY OF LANCASHIRE AND CHESHIRE, LIMITED. —A Company under this title was registered last week, with a capital of £150,000, in 30,000 shares of £5 each, with the object of entering into an agreement with the Lawrence Automatic Gas Company to acquire their patent rights.

THE COLNE WATER SCHEME.—Considerable progress has of late been made with the water-works at Laneshawbridge, Colne, where a large reservoir to hold between 90 and 100 million gallons is in course of construction. Already about 40 million gallons have been impounded, and the works are making rapid progress towards completion.

BERLIN MUNICIPAL GAS SUPPLY.

According to the report of the Berlin Chamber of Commerce on the working of the municipal gas undertaking during the past year (an abstract translation of which appears in the current number of the *Journal de l'Eclairage au Gaz*), the consumption of gas in the city, notwithstanding the competition of the electric light, increased, as compared with the preceding year, to the extent of 3,448,000 cubic metres, or 4.43 per cent. The greatest development of consumption was experienced in those localities where building operations were being actively carried on; but at the same time the districts in the central parts of the city showed an advance, arising no doubt from the fact that, in spite of the adoption of electric lighting, gas has still a vast field of operations. The total quantity of gas made was 81,274,000 cubic metres (or about 2868 million cubic feet), of which 10,596,865 cubic metres were consumed for the public lighting, 64,190,127 cubic metres by private persons, 692,151 cubic metres in the works and offices, and 5,794,857 cubic metres were unaccounted for. The consumption of "day" gas (comprising that used in the hours between the extinguishing and re-lighting of the public lamps) rose last year to 16,179,200 cubic metres; being equal to 20 per cent. of the total consumption. In certain parts of the city the quantity of gas burnt does not vary during the entire year; but in summer it only reaches 40 per cent. of the winter consumption. The consumers therefore asked for a reduction of 20 per cent. in the price of gas used during this part of the year, as it was employed for other than lighting purposes. The number of gas-engines supplied from the municipal works rose last year from 448 to 452; the total horse power increasing from 1266 to 1502. The slight addition to the number of engines, yet considerable increase in the motive power, is accounted for by the fact that a great many small engines which were formerly employed to pump water in houses have been thrown out of use, owing to the extension of the mains conveying a supply of water under pressure; while the engines used in the production of the electric light have been generally replaced by others of greater power. In Berlin, as elsewhere, gas has a serious competitor in petroleum. During the past year something like 16,000 gas-burners were dispensed with. Beyond this, there were in operation no less than 333 electric light installations, of which 163 were served from the central station in the city, and 170 from private plant. In the latter cases, the necessary motive power was obtained from steam in 124 establishments, and from gas-engines in the remainder. The electric lighting plant comprises 1554 arc, and 22,363 incandescent lamps; showing, as compared with the preceding year, an increase of 818 of the former, and 9658 of the latter. The number of gas consumers on the books was 46,177; being an increase of 1753 as compared with the year 1886. In the private lighting 724,223 burners, and in the public lighting 15,512 burners were employed; the total of these figures showing an increase of 30,629 burners. The average consumption of gas per burner used for street lighting during the past twelve months was 696.15 cubic metres, or nearly 25,000 cubic feet, as against 692 cubic metres in 1886. The average for the private burners was 89.23 cubic metres, or 3150 cubic feet, as against 88.23 cubic metres (about 35 cubic feet less) in 1886.

With regard to the manufacturing operations, only Silesian coal was employed last year in the production of gas; the quantities being 184,756 tons * of Upper Silesian, and 95,333 tons of Lower Silesian. As compared with 1886, the amount of coal consumed showed an increase of 3.35 per cent.; and the make of gas per ton was better. The cost of the raw material was 6,268,435 frs. (£250,737), or 236,767 frs. (£9471) more than in the previous year. The carbonization of the coal produced 177,240 tons of coke—an increase of 7620 tons. Of the total yield, 44,140 tons were employed for heating the retorts, or 157 kilos. per ton of coal carbonized; and there remained for disposal about 8000 bushels. After commencing favourably, the sale of this residual fell off towards the end of the year; and with regard to the current year, it was anticipated that it would be less easily disposed of, owing to the keen competition existing. It is stated that the London Gas Companies send over large quantities at a low price. The selling price dropped to about 3½d. per bushel last year; and a further fall was expected. The sale of the other residuals was not more favourable; and it was necessary to reduce prices. Of tar, 14,195 tons were produced last year—being 648 tons more than in 1886; but the sales only realized 462,364 frs. (£18,494), or 348,978 frs. (£13,959) less than before. The average return for tar was at the rate of 32 frs. 50c., or about 26s. per ton. The practice of utilizing this residual for the heating of the retorts has been again resorted to, with the view of turning it to the most profitable account. The market for ammoniacal liquor was also weak; but, as contracts were running, the prices obtained for it were the same as in the preceding year. Altogether, 27,039 tons of liquor were produced, which realized 490,081 frs. (£19,603); being 2164 tons and 38,271 frs. (£1531) more than before.

Owing to the extended consumption of gas, caused by the erection of additional houses, the manufacturing plant at the gas-works had to be increased to the extent of 15 per cent. The results of the year's working were, on the whole, favourable; and, after paying interest and spending a sum of 518,812 frs. (£20,752) in extending the works, the Municipality made a net profit of 5,735,951 frs. (£229,438). In addition to this, account should be taken of the cost of the gas supplied to the public lamps (for which no charge is made), which represents, reckoning the price at 16.9c. per cubic metre, or 4s. 10d. per 1000 cubic feet, a saving to the city of 1,766,144 frs. (£70,646). So that the Municipality realized by the gas undertaking a total return of 8,083,907 frs. (£323,356). The capital employed in the supply of gas in Berlin at the close of last year was 51,836,059 frs. (£2,073,442), which works out to 62c. and 69c. respectively per cubic metre of gas made and sold.

BURY CORPORATION GAS SUPPLY.

SUCCESSFUL WORKING AND INCREASED CONSUMPTION.

Last Thursday afternoon, the members of the Bury Town Council, at the invitation of the Gas Committee, paid their annual visit to the gas-works at Elton. The party were conducted through the works by Mr. Alderman Burrows and Mr. W. Woodward, the Gas Engineer and Manager; and considerable interest was taken in the inspection. In the course of some speeches made subsequent to the visit, Mr. Alderman Burrows referred to the success which had attended the manufacture of sulphate of ammonia since the works for that purpose were established two years ago. Latterly the Committee had, he said, had under consideration the question of the distillation of tar; and a deputation had visited several other works to inspect the various processes for utilizing residuals and obtain information. They had not completed their labours; but what they had seen had borne out the statement which the Gas Manager had placed before them as to the profitableness of undertaking the distillation of tar and of otherwise utilizing their residuals, instead of selling them in the form they were doing at the present time. He had no doubt that if they adopted the process of distilling tar as they saw it carried out at Leicester and Beckton—the

latter was perhaps too large a works to be compared with Bury, but even as it was now done at Leicester—it would be a good thing for Bury. When at Leicester he found from the report presented by the Gas Committee to the Town Council, that from the manufacture of sulphate and the distillation of tar they had made a profit of nearly £7000 in six months. Leicester was about three times the size of Bury; and if Leicester could make a profit of £6000 a year on the distillation of tar alone, it would be a good thing for Bury to take it up. Before, however, they attempted to do anything in this direction the Committee wished to see other places of a similar size to Bury, and then would make their report to the Council. Bury stood in the proud position of manufacturing and distributing gas at a lower price than any other town in Lancashire, and the profitable manner in which their gas-works were carried on was referred to every week, by some corporation or another. This being the case, he thought the Corporation and the Gas Committee were entitled to feel proud of the position they held with regard to that portion of their undertakings. Mr. Woodward, referring to the condition of the works, said the stack of retorts last erected was not perhaps what it would have been if the Committee had had a larger area to build upon. However, they made 7000 feet of gas per mouthpiece, which was 2000 feet per mouthpiece more than in the old ones; and if the whole of them were built on this principle, they could make 3,700,000 cubic feet of gas per day—equal to an annual consumption of 740 millions. Their present works would meet the requirements of the town for the next 25 years, even with a compound increase of 5 per cent. in the consumption. The new stack of retorts had not cost any more per retort than the old ones did; and when one took into consideration the amount of ironwork for the stage and flooring, and the material required, it was satisfactory that it was built at the right time, when materials were not dear. The sulphate of ammonia works had proved to be a profitable undertaking. They received for the ammoniacal liquor during the year previous to erecting the works £850; and last year, after deducting manufacturing and other charges, no less than £2881. It was gratifying to know that since the reduction in the price of gas an enormous number of meters which had been standing idle for six or seven years had been again brought into use, and the houses supplied with gas. Never since he had been in Bury had there been so many old gas-meters connected; and last week they had had an increase of half a million cubic feet in the consumption of gas. Reference was made to the extended use of gas for cooking and heating purposes; facilities being afforded by the Committee for this by the letting of gas-stoves on hire.

GAS V. ELECTRIC LIGHTING AT LEAMINGTON.

At the Meeting of the Leamington Town Council on Monday last week—the Deputy-Mayor (Mr. Alderman Wackrill) in the chair—the following letter, addressed to the Town Clerk by Mr. W. Cross, Secretary of the Leamington Priors Gas Company, was read:—"Several gentlemen have expressed to me their desire that the Gas Company should light a section of either Warwick Street or Regent Street with improved gas-lamps. I explained to them that the existing lamps are the property of the Corporation—the lighting, cleaning, and extinguishing of which are performed by the Corporation officials; and that the Corporation, as the lighting authority, could require the Gas Company to supply as much gas as they liked. Notwithstanding this explanation, these gentlemen stated that they thought it very desirable the Gas Company should make such a proposition to the Corporation. I therefore beg to say that my Company are willing to light the section of Warwick Street between Russell Street and Clarendon Street with improved lamps, if the Corporation are willing to pay for the gas consumed, which it is estimated would be about 131 per cent. more than is consumed by the existing lamps; the estimate being based upon a consumption of 15 feet per hour prior to 11 p.m., and 5 cubic feet per hour after 11 p.m.; the lamps to be provided by, and to remain the property of the Company, and to be lighted and extinguished, &c., by the Corporation officials." The Clerk (Mr. H. C. Passman) explained that the Company were putting the Corporation on the same terms as the Corporation had placed the Electric Lighting Company, so that the Council might judge between the two lights. Alderman Gilbert moved that the letter be deferred until the report of the General Purposes Committee came on; but an amendment was proposed that the letter be referred to the Lighting Committee. Mr. White said he was glad to hear the letter from the Gas Company read. It was only fair to the Company that the Council should put them on the same terms as those granted to the suppliers of the electric light. He contended that the Council had given the Electric Lighting Company 100 per cent. premium, and they were paying double what they previously paid for gas. He was anxious to see that the Gas Company had fair play, and moved as a further amendment—"That this Council accept the terms of the letter from the Gas Company." He trusted that the amendment would be accepted in fairness to the Company. Mr. Burgis said, in order that the Company might have fair play, he would second the proposition. Mr. Purser supported the proposal to refer the letter to the Lighting Committee; saying that the Gas Company should be put on an equality with the Electric Light Company. He pointed out that the electric light had cost 131 instead of 100 per cent. more than the gas. The letter was then referred to the Lighting Committee. Subsequently, the letter received from the Midland Electric Light and Power Company, making an offer to improve their lighting, as stated in the JOURNAL last week, by the fitting up of four arc lamps, five 300-candle incandescent lamps, and twenty-five 50-candle power lamps upon the Parade, at a cost of £33, of which the contractors were willing to pay one-third, and supply the current without extra charge, was submitted; and, after some discussion, the offer was accepted.

SAN PAULO GAS COMPANY, LIMITED.—The report of the Directors of this Company, made up to June 30 last, announces the payment, on the 20th inst., of an interim dividend at the rate of 10 per cent. per annum, free of income-tax; £2000 being placed to an account for the equalization of freights, and £831 carried forward.

THE SHEFFIELD CORPORATION AND THE HANDSWORTH WATER SUPPLY.—The Sheffield Town Council, at their meeting last Wednesday, were asked to approve of an application to the Local Government Board for sanction to an arrangement entered into between the Corporation and the Handsworth Local Board respecting the water supply to that place. The Town Clerk (Mr. Pye-Smith) explained that the Handsworth Board had agreed to purchase water in bulk from the Council. At present the Local Board could not charge any rates beyond the ordinary rates of the Corporation; and they wanted to be in a position to compel the ratepayers to take water, and for the Board to charge their own prices. The three conditions were: (1) That the Handsworth Board should allow the Corporation to lay pipes through their district under their existing powers; (2) that they should take water as heretofore, and as now, from the Sheffield Corporation; and (3) pay the costs of the application and getting legislative sanction to it. The application was agreed to.

* The French ton (2204 lbs.) is meant in all cases in this article.—Ed. J. G. L.

THE ELECTRIC LIGHTING EXPERIMENT AT BARNET.

The experiment in electric lighting which is now going on at Barnes has attracted considerable attention, owing to certain occurrences which have probably not been productive of pleasure to the promoters of the scheme. Readers of our "Electric Lighting Memoranda" have been made acquainted with the mishaps which have attended the project; though the general press has been remarkably silent on the matter. In reference to the last failure of the light (on the 21st ult.), the contractor for the lighting has written to the local paper, stating that duplicate sets of machinery have been completed, and are expected to be soon at work; and that meanwhile he would continue to do his best with the present "temporary" appliances, which he says were erected under the difficult circumstances of "limited time, hurried work, and novel description of arrangements and fittings." Barnet (he adds) is the first town in the United Kingdom whose streets are being entirely lighted with electricity; and the inhabitants should not therefore at the outset look for complete success which he promises is not far distant. Promises, however, are one thing, and performances another. This is forcibly illustrated by a resident, calling himself "Didimus," who has sent to the paper in question a comparative statement of the promises and performances of the contractor. He says: "Some eight or nine months ago Barnet was offered the electric light, and accepted it with a readiness which must have surprised even the enterprising electrician who made the offer. In price it was to be wondrous cheap, and in effect it was to excel. Well, after almost interminable delay, we got the light, and accepted in good faith the promise of the contractor to make it a success; but how about the fulfilment of the promise? What the contractor promised has been recorded in the published reports of the Barnet Local Board meetings; and, for convenience in reference, they have been arranged below in the form of a debtor and creditor account, which my readers may balance for themselves:—

Dr. As Promised by Contractor.

We should have duplicates and storage batteries to meet every possible condition. When the engine stops, there will be a supply to draw upon.

I should give you a system perfectly free from liability to accident.

You would get more light for money, and better light.

The lamps will be 32-candle power.

With 32-candle electric lamps, half the number of the present gas-lamps (104) will suffice to light the town.

Of course, in taking a contract like the lighting of Barnet, I am backed up by good people.

The thing will be a grand success.

A glance at this account shows that the contractor has not very much to his credit so far; and I turn to the prospectus of the Barnet and District Electric Supply Company, Limited, in the hope of finding something to make up the balance. In my search I find the following paragraph:—"The lighting of the public streets of Barnet has been in operation since Sept. 1, with sufficient surplus power for about 100 lights to adjoining dwelling-houses and shops." Where is it? This surplus power must be the outcome of a little miscalculation on the part of somebody, for the paragraph reads like a joke to those who draw their inferences from actual results as shown in the lighting of our streets. A timely exhibition of lighting power, instead of a vague assurance of surplus power, might have redeemed the experiment from failure, and would even now do something towards encouraging public confidence in a venture which hitherto has had so little to recommend it. The electric light will be adopted when electricians can give a successful light at a reasonable cost, and not till then."

Our readers are aware that the adoption of electric lighting for the public thoroughfares has been engaging the attention of the Blyth and Cowpen Local Board—and of the inhabitants, too, as shown by the demonstration recently reported in our columns. The *Blyth Examiner* has disapproved the scheme; and has not lost an opportunity of citing Barnet as an instance of the troubles likely to be brought upon a local authority, and those whom they represent, by trusting to a new illuminant for the lighting of their streets. A representative of the above-named paper recently visited Barnet, for the purpose, as he says, of "forming an accurate estimate of the new-fangled light." Barnet, he tells his readers, is "the only town in the kingdom . . . which has the astounding audacity to dispense entirely with a well-known, well-tried, and generally effective and economical street-lighting appliance in the shape of ordinary coal gas, for a purely speculative alternative." He then goes on to say that he chose Sunday evening for his visit, thinking that then all shops and the like would be closed, and that "the electric lights would have the field entirely to themselves, unaided by the gas consumed by private individuals." But he did not find this to be so, and had to make the best he could of the conditions. We will give the rest of his story in his own words:—

"As I emerged from the station I found myself surrounded by a good light; but I saw at once that these were the ordinary station gas-lamps. The Railway Company at Barnet are evidently not in a hurry to run after the Local Board's electric fad. If the Board choose to spend the ratepayers' money in demonstrating (if ever they should succeed in doing that) the superiority of electricity over gas, the Railway Company will clearly let them go on and do so. They can at any time avail themselves of the dearly-bought experiences of the Board, without involving themselves in any initial or trial expenses. Passing out of the station enclosure on to the top of the embankment, I soon came up to the first electric lamp in the direction of the town. There are two (perhaps three) rather better lights than the generality hereabout; and there seemed to be six or eight of the stronger lights in various parts of the town. There is one near the church, another upon the right-hand side of the street, set back the depth of a house, and in close proximity to a shop, the owner of which will no doubt consider himself rather favoured in having a light placed so near his premises, although it is quite true it stands alongside the disused gas-pillar. There is another on the opposite side of the street, at the junction of a road, near what might be a public pump or pant, from what I could make out in the dark (?). Upon this electric pillar was suspended an oil-lamp—to be fallen back upon when electricity took the sulks. And at the north end of the town, opposite the horse-pond, is another of these rather better lamps. These were, however, exceptional lamps; and even they were shabby enough, in all conscience. The great bulk of the lamps are the most pitiful apologies in the world for public street lights; and I do not wonder that a correspondent in the *Barnet Press* should have said 'If the Gas Company did not light Barnet better than this, then it must have been badly lighted indeed.' Nothing, I think, could very well be worse as a means of street lighting."

As We Find It.

No duplicates and no storage. When the engine slows down, the light follows suit; when it stops, the lamps pop out.

In the space of a month the system has totally failed on two occasions; and there have been many minor failures.

We have less light; the general effect is indifferent; and the cost is much greater than with gas.

They are nothing like it.

We have 73 electric lamps, and this number is quite inadequate.

A Company has been registered, and exists on paper; but proof is lacking that the capital has been subscribed.

It has, so far, been more or less a failure.

"Just after entering the town, the police station is passed on the right hand, and over the door is a bracket with the ordinary gas-lamp. The police authorities seem to provide this lamp; and the gas-light is continued by them. This light is equal to the best electric lamp in the town, and superior to the great bulk of them; and yet it is only an ordinary fish-tail jet, burning $\frac{1}{4}$ to 5 cubic feet of gas per hour, and of an illuminating power not exceeding 15 to 16 candles. Up the street I noticed one of the drink-shops had introduced electricity, while higher up on the opposite side, I think, to this one—another drink-place showed gas; and the latter had a superior light to the former. When I got to the last electric lamp at the north end of the town, I proceeded forward to the next light, which was a gas-lamp; and so marking, I judged, the end of the Local Board district. Between this and the next gas-lamp, still going northward, I stopped about 100 yards—this distance being apparently left to admit of an intermediate lamp being placed some day on the opposite side of the road; and yet the footroad between these two lamps 100 yards apart was as well lighted as the distance between two of the ordinary electric lamps in the town placed certainly not more than about 60 yards apart. The lamps are what are known as the incandescent lamp, as distinguished from the arc lamp. The latter is the lamp of intense brilliancy, dazzling the eye of anyone attempting to look steadily at it, and casting a bluish, unearthly sort of light all round. It is usually screened with opal glass to prevent injury to the eye of the observer. The incandescent lamp, on the other hand, emulates a gas-light as much as possible; and the nearer it approaches to gas the greater its excellence. Hence in the hotel in London where I am staying, we have the incandescent light, and it is not unpleasant; but the modification suitable for indoor purposes, if applied to outdoor purposes, would apparently utterly destroy the chances of the light being at all adopted for street purposes. Hence the Barnet lamps, although incandescent, are not screened or modified in any way. They have all the objectionable and injurious star-like brilliancy of the arc lamp about them, but they are destitute of the illuminating and diffusive power of the arc lamp; so that, as a rule, away from the foot of the lamp, the light they give is miserable in the extreme."

"The streets of Barnet have any number of metal pillars standing in them at the present time; and one would almost fancy that the place was famed for the production of such articles, and that the pillars one sees in the streets are samples from which intending purchasers can make their choice. These are the disused and despised gas-pillars. By the side of them in most of the cases stand the new electric-lamp pillars; and, independent of these, another series of pillars carrying the wires to supply the electricity, while here and there may be seen a Bray—or similar—pillar and lamp, also disused. The electric lamps are placed much higher than the gas-lamps were. Two reasons may have prompted this—one, to keep the wires as far as possible out of the way of the public, and the public by this means out of the way of danger; and the other perhaps to give the lamp a better chance of diffusing its light. The latter object, as I have already said, is a decided failure, and with the present appliances cannot be improved. The readers of the *Examiner* will know that £5 8s. per lamp has to be paid for the ordinary electric lamps in the streets of Barnet. I do not hesitate to say that the ordinary gas-lamps in Blyth streets, hitherto charged £2 6s. for by the Gas Company, give, on the average, better results for street-lighting purposes; and I cannot but infer that it must have been the same at Barnet."

By nine o'clock in the evening, the reporter completed his investigations, and started on his return to London. "I was soon seated," he says; "and, in conversation with the passengers, could not learn the why or the wherefore of this electric fiasco at Barnet—for such it most certainly is. I did learn, however, that whereas the Board had allowed the contractor, for convenience and expedition, to carry his wires on pillars, they had now found it was not according 'to the bond,' and they were going to make him take them down again and bury them in the ground, as they had required the Government to do with the telegraph wires. I thought, however, the contractor could still play quits with members of even a 'defuncted' Board; and it is certain that no member of the Barnet Board will get rid for the next six months of any responsibilities he has incurred over this electric lighting merely by 'resigning' his seat. It is very likely we have by no means heard the last of the Barnet Local Board, and the example it has set the kingdom in electric lighting."

At the meeting of the Barnet Local Board last Tuesday, the Lighting Committee brought up a report on the subject of the electric light, and made certain recommendations. After a long discussion, it was decided to consider the report in Committee. The result was that the matter was ordered to stand over for a fortnight.

ANTWERP WATER-WORKS COMPANY.

A Half-Yearly General Meeting of this Company was held last Thursday, at the London Offices, 86, Cannon Street—Mr. C. CREW in the chair.

The SECRETARY *pro tem.* (Mr. W. Conway) read the notice convening the meeting.

The CHAIRMAN said that he must regret their Chairman's (Mr. Horner's) absence. They would remember that at the time of the last meeting he was suffering from a severe illness; and although he had recovered from that, and had been able regularly to attend the Board meetings, he was away from home at the present moment for the benefit of his health. The present meeting was held at the request of the shareholders at the last annual meeting, in order to have a friendly conversation with the Directors, and to ask questions upon the progress of the Company in the half year. The Directors did not propose to submit any resolutions; but it would simply be his duty to enlarge upon the report and to answer inquiries. There were no accounts to be presented, as these were only submitted annually. The Auditors, however, had been to Antwerp to make their usual half-yearly audit; and they had their figures to show the progress of the concern. He was sorry to report that there had been a falling off in the new contracts, as compared with the corresponding half of last year. The new contracts this half year amounted to 204 as against 305 in the first half of 1887. The value of the contracts in the June half of 1887 was £696. This year, taking the increase in existing contracts, which might be considered as new contracts, the value was £564. There was not a great deal of difference, though the average for the past five corresponding half years had been £1136. There was another thing—they must consider that the new contracts had increased really by a further sum of £440, which had been obtained from customers by the fraudulent use of water; so that their accounts would be increased by this amount in future. These new contracts would not affect the present accounts; but the Company would get the full value of them next year. The attention of the Directors was called by their Manager to the fact that there were a large number of small consumers of water in Antwerp; and, in order to compete with the wells and the rain-storage reservoirs which every house is supplied with in Antwerp, it would be necessary either to reduce the tariff or charge by meter. The Directors looked into the thing carefully; and they found they could reduce the tariff, providing these people would take a minimum quantity of water—that was, agreed to pay the Company so much per

quarter whether they used the water or not. They reduced the price from 40s. to 15c. per cubic metre, according to the minimum paid, varying from 100 frs. to 1250 frs. per quarter. The Directors were satisfied with the result. The past half year showed an increase of £600 under this head alone. The income from all sources amounted to £10,036; while in the corresponding period of 1887 it was £9610—being an increase of £426. This required a little explanation. The income from all sources was made up of receipts for water sold, miscellaneous receipts, interest on amount at banks, and supply service. "Supply service" meant the Company putting in pipes to their customers' houses, in order that they might use the water. Although they had made considerable profit from this business since the thing was first started some five years ago, it had been the policy of the Company to encourage local plumbers to do the work. If he analyzed the total receipts, he found that the water receipts had advanced over the past half year by £922; the interest had also slightly increased; but the "supply service" had fallen off by £536. On the other hand, the cost of the supply service had also been reduced by £400. In regard to the expenses in London and Antwerp, the maintenance had cost over the half year about £154 more; the pumping had cost £89 more; and the depreciation of stores, £39 more. With £400 decrease in the supply service and £151 in the London expenses, they had a decrease in the expenses of £269. The net revenue in 1887 was £3554; and in 1888, £4248—being an improvement to the extent of about £700. In their report, the Directors stated that should the second half-year's working be equal to the present, they would be able to pay an increased dividend this year. This was verified by the figures. They had a credit balance of £1630 last year. Assuming they obtained as much revenue from the second half as for the first, they would have a net revenue of £8500. Putting these two amounts together, they would have a sum of £10,130 available for dividend. Last year they paid 2 per cent.; and if they paid 3 per cent. this year they would have a balance of £1130 left. But there was another matter they would have to consider very soon, and that was the question of an amortization fund, which the Directors had not yet touched. However, they had it in their minds to commence such a fund shortly. But if they did start it this year, assuming the net revenue was £10,130, a 2½ per cent. dividend would absorb £7500, which would give them a balance sufficient to meet the £2500 necessary to put by to pay back the capital at the end of the concession. They had saved £130 a year by renewing at 4 per cent. the £13,000 of 5 per cent. debentures which would fall due on Dec. 31 next. There was no doubt that the wet weather had seriously affected the receipts this year; but it was gratifying to find they had saved a great deal of water by a proper system of testing the mains which had been carried out. The quality of the water had been uniformly excellent. The cost of pumping was now 5d. per 1000 gallons, as against 4½d. in 1887; and the price obtained per 1000 gallons was 10½d., compared with 8½d. Taken altogether, he considered the report a very satisfactory one. No questions being asked, the proceedings terminated.

PERTH CORPORATION WATER SUPPLY.

The annual accounts of the Perth Water Commissioners were presented at a meeting of that body on Monday last week. They show an excess of income over expenditure of £251 19s. 6d., which reduces the debit balance at the beginning of the year from £297 8s. 1d. to £45 8s. 7d. The revenue amounted to £5775 19s. 10d., and the expenditure to £5524 0s. 4d. Of the expenditure, £174 13s. 2d. was spent in prospecting in connection with the new water supply. From the balance-sheet it appears that the works are valued at £48,556 10s. 10½d.; while there are other assets amounting to fully £900, and the amount of debt is £31,895 17s. 10d. Lord Provost Whittet, in moving the approval of the Auditor's report of the estimates for the current year, and that the assessments be fixed at the same rates as last year—namely, 8d. and 4d. in the pound in the inner, and 1s. and 6d. in the pound in the outer area—said that it was thought the rates would be equalized at Whitsunday; and that although the expected surplus was put down at £156, the Finance Committee were hopeful that it would be nearer £256. Mr. McCurrach seconded the motion, and it was carried. Mr. Shaw asked what provision had been made for giving Mr. Leslie, C.E., of Edinburgh, who was to visit Perth, information in regard to the proposed auxiliary supply (to which reference was made by our Edinburgh Correspondent last week). The Lord Provost said Mr. Peattie's plans and report would be submitted to Mr. Leslie, and that the proper thing for the Commission to do would be to allow that gentleman, without any interference, to obtain all the information he could from the proper authorities.

PROJECTED EXTENSION OF THE SWINDON WATER-WORKS

An Extraordinary General Meeting of the Swindon Water Company was recently held for the purpose of sanctioning an increase of capital to the extent of £9000, for the purpose of carrying out additional works. The Chairman of the Company (Mr. W. A. Barns) presided, and explained that for a very long time the Directors had been aware of a great difficulty in supplying the district, and especially the new town with water in sufficient quantities to suit the convenience of their customers; and as long ago as 1836 their Engineer (Mr. Shopland) was asked to prepare a scheme to overcome the difficulty. He suggested that a new 12-inch main should be laid, in addition to the existing 8-inch main, from Wroughton to Kingshill, there to deliver the water into a service reservoir to hold 500,000 gallons. This main would be capable of discharging daily 900,000 gallons of water, from the top water-level of the storage reservoir at Wroughton. He further advised that a new main should be put down to New Swindon capable of supplying 250,000 gallons daily; this being absolutely necessary, since a heavy draught of water was needed. From the service reservoir at Kingshill, it was proposed under the scheme to pump water into a tank for the supply of Old Swindon. If these alterations were carried out, the two districts would have distinct mains and a service reservoir each—both being specially adapted to the districts within their service. The cost of these alterations was estimated at £8280, which included £1620 for a new service reservoir, £2000 for a main to New Swindon, and £4000 for the new main to Kingshill. It was decided that the capital of the Company should be increased by the issue of £1 shares, to be offered to the existing shareholders *pro rata*, at par.

TARAPACA WATER COMPANY.—According to the *Financial News*, the Municipality of Iquique, acting upon reports presented to them by a Committee recently appointed to investigate the water supply of the city, have passed a resolution declaring that, in their opinion the concessions granted by Mr. T. Hart under Acts passed in January, 1885, and February, 1886, "have now lapsed and are forfeit." Our contemporary states that memorials from all the parties interested were received; and before recommending the Municipality to come to the conclusion above recorded, the Committee consulted the Intende of the province, who in turn referred to the Senate. Thus every step was taken to make certain of the facts; and, after these precautions, the Municipality decided against the validity of the concession, which is the principal asset of the Tarapaca Water Company.

LEEDS CORPORATION WATER SUPPLY.

BRADFORD AND THE NIDD WATERSHED.

At the Meeting of the Leeds Town Council last Thursday, the Chairman of the Water Committee (Mr. Alderman Woodhouse) moved—"That the corporate common seal be affixed to a deed of covenant with the Corporation of Bradford, for the purpose of carrying into effect the arrangement made with them as to the rights and interests of the Corporations of Leeds and Bradford respectively in the watersheds of the Rivers Burn, Laver, and Nidd." In doing so, he reviewed the proceedings which had resulted in an amicable settlement of the dispute between the two Corporations. He reminded the Council that, in 1866, Mr. Filliter, who was then the Water Engineer, prepared a report, in which he dealt very fully with the water supply of Leeds. In that report three rivers were mentioned—the Nidd, the Laver, and the Burn. The Nidd, with an area of 32 square miles, gave 21 million gallons a day of water; the Burn, with 23 square miles, and the Laver, with an area of 9 square miles, furnished together 21 million gallons a day; and these numbers, added to the supply from the Washburn to the extent of 23 million gallons a day, would give a total supply to Leeds of 65 million gallons of water daily. That this would be the future supply of Leeds had come to be regarded as a "pious legend," until Bradford, which used to get its water from the lower reaches of the Wharfe, found, on extending its search for more water, that the water was too hard for its manufactures. In 1887 Bradford therefore applied to Parliament for powers to secure the waters of the River Burn and its tributaries. The Leeds Water Committee found it necessary to take action; and, after some correspondence, an amicable arrangement had been come to—the consideration being that Leeds would not oppose Bradford in the event of that town making application to utilize the waters of the Nidd; while when Leeds had to go to Parliament for power to extend the water supply, it might make application for the Burn and its tributaries, and Bradford would not place any obstacle in the way. The motion was agreed to.

FINDING WATER BY DIVINATION.

The *Colchester Mercury* for last Friday contained the following account of a successful experiment in the use of the divining-rod in searching for water:—

"On Thursday, the 27th of September, Sir Henry Selwin Ibbetson and Lady Selwin Ibbetson invited a party of ladies and gentlemen to witness the performance of a Mr. Lawrence, from the West of England, with the divining-rod; the object being to test whether he would be able by its means to discover water on the Down Hall Estate. The party were first invited to lunch and chat with the expert, who is an old gentleman 79 years of age. Mr. Lawrence first walked round a well near the Hall to ascertain which way the water took its course; and as soon as he arrived at the opposite side of the well, he was seized apparently with convulsions. There were many exclamations of surprise from the company; and Sir Henry Selwin Ibbetson said, 'That's very satisfactory and conclusive, as we know the water takes that course from the side of the well down towards the wood and the brook.' With this astonishing revelation of the power possessed by Mr. Lawrence, the party proceeded to the kitchen garden, where her ladyship said she should like to find water. After the expert had made a couple of rounds, he came upon a vein of water, which was ultimately traced coming from the well across the land over sand towards the wood. Mr. Lawrence then tried in the yard next the dairy, and at once came upon two or three places where he stated water was to be found. One of these was under the doorstep; and while the party were conversing together, the expert was having one of his little dancing games upon the step of the back door. A field was afterwards tried. The expert, in company with one of the guests (Mr. Sam Deards), walked the field with Mr. King, the bailiff, and a man or two to drive stakes at every exhibition of the violent shaking of the divining-rod. In three instances Mr. Lawrence was so overcome that he literally fell into the arms of Mr. Deards for support. Having traced one spring running right across this field, the party proceeded to another field, where Mr. Lawrence was again seized with a shaking fit. At the lodge, where a well was very much wanted, the expert discovered a good spot right in the centre of the back yard. A more suitable place could not have been desired. A trial was next made at Besses Lodge; and here it was that one of the most marvellous displays occurred. Mr. Lawrence proceeded to walk round in the path of the garden, and had gone three-fourths of the way when he was seized with one of his 'fantastic tricks.' Mr. Lawrence afterwards stood over the soft-water tank; but this had no effect whatever upon him—still water having no power over the divining-rod. Going into the corner of a large hilly field opposite the lodge gate, water was again discovered; the expert and rod being violently affected, so much so that Mr. Deards caught hold of one end of the stick, and yet it moved and twisted in his hands. Mr. Lawrence asked Mr. Deards to stand behind him and take firm hold of his wrists. Mr. Deards expecting to receive a shock, caught hold of both wrists and held them firmly, but could not keep them from violently shaking. Water was discovered in other places, and the party then returned to the mansion. Sir Henry mentioned how delighted and amused he had been at having made Mr. Lawrence's acquaintance. Before leaving, Mr. Deards asked Mr. Lawrence to give to the *employés* of the estate and house one more proof of his evil spirit; and he did so—going at once to the doorstep of the mansion, and also to one of the stakes driven down near the garden gate. The effect that Mr. Lawrence's performance produced upon the minds and faces of some of the spectators was really most amusing."

We learn from a West of England paper that Mr. Mullins, whose recent experiments at Hastings have been noticed in the *JOURNAL*, is now carrying out a trial near Cirencester, under circumstances of great interest. Mr. J. Hayward, of Barnton Mill, occupies a field, barn, and some land in the adjacent parish of Bagendon; and at buildings called Price's Barn there is no water supply, except the runnings from the roofs. The buildings stand on the summit of the rolling Cotswold district; the ground being 144 feet above the road from Cirencester to Cheltenham, which runs along the valley of the Churn close by. Hearing of Mullins through a relative, Mr. Hayward, with the permission of his landlord, invoked the aid of the "diviner." About three months ago, Mullins, with a hazel twig, walked over the paddock in front of the buildings, and the rapid revolution of the twig in his hand at certain spots indicated, he asserted, the line of a spring running through the hill into the valley of the Churn below. After an interview with the landlord of the property, Mullins undertook to sink a well—the depth he estimated as necessary being from 70 to 80 feet—whereas owners of house property in the vicinity situated on much lower levels have sunk from 120 to 150 feet, and then often failed to keep a supply of water in dry weather. By the terms of the contract, Mullins is to receive a certain stated sum on finding a supply of water; but if he fails he does not receive any payment whatever. His men have now been at work for seven or eight weeks, and have sunk just over 70 feet through the rock without coming to water, but they do not entertain any anxiety as to the result. The termination of the undertaking is being looked forward to with interest.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday*.

Although this year we have not the excitement of a gas transfer in the impending municipal elections, the subject is cropping up here and there. It is brought up by those who took part in the business as a means of reflecting credit upon them for their part in the work; and it is referred to by new candidates in that conveniently mysterious way which, on investigation, may mean anything or nothing, but which at first sight conveys the impression that the speaker, if he had been in power, would have done it much better. A fine instance of the latter was given on Tuesday night, when an aspiring candidate told his hearers that "the gas purchase, he thought, had been too dear. The Trust must be very economically administered; and he would begin by abolishing the charge for meters." He went on to say that the principal streets should be lighted with electricity. Was ever such bunkum talked? If he means by economy the judicious management of the business in the interests of the community, why did he recommend costly experimenting in electric lighting? If he meant that the gas undertakings had cost so much that they must be managed so as to maintain a large revenue, why did he suggest that the sum at present derived from meters should be thrown away? Were his advice adopted, the revenue of the Gas Committee would be reduced by the charge for meters, and the citizens have, in addition, to be taxed to maintain electric lighting in one or two thoroughfares. Economical management would scarcely be a correct description of that sort of thing, I fancy.

The proposal to spend £20,000 upon the improvement of the Edinburgh Gas-Works, which I mentioned a fortnight ago, has been the subject of newspaper correspondence here. One of the writers is Mr. John Romans, C.E., who, it may be remembered, strongly opposed last year the transfer of the Edinburgh works, averring that it was possible to build and equip new works with mains and services for £300,000. Mr. Romans observed the statement in the *JOURNAL*, and wonders why it did not appear in any Edinburgh newspaper. He then goes on to say that, instead of being alarmed at the amount asked for, his surprise, if any, was as to how the Engineer had managed to circumscribe his requirements to that figure. His opinion remains unchanged that the Commissioners should not spend a shilling upon the Edinburgh works, but set honestly to work to obtain a site for new works near to coalfields, of easy railway access, not sightable from the topmast of a man-of-war, and there gradually erect the city gas-works complete. He concludes: "Of course, this will be a bitter pill to swallow for the professional men who were the deceivers, and the town councillors who were deceived. Still it is better to face it, as to this it must come, if gas is to continue to be our chief illuminant for the next quarter of a century." Mr. Romans is a little impetuous, as the strength of his language shows. If he cannot understand how Mr. Mitchell's proposal was to expend only £20,000, might I point out to him that, with the surplus power of the Leith gas-works, a full output will not be required from the Edinburgh works, and only a portion of them need be dealt with in the meantime. The same reason also militates against his recommendation to procure a new site at once. Until the Leith establishment gets worked out, there is no necessity for superseding it. This may be twelve years hence; so that there is time to look out for a new site, and meantime I am not convinced that it is not the best policy of the Commissioners to expend a moderate sum upon the improvement of the Edinburgh works. This course would enable them to make the most of both the existing works; and then, after the costs incident to a transfer have been at least partly met, the Commissioners would have more freedom in recommending the large outlay involved in the erection of new works.

The Arbroath Gas Corporation have changed front on the question of extending their works. Only a month ago, they resolved to proceed with the improvement of the existing works, and the erection of a new holder for the lower district of the town. The alternative proposal, to entirely remove the works, and build them on a lower site, was then flouted by Provost Anderson as "far too late." At their meeting on Monday, instead of giving authority for the work to go on, they had a long discussion, and then appointed a Special Committee to look out for a suitable site for new works; and the question of the proposed extension was remitted to Mr. W. Foulis, Engineer of the Glasgow Gas-Works, to consider and report upon. The Corporation already possess a report by Mr. K. Mitchell, of the Edinburgh Gas-Works, on the subject. Their remit to Mr. Foulis looks very much like this—that, having changed their minds, they are anxious to get the opinion of a man of skill to back them up. The position to which they have gravitated appears to be that, as an expenditure of more than £5000 in extensions is inevitable, as new works could be more economically worked than the present, and as almost as much would be obtained for the present site as would procure a new one, therefore the cost of transferring the works to a new site is the only item which stands in the way of their having new works. There would be a saving of £300 a year on cartage alone, if the new works were placed beside the railway; and that, with other economies, it is estimated, would more than meet interest on the cost of the transfer. All this is very fine in theory. Whether it can be put in practice, the Corporation knows as well as anybody depends entirely upon cost, and chiefly upon the cost of a new site. Why, in these circumstances, they should want further speculative reporting is not apparent. A remit to obtain a site, and to ascertain its price, would have been sufficient. After that, if the price were suitable, inquiry could have been made as to the one point of what the cost of transfer would be; and the whole question could then have been taken up by the Corporation, and decided without difficulty. It may appear more heroic to breast the question at once, and have a report upon "the whole subject;" but, to my mind, it is not likely to be either the most intelligent or the most profitable.

Mr. Adam Pratt, of Aberdeen, who may be said to be the backbone of the agitation there in regard to alleged overcharges for gas, keeps pegging away at the subject with untiring zeal. He must be a veritable thorn in the side of the gas management in Aberdeen. He seems to be in almost constant correspondence with them; and scarcely a week passes in which he does not take advantage of the columns of the local press to let the world know what has taken place. This week a letter by Mr. Pratt to the Town Clerk is published, which indicates a more serious attitude than has yet been taken up by the Gas Committee towards the complaining party. Mr. Pratt writes: "With reference to the overcharged accounts of 134 gas consumers, as furnished to you on the 9th of August last, as requested, would you kindly inform me if the oases in detail have yet been investigated? Complainers on the list, whose gas supply is cut off, have received notice from the Gas Treasurer that legal proceedings are to be taken against them." From this it would appear that the Committee have made up their minds to have no dallying on the subject of liability for what has been already incurred; and from this it is easy to infer that they have investigated all the accounts in respect to which there were complaints. It should not be a difficult task to inquire into 134 cases. I have been informed by a resident in Aberdeen that some of those who complained have received a reduction, presumably where the meter was found

to be at fault—a situation out of which the Gas Committee could not get except by remitting a portion of the sum charged.

At the recent annual meeting of the Newport (Fifeshire) Gas Company, it was resolved, on account of the improved financial position of the Company, to reduce the price of gas 5d. per 1000 cubic feet.

At the meeting of the Fraserburgh Police Commission last Monday, it was proposed that a Committee be appointed to confer with the local Gas Company, with the view of arranging for a voluntary transfer of the Company's undertaking to the Commission; but, after discussion, it was resolved to take no further steps in the matter in the meantime.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday*.

When the Glasgow Corporation Gas Committee's minutes were up for consideration at the usual meeting of the Town Council on Thursday, attention was drawn by Treasurer Richmond to the fact that a number of contracts had been entered into for the extension of the Tradeston Gas-Works. While admitting that he had the greatest confidence in the Gas Committee, he thought the Council should know the nature of the contracts referred to, and what was being done, seeing that an expenditure of £150,000 or £160,000 was involved. Mr. Ure, Convener of the Sub-Committee on Works, said that they would be glad to exhibit the plans, and give all the information desired. Bailie McLaren stated that about a year ago the Council had under consideration the extension of the Tradeston works, and at that time plans and specifications were submitted, and the probable expenditure was sanctioned; so that the work which the Council had already approved of was what the Gas Committee were carrying out. They had nothing to hide, and would be glad to submit the plans of the alterations and extensions resolved upon.

Several of the Glasgow Town Councillors have touched upon gas affairs at the annual meetings of the electors held in their respective wards this week. Bailie Mitchell spoke of the Gas Trust as being in a very prosperous state, as was evident by the fact that 2d. per 1000 feet had been taken off the price of gas—from 2s. 10d. to 2s. 8d.; and in view of the possibility of the annexation of the suburban burghs and adjacent districts to the city, the Gas Committee had agreed, he said, to recommend to the Town Council to buy the Partick, Hillhead, and Maryhill Gas Company's works. Of course, if there was no annexation, there would be no purchase. Bailie Stevenson, in the Fifteenth Ward, stated that the Gas Trust revenue for last year was somewhere about £383,000; and they had put aside £49,000 for depreciation. One of the representatives of the Twelfth Ward (Mr. J. Macfarlane) affirmed that the reduction in price amounted to a sum of £60,000; and this saving to the gas consumers had been effected without any material lowering of the quality of the gas. Bailie McLaren, in the course of a speech which he made on Thursday at a meeting of his constituents in the Fourth Ward, stated that the revenue of the Police and Gas Departments alone amounted nearly to that of some of the small German principalities; and the Convener (in this case himself) had nearly as much to do as some of the Chancellors of those principalities in endeavouring to bring in a budget calculated to keep down the rates. Referring to the reduction that had been made in the price of gas, he said he had anticipated that it would be followed by a further and similar reduction next year; for they had purchased about 290,000 tons of coal at a little less than the average price paid last year, and with the increased consumption and better gas-producing appliances, they might be able to present a very favourable balance-sheet when the extension of the city boundaries came before Parliament next session. He also remarked on the complaints which he had heard to the effect that, while the price of gas was reduced, the accounts of the consumers were always the same; at all events, they did not get lower. He had himself made a test in regard to this matter; and the result he found was that, while ten years ago the Public Lighting Department consumed 146 million cubic feet of gas, and paid £29,375, during the past year the consumption was 190 million cubic feet, for which the charge paid was only £25,460.

A public meeting was held in Stevenston (Ayrshire) last Monday, for the purpose of further considering the proposal to form a new Gas Company, to manufacture gas from oil. Mr. S. Lyon, who presided, reported that shares had been freely taken up on the station side of the town, and that the residents in other districts in which the shares had not been so well taken up had promised to patronize the new Company. Mr. Kerr, of Ardeer Foundry, the principal mover in the scheme, submitted plans and the estimated cost of the proposed oil-gas works. In the course of the conversation which ensued, it was suggested that in the meantime small works should be started, of sufficient producing power to meet the demands of New Street and the district around the Railway Station. Ultimately, it was agreed, on the motion of Mr. Pennel, seconded by Mr. Rickett, that, before deciding on the erection of new gas-works, a deputation should be appointed from the meeting to wait upon the Directors of the existing Gas Company, and urge the propriety of reducing the price of gas to 4s. 6d. per 1000 cubic feet, and to report to a future meeting. From this result of Monday's meeting, it is very evident that the proposal in question has not met with anything like enthusiastic support.

At the monthly meeting of the Millport Police Commissioners last Monday, a communication was submitted from the Gas Company, stating that the price of gas supplied to the public lamps would be 5s. 10d. per 1000 cubic feet, and that an allowance of 5 per cent. would be made on payment of the account.

At the meeting of the Armadale Police Commissioners on Monday, the charge for gas consumed in the public lamps was also under consideration. A letter from the Gas Company was submitted in which the Commissioners were requested to sign an agreement to the effect that they pay 10s. for each gas-lamp for one year; that a reduction of 1s. be made on each lamp, seeing that there had been no lighting during September; further, that the lamps be lighted at dusk and extinguished at ten o'clock every night except Saturdays, when it should be done at eleven o'clock. If extra light were needed during the night for street alterations, &c., the Commissioners should pay for the same accordingly. The Clerk was empowered to make several alterations in the terms of the proposed contract, failing the acceptance of which by the Gas Company the Commissioners decline to sign the agreement.

The Dunblane Burgh Commissioners have approved of an offer from the local Gas Company to supply gas to the public lamps at 5s. 10d. per 1000 feet, with a discount of 30 per cent.

That part of the burgh of Wishaw known as Craigneuk was again before the Commissioners last Monday in regard to the proposal to light the public thoroughfares with oil. A report on the subject was read to the meeting, which had been prepared by the Burgh Surveyor, Mr. Tait. It stated that, to light Craigneuk and district with oil-lamps in anything like an efficient manner, the distance between each lamp should not be more than 100 yards. To do this 30 lamps would be required. The first cost of the lamps, which could be used for gas, would be £79 10s.; lighting, 14s. each per annum, £421; oil, 9s. 6d. each per annum, £14 15s.; repairs, 3s. each per annum, £4 10s.—thus making the annual cost, £39 15s. The report further stated that, with oil at its present price, the lighting would

cost about 25 per cent. less than with gas; but the saving is a long way more than counterbalanced by the extra charge for lighting and cleaning the oil-lamps. Baillie Russell questioned if any other town in Scotland ever made such a ridiculous proposal as that of lighting the streets with oil-lamps. He was in favour of a small Committee being appointed to confer with the proprietors of the Craignuk district to learn how many of them were willing to make connections if a gas-main were laid down, sufficient (say) for 30 lights, the public lamps then, of course to be lighted with gas. A Committee was ultimately appointed for this purpose.

The proposal to form a Water Commission for the burghs of Airdrie and Coatbridge, and various adjacent parishes, is now fully launched before the public throughout the district, and already it has been favourably received. The intention of the proposed Water Commission is to buy up the undertaking of the Airdrie and Coatbridge Water Company. A meeting was held recently, at which all the local authorities of the district were represented, and the matter of buying up the undertaking was fully considered. A discussion took place on the practicability and advantage of the scheme to the wide district interested in it. In the course of conversation, it was stated that the proposed terms of purchase could be either to pay the Water Company the present selling value of their shares, or give them perpetual annuities at the rate of 10 per cent. on their ordinary shares, and 5 or 6 per cent. on their preference shares. On Thursday of last week a special meeting of the Airdrie Town Council was held, in order to receive a report on the subject from the Committee appointed to attend the meeting already referred to. The report recommended the proposed scheme of purchase; and after considerable discussion, the Council agreed to its adoption unanimously. In the event of the Coatbridge Town Council also agreeing to the proposal, it was remitted to a Committee to call a meeting of the ratepayers of Airdrie, so as to have their opinion of the scheme. The matter has yet to be discussed at special meetings of the Shotts, Bothwell, and Old Monklands Local Authorities, and at the Coatbridge Town Council.

The Clydebank Police Commissioners and the tenants of houses on common stairs have got into a very serious difficulty in regard to the lighting of the closes and stairs. At the quarterly meeting of the Commissioners on Monday, the Lighting Committee reported that the Glasgow Gas Corporation required a deposit of £3 from the tenants of each close and stair before they would supply gas for such places. The Clerk stated that he had called at the Gas Office in Glasgow on the subject; but the only abatement he could get was the reduction of the deposit to £2. Mr. Crawford thought the demands of the Gas Trust were unreasonable. When they supplied the gas before with a No. 1 burner, they did so at 12s. 3d. a year. There were only two No. 1 burners in a close; and this at the most was 24s. 6d. a year. How they came to ask £2 or £3 he could not make out. A long conversation took place on the subject; and reference was made to the provisions of the Scotch Police Act bearing upon stair lighting. The result was that the Master of Works was instructed to see that the closes and stairs were lighted, and to institute prosecutions where that was not done.

On the Glasgow Stock Exchange on Wednesday, the ordinary shares of the Partick, Hillhead, and Maryhill Gas Company were sold at 85s. per £5 share; being a reduction of 1s. 6d. from the last price at which business was done.

Sulphate of ammonia has been selling this week at £11 10s. per ton; and there are inquiries for forward delivery.

In the earlier part of this week, the Glasgow pig-iron warrant market was flat; the price of Scotch iron receding to 40s. per ton cash on Tuesday and Thursday. The market closed firmer yesterday, the price for Scotch warrants being 40s. 8d. per ton cash buyers, and for Cleveland and hematite iron 43s. 10½d. and 33s. 11d. respectively. The Scotch special brands are steady.

On the whole the local coal trade continues to be in a very satisfactory position. For certain qualities of coal, there is an active shipping demand; and full prices are maintained at all the export centres. Good house coal now commands 7s. per ton at the pits.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Oct. 13.

Sulphate of Ammonia.—A continued fair prompt demand has kept the market very steady; and there is therefore no change in values to be reported. It now seems probable that present prices will be maintained throughout the month; for although more, and larger, parcels are coming on the market, buyers are found for them, and it is reported that £11 12s. 6d. has been paid for all October delivery. The inquiry for spring contracts also continues; and buyers pay advanced rates for the few contracts which they can pick up. Nitrate on spot has advanced to 9s. 9d. to 10s.; but there is no change in the values of floating cargoes or of parcels for spring delivery.

LONDON, Oct. 13.

Tar Products.—A little more life has infused itself into this market, with the exception of benzols, which are both flat and drooping. Carbolic acid is decidedly better; and there is a fair demand for anthracene. Pitch buyers are now in the market; but they look askance at the higher prices demanded by distillers. Prices may be taken as follows:—Tar, according to position, 17s. 6d. to 22s. 6d. per ton. Benzol, 90 per cent., 3s. per gallon; 50 per cent., 2s. 4½d. Toluol, 1s. 9d. per gallon. Solvent naphtha, 1s. 3d. per gallon. Crude naphtha, 30 per cent., 1s. per gallon. Light oil, 3d. per gallon. Creosote, 2d. per gallon. Pitch, 12s. to 15s. per ton. Carbolic acid (crude), 3s. 4d. per gallon. Cresylic acid, 9d. per gallon. Tar salts, 15s. per ton. Anthracene, 30 per cent., "A" quality, 1s. 6d. per unit; "B" quality, 1s. 3d.

Ammonia Products.—Sulphate is in decidedly good demand, and the price is firmer. The higher price of nitrate of soda is likely to force this product to a better figure. The business of the week is reported at varying prices from £11 8s. 9d. to £11 12s. 6d., less discount. Gas liquor (5° Twaddell), 7s. 6d. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 1½d. per lb. Carbonate of ammonia, 3½d. per lb. Murate of ammonia, brown, £18 per ton; white, £27. Sal-ammoniac, £30 per ton.

[From the *Chemical Trade Journal*, Oct. 13.]

Sulphate of Ammonia.—The sulphate market keeps very firm, though there is no change in the quotations. Business is reported at £11 11s. 3d. to £11 12s. 6d. f.o.b. Hull, and at similar rates at Leith and Liverpool. Beckton is quoted at £11 12s. 6d., and outside makes in the London market are realizing similar figures. The French demand is still good; and there are numerous inquiries for spring delivery.

Tar Products.—Benzols remain without any decided change. If anything, the chances are for the better so far as parcels for early delivery are concerned; 90's may be called 3s., and 50/90's, 2s. 5d., while solvent is still firm at former prices. Anthracene is still unchanged; while crude carbolic has gone a shade stronger. Pitch is stated to be very firm; and the rumour that Beckton has sold some quantity at 15s. has given a little healthier tone to this branch of the tar trade.

REDUCTION OF METER-RENTS BY THE BRISTOL GAS COMPANY.—The decision come to by the Directors of the Bristol Gas Company to reduce their meter-rents nearly 50 per cent. will entail a sacrifice of about £2500 per annum.

SALES OF SHARES.—On Tuesday, the 2nd inst., Mr. Burbidge sold by auction, at Calne, 50 fully-paid £2 shares in the *Calne Water Company, Limited*. The last dividend paid by the Company was 6½ per cent. per annum. The shares were put up in lots of ten each. The bidding for the first lot was started at £2 5s., and advanced to £3 5s., when the shares were knocked down to a resident in Calne, who purchased the remaining lots at the same rate.—Last Tuesday, Messrs. Nicholson, Greaves, and Barber sold at Sheffield, 891 "D." new shares in the *Sheffield Gas Company*. There was a large attendance, and the competition for the shares was keen. Of the entire number, 105 were sold at £4 5s. prem., and 91 at £4 7s. 6d. prem. Nothing had been paid on the shares; indeed, the first call will not be made until next month.—Last Tuesday, Mr. J. P. Chapman sold by auction a number of shares in the *Lewes Water Company*, which realized unusually high prices. The first lot offered was an original fully-paid £25 share, which was sold for £78 10s. to a resident in Lewes, who subsequently purchased a similar share for £77. New shares (£25) fetched £52 10s., £53, and £53 10s. The last lot offered was £20 of preference 5 per cent. stock, which was sold for £30.

THE OIL LIGHTING ON HAM COMMON.—At the last meeting of the Ham Local Board, the following petition was presented:—"We, the undersigned inhabitants of Ham, beg to bring before the notice of the Local Board the very inefficient lighting of Ham Common and the parish in general. We consider it alike dangerous to foot passengers, vehicles, and property; and therefore desire that our parish should be again lighted with gas, and not sunk in the mediæval darkness of oil-lamps. We are quite sure that hardly anyone will object to the small, if any, additional cost of effecting this amelioration." The petition bore the signatures of about 67 persons, and the Chairman (Rev. T. G. P. Hough) said there were not more than a dozen ratepayers amongst them; the signatures were mainly those of poor people who were not ratepayers. In reply to a member, the Clerk said there were 20 lamps in the district; and the cost of lighting the parish last year was £44 6s. 11d. It was agreed that gas would be much better than oil; and one member remarked that on a windy night he had seen the Common with hardly a lamp alight. It was decided that the Clerk should write to the Richmond Gas Company and ask what would be the cost of lighting the lamps for six months, or a longer period.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST. (For Stock Market Intelligence, see ante, p. 671.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.					£ s. d.
GAS COMPANIES.								
590,000	10	12 Oct.	10½	Alliance & Dublin 10 p. c.	10	18-19*	..	5 10 6
100,000	10	"	7½	Do. 7 p. c.	10	123-133*	..	5 11 1
300,000	100	2 July	5	Australian (Sydney) 5½% Deb.	100	110-112	..	4 9 3
100,000	20	30 May	10	Bahia, Limited	20	23-25	..	8 0 0
200,000	5	11 May	7½	Bombay, Limited	5	73-73½	..	4 16 8
40,000	5	"	7½	Do. New	4	53-53½	..	5 4 2
380,000	Stock	29 Aug.	11	Brentford Consolidated . .	100	222-227	+2	5 3 6
110,000	"	"	8	Do. New	100	161-166	..	5 5 5
220,000	20	13 Sept.	10½	Brighton & Hove, Original .	20	43-45	..	4 13 4
320,000	20	28 Sept.	11½	British	20	45-47	..	4 15 9
50,000	10	13 Sept.	11	Bromley, Ordinary 10 p. c.	10	19-21	..	5 4 9
39,000	10	"	8	Do. 7 p. c.	10	13-14	..	5 14 3
328,750	10	30 May	8	Buenos Ayres (New) Limited	10	143-153	..	5 3 2
200,000	100	2 July	6	Do. 6 p. c. Deb.	100	110-112	..	5 7 1
150,000	20	10 Aug.	7	Cagliari, Limited	20	25-27	..	5 3 9
550,000	Stock	12 Oct.	13½	Commercial, Old Stock . .	100	263-268*	..	5 2 7
130,000	"	"	10½	Do. New do.	100	209-214*	..	5 0 5
121,234	"	28 June	4½	Do. 4½ p. c. Deb. do.	100	123-128	..	8 10 3
557,320	20	14 June	12	Continental Union, Limited .	20	45-46	..	5 4 4
242,680	20	"	12	Do. New 69 & 72	14	30-31	..	5 3 1
200,000	20	"	9	Do. 7 p. c. Pref.	20	36-38	..	4 14 8
75,000	Stock	28 Sept.	10	Crystal Palace District . .	100	205-215	..	4 13 0
234,060	10	27 July	13	European, Limited	10	253-263	..	4 18 1
120,000	10	"	13	Do. New	10	183-193	..	5 0 0
354,060	10	"	13	Do. do.	5	123-133	..	4 16 3
5,468,600	Stock	29 Aug.	13	Gaslight & Coke, A, Ordinary	100	243-252	..	5 3 2
100,000	"	"	4	Do. E, 4 p. c. max.	100	100-105	..	3 16 3
665,000	"	"	10	Do. C, D, & E, 10 p. c. Pf.	100	260-265	..	3 15 6
30,000	"	"	5	Do. F, 5 p. c. Prf.	100	125-130	..	3 16 11
60,000	"	"	7½	Do. G, 7½ p. c. do.	100	182-187	..	4 0 2
1,300,000	"	"	7	Do. H, 7 p. c. max.	100	168-173	..	4 0 11
469,000	"	"	10	Do. J, 10 p. c. Prf.	100	258-263	..	3 16 1
1,061,150	"	14 June	4	Do. 4 p. c. Deb. Stk.	100	120-123	..	3 5 0
242,850	"	"	4½	Do. 4½ p. c. do.	100	125-130	..	3 3 3
650,000	"	"	6	Do. 6 p. c. do.	100	175-178	..	3 7 5
3,600,000	Stock	11 May.	10	Imperial Continental . . .	100	210-213	-1	4 13 10
75,000	5	14 June	6	Malta & Mediterranean, Ltd	5	5-5½	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	112-114	..	4 7 9
541,920	20	14 June	6	Monte Video, Limited . . .	20	20-21	..	5 14 3
150,000	5	30 May	7	Oriental, Limited	5	9-9½	..	5 5 3
60,000	5	23 Sept.	7	Ottoman, Limited	5	6-7	..	5 0 0
People's Gas of Chicago—								
420,000	100	2 May	6	1st Mtg. Bds.	100	107-110	..	5 9 1
500,000	100	1 June	6	2nd Do.	100	95-100	..	6 0 0
100,000	10	12 Oct.	10	San Paulo, Limited	10	16-17*	+½	5 17 8
500,000	Stock	29 Aug.	15½	South Metropolitan, A Stock	100	306-311	..	4 19 8
1,350,000	"	"	12	Do. B do.	100	241-245	..	4 17 11
141,500	"	"	13	Do. C do.	100	245-255	..	5 1 11
550,000	"	28 June	5	Do. 5 p. c. Deb. Stk.	100	185-190	..	3 11 5
60,000	5	29 Aug.	11	Tottenham & Edm'ton, Orig.	5	11-13	..	4 4 0
WATER COMPANIES.								
717,467	Stock	28 June	9	Chelsea, Ordinary	100	260-265	..	3 7 11
1,720,560	Stock	12 Oct.	7	East London, Ordinary . .	100	193-198*	..	3 10 8
700,000	50	14 June	9	Grand Junction	50	123-127	-1	3 10 10
708,000	Stock	10 Aug.	10½	Kent	100	270-275	..	3 16 4
1,043,800	100	28 June	9	Lambeth, 10 p. c. max.	100	255-260	-5	3 9 3
406,200	100	"	7½	Do. 7½ p. c. max.	100	197-202	-6	3 14 3
200,000	Stock	28 Sept.	4	Do. 4 p. c. Deb. Stk.	100	116-120	..	3 3 8
500,000	100	27 July	12½	New River, New Shares . .	100	340-350	-5	3 9 3
1,000,000	Stock	"	12	Do. 4 p. c. Deb. Stk.	100	124-128	..	3 2 6
902,300	Stock	14 June	6	S'hwk & V'xhall, 10 p. c. max.	100	166-171	..	3 10 2
126,500	100	"	6	Do. 7½ p. c. do.	100	157-162	..	3 14 1
1,155,066	Stock	14 June	10	West Middlesex	100	265-270	..	3 14 1

* Ex div

THE PUBLIC LIGHTING QUESTION AT BLYTH.—On Monday last week a public meeting of the ratepayers of the Cowpen township, Blyth, was held in the Market Place, under the auspices of the Cowpen Local Board, to take into consideration the advisability of lighting the Cowpen township by means of electricity; gas having been abandoned owing to a dispute with the Gas Company. Having heard the estimated cost of lighting by the proposed system and by oil, the meeting unanimously agreed to urge upon the Local Board the advisability of adopting the electric light without further delay.

THE DANGERS OF OIL-LAMPS.—During the last few weeks several of the tradesmen of Oldbury have had their gas cut off, and have been lighting their establishments with oil, which is said to be much cheaper. Some of the members of the Local Board have expressed their fear that this plan would be generally followed; but up to the present it has not been. One evening last week an explosion took place in the window of a tradesman in Church Street, who has been using oil-lamps. One of the lamps burst; blowing out a portion of the window, and setting fire to the materials therein. Fortunately the fire was not of a serious nature.

SELKIRK WATER SUPPLY.—About 21 years ago the old pump-wells in Selkirk were superseded by a filtration and pumping scheme; the water being drawn into a collecting well from a gravelly meadow at the side of the River Ettrick, and pumped up 300 feet into a supply reservoir. Latterly the supply—about 35 gallons per head per day to a population of upwards of 6000—has been found slightly insufficient. The Burgh Surveyor (Mr. J. Priddy) was recently instructed by the Police Commissioners to consider the best means of increasing the supply. Mr. Priddy at once set to work, and has just completed operations; and by cutting drifts in the gravel-bed and digging a second collecting-well, at the cost of about £600, a superabundance of excellent water has been obtained.

KIMBERLEY WATER COMPANY, LIMITED.—The Directors of this Company recommend an interim dividend at the rate of 10 per cent. per annum, free of income-tax, for the half year ending June 30 last. They also announce that a preliminary agreement has been entered into for the acquisition by the Company of the De Beers Consolidated Mines Water Supply Act, recently passed by the Cape Parliament. This purchase, when completed, will put an end to the threatened opposition by the construction of new water-works.

BRISBANE GAS COMPANY.—The report of the Directors of this Company for the half year ending June 30 last states that there was a steady increase in the demand for gas in that period. The sales amounted to £12,309; and this, with the balance brought forward (£9341), made a total of £21,250. The manufacture and distribution of gas cost £7358; rates and taxes amounted to £158; interest to £1890; the reserve fund to £7000; and there was a balance of £4310 at the close of the six months. The Company's new works are fulfilling the expectations of the Directors.

THE BURSTING OF A RESERVOIR IN SOUTH AMERICA.—In the JOURNAL for Aug. 21 last, we briefly recorded a serious disaster which occurred to a reservoir in Valparaiso on the 11th of that month. From particulars since received, we learn that the reservoir was situated 600 feet above the level of the city of San Juan de Dios, the streets of which were deluged. The water rushed through the city in a wave 12 feet high, carrying nearly everything before it. At first it was thought that an immense tidal wave had come from the sea. The shops were flooded, and their contents destroyed. The people who were in the streets at the time were washed up and down—some being drowned, and others sustaining terrible injuries. Four days after the disaster the streets were still in an impassable state. No fewer than 57 dead bodies were recovered up to the time the despatch was sent off; but this number it was thought would be largely increased.

THE QUALITY OF THE LONDON GAS SUPPLY

DURING THE FOUR WEEKS ENDED OCT. 9.

[From returns to the Metropolitan Board of Works by Mr. W. J. DIEDIN, F.I.C., F.C.S.]

COMPANIES—DISTRICTS.	ILLUMINATING POWER. (In Standard Sperm Candles.)						SULPHUR. (Grains in 100 Cubic Feet of Gas.)						AMMONIA. (Grains in 100 Cubic Feet of Gas.)					
	Maxi- mum.	Mini- mum.	Means.				Maxi- mum.	Mini- mum.	Means.				Maxi- mum.	Mini- mum.	Means.			
			Sept. 18	Sept. 25	Oct. 2	9			Sept. 18	Sept. 25	Oct. 2	9			Sept. 18	Sept. 25	Oct. 2	9
The Gaslight and Coke Company—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Notting Hill*	16.8	15.8	16.5	16.1	16.2	16.3	15.4	8.8	11.5	10.1	11.7	14.4	0.2	0.0	0.0	0.0	0.1	0.0
Camden Town	16.8	16.2	16.4	16.5	16.5	16.5	14.1	11.2	12.3	13.3	12.7	11.7	0.2	0.0	0.1	0.1	0.1	0.0
Dalston	17.3	16.1	16.5	16.7	16.6	16.7	7.1	4.4	5.7	5.8	5.4	5.7	0.5	0.0	0.3	0.2	0.1	0.1
Bow	16.8	16.3	16.3	16.7	16.5	16.6	12.9	9.2	12.4	11.6	12.3	10.7	0.4	0.0	0.4	0.0	0.0	0.1
Chelsea (Fulham)	17.0	16.4	16.8	16.7	16.6	17.0	12.2	9.0	11.0	11.0	10.1	10.6	0.4	0.2	0.3	0.2	0.3	0.4
Do. (Nine Elms)	17.2	16.5	16.9	17.0	16.9	16.8	13.2	6.6	11.4	10.7	12.1	11.5	0.3	0.0	0.1	0.1	0.2	0.1
Kingsland Road	16.7	16.0	16.1	16.3	16.3	16.4	9.3	8.3	8.7	8.6	8.5	8.7	0.6	0.1	0.3	0.2	0.2	0.1
Charing Cross (48-inch main)	16.8	15.9	16.0	16.1	16.7	16.5	10.0	7.8	8.2	8.9	9.5	9.3	0.3	0.1	0.2	0.3	0.2	0.2
Do. (district main)	17.1	16.1	16.5	16.9	16.9	16.8	11.9	8.3	10.6	9.2	9.1	9.3	0.6	0.2	0.5	0.4	0.5	0.4
St. John's Wood	17.1	16.1	16.4	16.6	16.5	16.8	15.5	8.3	9.6	10.4	10.0	12.2	0.4	0.1	0.3	0.3	0.2	0.2
Lambeth Road	16.6	16.0	16.3	16.4	16.2	16.4	11.1	8.8	10.4	10.3	9.6	9.8	0.8	0.3	0.5	0.6	0.5	0.4
Holloway	21.3	20.3	20.6	20.8	20.7	20.7	11.4	9.1	9.7	10.3	10.2	10.3	0.4	0.2	0.4	0.4	0.3	0.3
Westminster (cannel gas)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
South Metropolitan Gas Company—	16.9	16.1	16.4	16.5	16.6	16.6	10.5	8.4	8.8	9.2	9.0	9.6	0.2	0.0	0.0	0.1	0.0	0.1
Peckham	16.7	16.1	16.3	16.3	16.5	16.6	11.3	8.1	9.3	9.6	9.5	10.3	0.4	0.0	0.0	0.0	0.0	0.3
Tooley Street	16.5	16.0	16.2	16.3	16.2	16.3	12.9	9.1	10.6	10.2	11.2	9.8	0.4	0.0	0.1	0.1	0.2	0.0
Clapham	16.8	16.2	16.5	16.6	16.5	16.4	9.5	6.6	8.0	8.3	8.8	7.9	0.0	0.0	0.0	0.0	0.0	0.0
Lewisham	16.7	16.0	16.2	16.2	16.2	16.2	16.1	7.8	10.2	10.0	10.0	9.6	0.4	0.1	0.3	0.2	0.3	0.3
Blackfriars Road	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Commercial Gas Company—	17.4	16.2	16.8	16.9	16.5	16.5	8.9	1.9	6.9	7.7	7.0	6.7	1.0	0.0	0.2	0.1	0.0	0.0
Old Ford	16.7	16.0	16.4	16.2	16.2	16.6	15.1	7.8	11.0	9.0	8.4	9.9	0.4	0.2	0.4	0.3	0.2	0.3
St. George's-in-the-East	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

* Station closed during alterations.

SULPHURETTED HYDROGEN.—None on any occasion.

PRESSURE.—In excess on all occasions.

Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 22 grains in 100 cubic feet of gas; ammonia not to exceed 4 grains in 100 cubic feet of gas. Pressure between sunset and midnight to be equal to a column of 1 inch of water; between midnight and sunset, 6-10ths of an inch.

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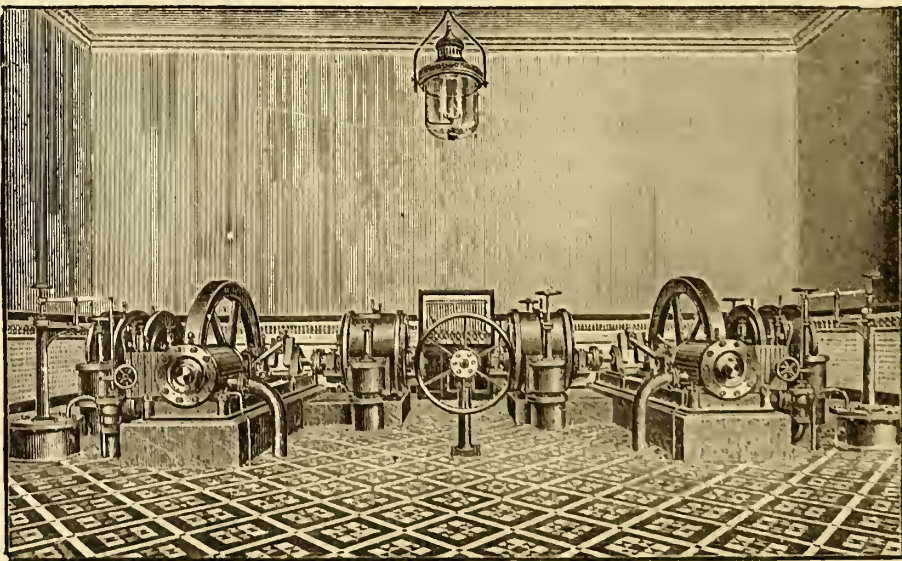
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THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 23, 1888.

COAL OWNERS, MINERS, AND AGENTS.

ONCE more in the newspapers there is talk of coal, in consequence of the imminent conflict between the miners and mine-owners of the great district of which Sheffield is the centre, over the demand of the men for a 10 per cent. increase of wages. The Mayor of Sheffield has tried to mediate between the two parties; but the latest intelligence from the seat of the disturbance is to the effect that the employers have met and decided that the demand of the men must be resisted to the uttermost. If this decision is really acted upon, and if the men are firm, there must inevitably be a strike of great magnitude and far-reaching effects. The price of coal will go up, in consequence of the cessation of the supply from one of the largest producing districts of the country; and then perhaps the demand of the men may be granted, but possibly not until after all the good that might be expected from the concession has been neutralized by the waste of the industrial war. Some observers declare that, not-

withstanding the firm attitude taken up by the coal-owners for the time, they will yield the advance of wages rather than lose their share of the improvement of trade that has been recognized in all parts of the country. Indeed, it is even reported that the advance has been granted by some owners. With reference to this point, it may be at once confessed that the common sentiment of the general public is in favour of the miner receiving his fair share of any advance in national prosperity. It is, of course, natural for wage-earners of every description to keep on the alert for a chance of getting higher pay for their labour, as it is for paymasters to try to get their labour at the cheapest possible rate. There is something in the work of the coal miner, however, that appeals strongly to the sympathies of the rest of the nation; and when miners combine to ask for an advance of wages—say, from 20s. to 22s. a week—alleging that the state of trade warrants such a request, there are few people who would not be glad to hear that they had obtained it. If the price of coal were advanced by 5d. or 6d. per ton, which would more than suffice to give the miner the higher wages he asks for, nobody would have much reason to complain. If gas coal, for example, is made 1s. a ton dearer before the winter actually sets in, gas makers will not be materially affected. We have never in these columns laid excessive stress upon the desirability of extreme cheapness for coal. On the contrary, we have always urged that coal prices should be such as to provide fair wages for the workmen and reasonable profits for their employers, and deplored the competition and other less clear influences of trade that have for many years kept the price of coal down to an unremunerative level. If, therefore, there is in the present aspect of affairs connected with coal mining the germ of a promise of better days for coal-owners and miners, we should welcome it, even though gas coal were made slightly dearer. Coke and tar would then be dearer too; so that the net cost of coal for gas making need not necessarily be enhanced.

The coal trade of the country—or at least that branch of it with which we are most immediately concerned—has long been in a condition that could not be called satisfactory to anybody. Coal-owners, agents—in short, everybody interested in gas coal contracts from the suppliers' side—have complained of the difficulty of making a living out of the ruling prices, and have been accustomed to assume the part of persons aggrieved by acceptance of their own terms. They endeavoured to cut each other's throats, and then wept loudly over the prevalence of the unnatural strife among brethren. No doubt for many years the vast capital sunk in the coal trade has not yielded very much of a return to its possessors. A writer in *The Times*, dealing with the present outlook in the trade, remarks that "in many cases the coal-owners have carried on their business for a number of years without any profits at all;" and this is probably not an exaggeration of the state of affairs. It can at least be said, however, that the coal interest has not suffered in silence. The takers of unremunerative contracts have not been thankful for them, while knowing that they must continue to turn out coal at any price in order to keep their capital from sinking out of sight altogether. It is doubtless a trial to mine-owners, who have thus kept their workmen employed at a loss to themselves, to be met with a demand for higher wages as soon as there is the faintest prospect of making up for lost time; but, in the conflict of selfish interests which rules the industrial world, it is seldom safe to say what claims are just or unjust. All that we are for the present concerned to remark upon the question is that we believe consumers of coal in general can well spare a little more money for it than they have been recently required to pay, and that they will do so willingly, provided that the miner, and the owner likewise, gets his fair share. The outer world will be justly disgusted, however, if it is discovered that the demand of the workman for 10 per cent. more wages is made, by the machinations of middlemen and others, to excuse a great advance in the selling price of the delivered commodity, or to create a "coal famine" in the land. Nobody can desire a repetition of the coal famine of 1873-5, either in the interest of miner, owner, or consumer. A short period of abnormal prices, although wages followed them, must do incalculable mischief. Take the example of 1873. The high prices of that period stimulated the efforts of coal-owners in all directions. Forsaken pits were reopened, new veins were exploited, mines that did not pay expenses under ordinary conditions were sold to companies or eager speculators; and in this way the number of collieries at work was increased from 2760 in 1871 to 4933 in 1875—an increase

of about 80 per cent. within the four years. Similarly, the number of men and boys employed in and about the coal-pits of the United Kingdom grew in the same four years from 371,000 to 538,000; being an increase of about 45 per cent. The coal production, however, did not correspondingly increase. The output of 1871 was 117,352,000 tons, while that of 1875 was 131,867,000 tons, which is an increase of only about 12 per cent. These figures show the waste of effort under extreme pressure. Every possible endeavour was made at this period to obtain coal, which was selling at famine prices; but the result was a lamentable failure. To obtain an additional output of 12 per cent., the working staff was increased by 45 per cent., and the pits by 80 per cent.; meaning that the extra labour did not earn its cost, and that the capital sunk in the new mines was for the most part thrown away. It is consequently easy to understand that neither capitalists nor labourers have any cause to expect benefit from a repetition of these conditions. The men, perhaps, suffered most from the fitful fever. The high wages demoralized them; and the inrush of fresh hands, which no trade societies could keep out, dragged down the wages afterwards to starvation point. Some of the 167,000 extra men and boys recruited from town and country, and put to coal mining during the "flush times," returned to the places whence they came; some drifted into other industries, and swamped them; others remained to starve in 1883 in the localities where they caroused in 1873. On all sides the coal famine, as it was called, was repeated after a time by other consequential famines more deserving the name.

If the prospect of a break in the deadly monotony of the gas coal trade for the past ten years should have the effect of putting a stop to the abuses that have crept into it, the result would be worth buying at the price of a considerable rise in the cost of the commodity. What Shakespeare calls "the cankers of a calm world and a long peace" have been too conspicuous in this branch of commerce. The middleman and middle influences have developed into rank luxuriance, like baneful weeds sapping the substance of the land on all sides. It is a remarkable fact that all the scandals that have lately arisen in connection with the purchase of coals for gas making have applied to cases where a middleman has been employed. The manager of a well-known colliery, by way of illustrating the influence of middlemen, once declared to us that he often competed for contracts unsuccessfully against agents selling his own coal. The wonder is why such things should be. The coal trade, especially in some districts, is poisoned by middlemen. Take the case of Halifax, which is now figuring conspicuously in men's minds. It is notorious that Mr. Ellis Lever, a coal agent, is at the bottom of the attack that has been made here upon another coal agent, Mr. E. G. Wrigley, and others. Mr. Lever has also stirred up the gas authorities of Salford and Leeds; alleging that some other coal agents are defrauding them. This sort of thing may be all right and proper in the estimation of some people; but does it not look as though anybody who dares to buy coal through any other agent may sooner or later have to endure the doubtful honour of being made a recipient of Mr. Lever's threatening telegrams? The question is, Are these middle people necessary in the scheme of the British gas industry? One can understand that in some trades a middleman can sometimes buy large quantities of stuff from a needy seller, and can afterwards retail it at prices lower than those for which the same article can be obtained in the open market. But coal is not largely stocked; and one is driven to ask why consumers who buy so extensively as do most gas companies, cannot always deal at first hand. Many do, as we know; and these are free from a vast amount of annoyance. The plain fact is that unlimited competition—that great panacea of the hide-bound Free Trader—while it is a good thing in the main, has its "seamy side," like most other human institutions. There are as upright, fair-dealing coal-owners in the land as there are honest and faithful gas managers to deal with them. Unhappily, but naturally, there are sellers who prefer to obtain business by underhand means; and they do not lack accomplices on the other side. Competition is so keen, that if one canvasser for orders begins to use occult influences, others will outbid him. So the unholy game goes on—one outbidding the other, until at last somebody finds it more profitable to start on a different tack altogether. It is at least probable that, if the race of middlemen were wiped out, purchasers would feel easier respecting the appropriation of their money; so that, if prices were raised either for the benefit of the coal-owner or the miner, or of both together, it

would be certain that the additional payment would go to the rightful claimants, and not be swallowed up on the road. There is some talk of a huge Coal Trust, with a capital of £80,000,000 sterling, to be constructed on the lines of the Cheshire Salt Trust. If such an organization should be formed, it would have the not insignificant effect of removing the occupation of the middleman, who lives by setting one coal-owner against another. On this account we may wish the attempt success.

THE MEETING OF THE MIDLAND ASSOCIATION.

The members of the Midland Association of Gas Managers met in Birmingham on Thursday last, under the presidency of Mr. Henry Hack, M. Inst. C.E., under whom the Association has had two prosperous and comfortable years of existence and work. Mr. Hack will now resign his charge to Mr. C. Taylor, of Derby, who will doubtless do his best to preserve the Association from any falling off in efficiency during the coming year. The business of the meeting comprised the adjourned discussion on Mr. J. T. Lewis's paper on "The Competition of Petroleum with Gas for Lighting Purposes" (presented at the previous meeting), and the reading of a paper by the President-Elect upon high heats in carbonizing. We shall, of course, publish the usual report of the proceedings in an early number. The discussion upon Mr. Lewis's paper, although interesting and useful so far as it went, was not particularly instructive—that is to say, very little transpired with regard to the experience of members in connection with the extension of the use of gas among classes of the population who do not ordinarily patronize it. Perhaps it would be correct to say that there was no information available upon the point; Mr. Lewis's own departure in the direction of weekly collections being avowedly an experiment of an unfamiliar kind. So far Mr. Lewis has expressed himself as being well satisfied with the promise of his experiment; and he is a man who can be depended upon to tell the truth from time to time as his experience discloses it, without reference to whether or not it suits his own preconceived ideas. Hence we are justified in regarding the Wellingborough venture as a rather important and decidedly interesting one. During the discussion, a good deal was said respecting the advantages or the reverse of forcing gas consumption upon people who have been accustomed to do without it, and whose custom is, after all, too small to make it very much worth while to run after it. While admitting the force of objections of this order, we venture to remark that any gas manager who means to take in hand the work of popularizing gas among all classes of the community will find himself sadly hampered at the outset if he begins by distinguishing too curiously the consumers whose custom does not pay from the others. The attention of the meeting was engrossed by Mr. Taylor's remarks upon carbonizing temperatures; but, as the subject was reserved to be discussed at the next meeting, there is not much to be said about it now. We will be content with observing, with reference to the single point of stopped ascension-pipes, that ninety-nine gas managers out of a hundred, when they discover that to push their heats beyond a certain limit means trouble with the pipes, will quietly keep on the safe and comfortable side, whatever may be the other inducements to cross it. The President of The Gas Institute was present at the meeting, and was appealed to for a statement respecting what is to be done to terminate the existing crisis in the existence of the body whereof he is the head. He thereupon declared that he would produce a policy immediately after the meeting of the Council next month; which promise soothed his interlocutors. It is an illustration of the far-reaching effects of the deadlock in the Institute that the Midland Association will not go on with their contemplated work of technical instruction while the Institute scheme is in abeyance through the withdrawal of the bulk of the members to whom was entrusted the duty of carrying into effect the resolution passed last June. The meeting ended in a dinner, according to custom.

PETROLEUM EXPLOSIONS.

CONSIDERABLE alarm was spread through Europe last week by the explosion of the petroleum-laden steamer *Ville de Calais* in the harbour from which the ill-fated craft took her name. The newspapers spread far and wide the mysterious intelligence that she was a "tank" steamer, as though the term implied something dreadful; and the minds of the general public of newspaper readers were not reassured by the statement that tank steamers have of late largely superseded the vessels that used to carry oil in barrels. It is a

lamentable characteristic of the ordinary newspaper reader, judging from his behaviour upon such occasions as that now in question, that he never learns anything concerning what is going on round him until his incuriousness is broken in upon by some dire catastrophe; and he then fills the air—or the columns of the newspapers—with frantic appeals to Government, or the Police, or somebody, to “do something” instantly. So he continues screaming incoherently until his attention is taken off by another sensation. The explosion in the harbour of Calais has aroused a little excitement about the safety of the Thames; for it is rightly argued that if so much damage can be done in a small port, what might not happen in London or Liverpool from the vast quantities of petroleum daily received into these great commercial centres of importation and distribution? It seems to be admitted that the explosion of the *Ville de Calais* was due to the careless introduction of a naked light into one of her tanks when empty of oil; for a tank steamer resembles a gasholder in being more liable to explode when temporarily thrown out of use than when full of its ordinary contents. Human carelessness, however, is an ineradicable constituent of the chances of life; and it is not pleasant to reflect that the momentary aberration of an overworked sailor or sea-going engineer might cause a repetition of the Calais disaster in any of our most crowded waterways. It is futile to grumble upon this score, however. Petroleum we shall always have with us, like the poor—for whom, indeed, it is largely required. The only thing to see to is that petroleum tanks, whether afloat or ashore, are managed with all possible care, and, so far as possible, put out of the power of hurting anything, whatever may happen to them. Meanwhile, as Mr. Charles Marvin writes to *The Times* to point out, startling catastrophes like the explosion of the *Ville de Calais*, although they make more noise in the world, in more ways than one, are not chargeable with more than a small percentage of the total damage done by petroleum in the land. The worst offender is the cheap lamp, which kills from 200 to 300 people annually without anybody noticing it. Coal mines, tank steamers, and coal gas explosions altogether do not kill so many people as common lamps, against which there are no laws or regulations, and which do not come under supervision by inspectors.

A QUESTION OF TRIFLES.

The gas managers who took part in the discussion, at the Midland Association meeting, of Mr. J. T. Lewis's paper on the competition of petroleum with gas (mentioned in another paragraph), seem to have overlooked one or two very plain considerations that might well have been referred to on that occasion. First with regard to the question as to which classes of consumers are profitable, which is one of the central points of the doctrine of the advisability of extending the use of gas. The quality of being profitable is not an entity that can be disentangled from all the other circumstances of the connection in which it is sought. There is no standard in this matter, or it is a shifting one. No single consumer of gas in any large undertaking could be regarded as profitable at the price he pays for his gas, if it were not for the others. Hence there is a sense in which it may be said truthfully that no consumer “pays;” and is it too much to claim that there is also a sense in which every consumer pays? Take the example of an insurance company. The rate of fire insurance for an ordinary domestic risk is 1s. 6d. per cent., and any office will gladly accept a single £100 at this rate, going through all the routine of writing out the policy and entering up the business, and collecting the premium at the regular times. Does this “pay?” In one sense, of course not; but in another sense it is all “good business.” We are aware that the analogy is not quite perfect; but a better one may be found in the example of the pushing tradesman who will send the smallest order home to his customer's address, although the direct profit upon it may not pay for the errand boy's time. One cottage consumer of sixpennyworth of gas a week in a street would not pay; but would not a hundred more of such consumers in the same street be worth having? It is rather a deplorable thing for these small consumers that the custom in England is to speak of the price of gas by the unit of 1000 cubic feet. It is too large a unit for common use by small consumers; 100 cubic feet is quite large enough. This is the exact equivalent to the Board of Trade unit for electrical supplies. Thus we can see from this example that, albeit unconsciously, the tendency in favour of a smaller and more manageable unit has been accentuated. Electricity at 8d. per unit does not sound nearly so dear as gas at 6s. 8d.

per 1000 cubic feet. In the countries which have adopted the metric system, the unit for the sale of gas is the cubic metre, or 35·316 cubic feet, which is almost too small for gas, yet it masks the high price of gas in many places, because the value of such a unit can be expressed in centimes—again a small denomination. This is a point that has been mentioned in the *JOURNAL* upon previous occasions, but it will bear repetition in connection with such topics as that discussed by the Midland gas managers last Thursday.

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(FOR STOCK AND SHARE LIST, see p. 734.)

THE general tendency of the Stock Exchange markets during the past week has been downward. Some degree of uncertainty as to the course the Money Market would take prevailed; and this had its effect. Apprehension as to the spread of the colliery strikes was also entertained, which had its influence on railways; and a more or less general lack of support all round made everything inclined to be dull. There was more doing, however, in the Gas market than has been the average for two or three weeks past. The changes in quotation are but few; and they are somewhat irregular. Gaslight “A” has not been very active; but the firmness it exhibited the week before has grown more marked, and rather better prices have been easily obtained. The quotation has risen 1. The “H” stock, on the other hand, failed to maintain the advance it had made in the preceding week, and fell back to a similar extent. A little was done in the 10 per cent. preferences at old prices. South Metropolitan have been unusually active—especially in the beginning of the week, when they showed out fairly steady. The “B” weakened towards the end, and fell 3; but the “A” closed unchanged. Commercial have been very quiet; but the old stock has receded 3. There is no sufficient reason, so far as we are aware, for these reductions. The colliery strike has been alleged as one; but we cannot agree in the sufficiency of that. Among the Suburban undertakings, Brentford continues to be the most to the front; and a fair amount of business in the old shares has been done at good figures. Of the Foreign Companies, Imperial Continental has been strong, and marked top price on Friday. The Directors announce that they will recommend their usual 5 per cent. dividend for the half year at the approaching meeting. Bombay old was dealt in once or twice, but nothing was done in the new; though at the Mart on Wednesday some of the £4 paid shares realized 5½. The Para Company, which is coming more prominently into notice since its resumption of the payment of dividends, was also moderately dealt in; and we now include this Company's quotation in our stock and share list. The Water Companies have been pretty active, and for the most part steady. Lambeth marked a further fall during the week, but recovered before the close; and the only relapse is in New River debentures.

The daily operations were: On Monday, Gas issues were very quiet, except South Metropolitan, which showed great activity. The “B” fell 1; though the closing mark was the best of the day. There was nothing noticeable in Water. Tuesday's Gas business was moderate, and more evenly distributed through the list. Gaslight “H” fell 1. Water was hardly noticed, but New River debentures receded 1. On Wednesday, Gaslight “A” and Brentford old were moderately dealt in; but everything else was very quiet. In Water, Lambeth 10 per cents. fell 2½. Thursday's Gas business was only noticeable for the improving tendency in Gaslight “A,” which rose 1. Water stocks ruled fairly firm. Lambeth debentures were 1 higher. Friday was rather a quiet day in Gas; and business was mostly in Gaslight issues. Commercial old fell 3; and South Metropolitan “B,” 2. But nothing was done in either. In Water, Lambeth 10 per cents. recovered their fall of 2½. Both Gas and Water were rather more active on Saturday than usual, and pretty steady. All quotations closed without further variation.

ELECTRIC LIGHTING MEMORANDA.

THE WATERHOUSE SYSTEM OF ELECTRIC LIGHTING—GAS PREFERRED TO ELECTRICITY AT NEW ORLEANS—THE QUESTION OF INTRODUCING ELECTRIC LIGHTING INTO HARROW—MR. J. E. H. GORDON AND THE “ELECTRICAL REVIEW.”

A FEW weeks ago we had to chronicle the offer of a London firm to introduce a new system of electric lighting, bearing the name of Waterhouse, into Leamington, to compete with Messrs. Chamberlain and Hookham. We remarked at the time that the name of Waterhouse was strange to us; and we could not give any information respecting the system of electrical supply so called. Since those remarks were published, however, particulars of the Waterhouse arrangements have reached us from the United States, from which we extract the following general description. It appears that the system made its first appearance in a very small way two years ago; but it is said to have advanced so rapidly in public favour as to be now reckoned among the best in use. No technical description of the apparatus has been published—on account, it is said, of considerations with regard to the patents. Sufficient protection has been obtained, however, to enable the broad lines of the invention to be publicly explained. The centre of the system is a so-called “automatic regulator,” consisting of a

pecially modified dynamo, so wound and proportioned that the generation of electricity is always directly regulated to the requirements of the lamp circuit. "The Waterhouse regulator varies the electro-motive force directly with the resistance on the lamp-line, producing self-regulation, and maintaining on the lamp-line the standard current, whether one lamp or the full number are burning. By this method, as the lamps are cut out, the current is reduced in the dynamo, even to the fraction of an ampere; and so it is apparent that one light on the Waterhouse dynamo can be maintained for any length of time without producing more than the standard current." This is the description given in the *American Gas-light Journal*; and, of course, must be taken for what it is worth, as no data whereby the statement may be checked are available. The Waterhouse arc lamp, which this wonderful self-regulating dynamo supplies, is described as inaugurating a new family of lamps, not at all like anything that has gone before. It is sensibly remarked as curious that, at this time of day, a system of electric lighting free from suspicion of copying or infringement should be evolved; yet this is the high praise accorded to the Waterhouse system. Beyond the general assertion that the Waterhouse plan is economical in operation, nothing is advanced on the commercial aspect of the scheme; and there is no novelty in this claim.

Seeing how strenuously the general superiority and popularity of electric lighting in the United States is insisted on by electricians on this side of the water, a report such as the following comes with all the force of a revelation. At New Orleans a movement is on foot for beautifying the streets by voluntary effort, in furtherance of which an open-air concert was recently arranged. The organizers of the movement, in order to provide against possible disaster, were driven to write to the Secretary of the Gas Company a somewhat extraordinary letter, containing this appeal: "Inasmuch as the present system of lighting [electric] is totally unreliable, and we cannot depend upon having light even when most needed, we take the liberty of calling upon you, as a staunch friend of this community, and a liberal contributor to all occasions of public benefit, to furnish us with gaslight around the square for the above occasion." Comment on this statement would be superfluous.

A meeting of the ratepayers of the Harrow district was recently held, as noticed in our last week's issue, to consider the question of introducing electric lighting into the town. Representatives of at least two electrical firms were present; so the reproach of undue favouritism for any particular system could not lie against the organizers of the meeting. The proceedings were enlivened at times by sharp conflicts of assertion and denial between enthusiastic friends of electric lighting and those who professed scepticism respecting its efficiency and economy as compared with gas. One or two speakers were put up to belaud electricity; one gentleman being bold enough to prophesy that the adoption of electric lighting by the Local Board would lead to a reduction of the rates, the lowering of rents, and a consequent revival of the popularity of the neighbourhood as a place of residence. This, in face of the experience of the next-door suburb of Barnet, was almost too much for the patience of the meeting; for there was no lack of witnesses to the costliness and uncertainty of this system of lighting. Harrow is, after all, only a suburb; and as most of the residents have business connections of some kind with London, it was more than many of the people who attended the meeting could be persuaded that a system of lighting which has been frequently tried and found wanting in the City would be perfectly satisfactory in an outlying district. Still, the meeting adopted a resolution asking the Local Board to "investigate the question whether the electric light can be introduced to the advantage of the town;" and this will do no harm, if care is taken to prevent local partisans from misrepresenting this very innocent resolution as a declaration in favour of the system of lighting in question. The Local Board happened to meet on the following night, and duly received a copy of the resolution of the public meeting, which they promptly referred to the Lighting Committee, one of the members of which remarked that he should want something more definite than anything he heard on that occasion to favourably impress him with regard to the suitability of electric lighting for Harrow.

Things are not very pleasant between Mr. J. E. H. Gordon, the Manager of the Metropolitan Electric Supply Company, who have now commenced business at Whitehall, and the conductors of the *Electrical Review*. The latter have, in fact, offended Mr. Gordon by publishing at various times uncomplimentary notices of the Paddington electric lighting installation, for the design of which he is responsible, and which forms the subject of the amusing extract from the *St. James's Gazette* which appears in another column. When the Metropolitan Electric Company was floated amid the plaudits of the press, the *Electrical Review* was among the few technical journals that refused to listen to the voices of Stock Exchange charmers, who would have claimed their flashy allotment as tantamount to a proved success in working; and they placed the bitter drop in Mr. Gordon's cup of triumph by asking "How about Paddington?" Mr. Gordon loftily declined to say anything about Paddington, or of the circumstances under which the electric lighting department of the Telegraph Construction and Maintenance Company, of which he was the head, was suddenly shut up. Recently the *Electrical Review* got wind of the fact that there had been some hitch in the lighting of the Avenue Theatre, which is served from the Metropolitan Company's very complete Whitehall establishment, and they applied for information as to

the facts. In response, Mr. Gordon allowed his temper to appear through the terms of a letter in which he recommended his interrogators to go to the Avenue Theatre, and see for themselves that the lighting was all right; implying at the same time that this would be a better employment for their time than writing unpleasant things about the Metropolitan Electric Company and himself as the working head. When will people learn that it is the worst of all possible mistakes to show temper when assailed by a newspaper? Mr. Gordon's manifest irritation and injudicious surliness laid him open to a damaging retort from the Editors of the *Electrical Review*, who had nothing to lose and everything to gain by disclosing the correspondence, and this they have accordingly done.

THE VENTILATION OF GAS-LIGHTED BUILDINGS.—In the list of prizes offered by the Société Technique du Gaz en France for competition at the annual congress next year, there is one of 3000 frs. (£120) for the best paper on the ventilation of gas-lighted buildings. In reference to this prize, the Committee have issued a special "programme" indicating the lines on which they think the subject may be best dealt with, but, of course, without birding the competitors in any way to their suggestions. They advise special attention to the practical side of the question; and state that preference will be given to the paper which describes the results of experiments actually carried out.

PRESENTATION TO MR. ALDERMAN H. LEE, OF WAKEFIELD.—On Wednesday, the 17th inst., the Corporation of Wakefield recognized the long and able services rendered by the Mayor (Mr. Alderman Henry Lee) in connection with municipal matters, and more particularly with the carrying out of the new scheme of water supply, by conferring upon him the first honorary freedom of the city. The ceremony took place at a special "evening dress" meeting of the Council; and the presentation was made by Mr. Alderman Mander, J.P. In the course of his remarks, he alluded to the fact that next month Mr. Lee will have completed a 32 years' connection with the Corporation, during which period he had, he said, been either Chairman or Vice-Chairman of numerous Committees, not the least important being the Water Committee, over which he had presided from its constitution until that day. Mr. Lee had been elected twice to the aldermanic bench, and thrice to the dignified office of Mayor. A record like this was not a mean one; but one of which anybody might well be proud, and it ought to serve as an example to all young men. He concluded by expressing the hope that the Mayor might be long spared to perform useful service, and would look back upon his life with the thought that it had not been spent in vain. The scroll bearing the honorary freedom was placed in a silver casket, having upon it a plate with the following inscription:—"Presented, with the Honorary Freedom of the City of Wakefield, to Alderman Henry Lee, J.P., Mayor, as a token of the esteem and regard in which he is held by his fellow-citizens, and in recognition of the faithful discharge by him of public duties during his membership of the Town Council—a period of more than 30 years—and especially for his unceasing exertions in obtaining and carrying out to a successful issue the scheme for a new water supply from Rishworth Moors, 10th October, 1888." Upon another plate are engraved the names of the subscribers. The Mayor expressed his deep obligation to the Council for the honour they had conferred upon him, and the proceedings closed. Subsequently the Mayor was entertained at a banquet in celebration of the event.

FINDING WATER BY DIVINATION.—The *Morning Post* continues to keep its columns open to correspondence on the subject of the divining-rod; and some extremely interesting letters, written from various points of view, have appeared in our contemporary since this matter was last noticed in the editorial portion of the *JOURNAL*. Some of the writers are incredulous; others fantastic in their theories; while a few seem to be upon the right track. One of the sceptical letter-writers suggested that a professed rhabdomantist should be blindfolded, and, rather prematurely, expressed the belief that he would then be unable to use the rod. This theory, however, is disposed of by another correspondent, who alleges that he not only covered the eyes of one of the experts whose names have been mentioned, but resorted to other expedients for the purpose of testing the powers he claimed to possess, and which, notwithstanding the difficulties purposely created, the rhabdomantist proved himself still able to exercise. The writer of a more recent letter to the *Morning Post* has adverted to what Mr. John Stears, of Hull, has written on the subject (see *ante*, p. 602) as probably containing the true key to the phenomena in question. Mr. Stears stated that if he stood upon some china dishes all his power was lost; thus giving rise to the inference that the power he possesses has its origin in electricity. This is the very point to which attention was specially directed in our article on the subject which appeared in the issue of the *JOURNAL* for the 9th inst. In referring to Mr. Stears's theory, we pointed out that the same thing had been experienced by Bleton, the remarkable hydroscope to whom Mr. Baring-Gould makes allusion. It is now stated—but we do not know at the moment whether or not the statement is correct—that this form or action of electric force was long ago discovered by Mr. Cromwell Varley, whose omniscience as an electrician is beyond dispute. Undoubtedly it is true that electric currents from the earth are constantly passing through our bodies, though the further development involved in the manifestations of the "divining" or searching rod are at present beyond our ken.

Notes.

GAS-HEATED ROLLS FOR IRON.

A remarkable application of gas for an industrial purpose is described in a recent issue of *Engineering*. It is stated that before rolling-mills can be started in work at the commencement of the week, the rolls must be gradually and carefully heated. If this is not properly done, the unequal local expansion caused by contact with large masses of red-hot metal will cause fracture of the rolls, and thus entail serious loss. Generally this necessary preliminary heating is effected by lighting coke fires under and round the rolls, or by placing large pieces of hot metal near them, or even by passing through them some thin metal. These devices are at best of a makeshift character, however, and are so uncertain in their action that breakage of the rolls is not a rare accident. To ensure uniform and regular heating of rolls, Mr. Franklin Heaton, of Middlesbrough-on-Tees, has devised a simple but effective gas arrangement. It consists of gas-pipes fixed by temporary connections in a position parallel to the rolls, one on each side. These pipes bear a number of gas-jets, which, when lighted, gently yet thoroughly warm the rolls, which are meanwhile slowly revolved. The two upper pipes are connected with the riders, and rise and fall with the roll. Obvious as the use of gas for this purpose and in this way seems, it appears to be a great novelty. The system effects a considerable saving in rolls, for in one mill the average life of a pair of rolls previous to the application of gas was not quite 80 days; whereas after the adoption of the system it was 342 days. In another large mill, with rolls 36 inches in diameter by 9 feet long, weighing 17 tons each, only two rolls have been broken since the system was adopted, and both cases were due to neglect of the men to turn on the gas. As regards cleanliness and ease of application, the gas process of heating is manifestly greatly superior to the methods it has replaced.

LACQUER FOR IRON AND STEEL.

A new preservative of iron and steel has been found in a modification of the well-known Japanese gum-lacquer. After many experiments, the preparation has been finally adopted for the Imperial Japanese Navy. There is a certain difference between the compound prepared for painting iron and steel and the ordinary lacquer employed for wood; but its principal element is still the gum-lacquer. The inventor of the new composition had great difficulty in conquering the tendency of this material to get very hard and then to crack; but, according to the reports, he has succeeded at last. Experience has shown that a ship protected with this variety of lacquer has been able to keep afloat in tropical seas for three years—going into dry dock only once instead of six times during that time, as usual. A ship of the Russian Pacific Squadron has tried the new coating, and the result has been very satisfactory. It is consequently thought that at last a tolerably perfect anti-corrosive coating for iron and steel structures has been discovered, which may render substantial service in the preservation of all descriptions of erections in these materials. The first cost of the preparation is rather high; but it is claimed that the excess of cost is more than compensated by the protection obtained. For ship use it is also asserted that great advantage accrues from the high polish which this lacquer retains while the coating remains perfect; but, on the other hand, fears are expressed that the supply of gum-lacquer will be unequal to the demand, if the requirements for these engineering purposes are added to the regular consumption of the article for ornamental joinery and cabinet-work.

ACTION OF PRODUCTS OF COMBUSTION UPON STEAM-JETS.

Herr R. von Helmholtz has communicated to *Wiedemann's Annalen* some observations made by himself upon a jet of steam. He remarks that a jet of steam escaping from a hole of 1 or 2 mm. diameter, lighted obliquely and observed upon a black background, is invisible at the lower extremity, and presents towards the top the well-known whitish appearance. This aspect may be modified in many ways. If an electrified point is brought near the steam, the jet immediately becomes azure blue, or, according to the power of the electrical machine, purple, red, yellow, green, &c. These tints are intimately connected with the dimensions of the liquid drops; and hence it follows that the electrical point has the power of provoking condensation of the supersaturated vapour which is found at the lower part of the jet. The same result is obtained by bringing near to the steam-jet a platinum wire made brightly incandescent by an electrical current; or silver, iron, copper, or brass wires simply made red hot in a flame, or even glass heated below the red, or an organic matter, wood, paper, &c., in a state of slow combustion. The products of any flame whatever, with the exception of the flame of pure alcohol, directed upon the jet of steam by the aid of a chimney or by simple blowing, produce a very energetic effect. Finally, traces of certain chemical substances introduced into the steam-jet cause the same modification. Among these are hydrochloric and nitric acid; but concentrated sulphuric acid especially shows the phenomenon. It is known that solid dust particles provoke the condensation of supersaturated vapours; but their presence cannot be invoked here to explain the preceding facts. The author is of opinion that they may be attributed to a molecular concussion, the effect of which may be compared to that of mechanical concussion upon superheated or supersaturated liquids. A flame, for example, is the scene of closely approximated and extremely varied movements; and the chemical atoms which are incessantly passing in it from one

combination to another are found in every kind of unstable condition. These movements and changeful states of equilibrium leave their traces in the products of combustion at a certain distance from the flame properly so called, and determine the observed phenomena. The luminous effect produced at the extremity of an electrified point and the presence of ozone in its vicinity show that this point is the cause of concussions comparable to those provoked by active combustion; and the analogy between the two phenomena is found again in the fact that they both furnish means for making electricity pass through gas. As to solid incandescent bodies, they can act either through the emission of solid particles from their surfaces or by the chemical concussions which they communicate to the surrounding gases.

FLEXIBLE GAS TUBING AND FITTINGS.

The *Revue Industrielle* illustrates and describes a new connection for flexible gas-tubes. It is remarked that the flexible tubes manufactured of continuous spirals of white metal enclosing a thread of india-rubber between the joints are preferable to all others in the market. They are particularly convenient for gas; being without odour, easy to keep clean, durable, and free from liability to break. When used for water, they resist considerable pressure, do not rust in air or water, can be laid along the ground without suffering damage, and withstand severe blows. Up to the present time it has been a drawback to these pipes that there has been no wholly metallic connection for them; but this lack has now been filled by an invention of M. Poujade. This consists of a metallic piece capable of being simply screwed upon the helical spirals of the tube. This fitting terminates at the other end in a hemispherical head, covered with a shield revolving on its axis, and enclosing a bayonet joint. The shield may be turned round sufficiently to admit the end of a gas-cock or other fitting which is to be connected to the flexible tube, and it is then turned back again, pressing the enclosed fitting against an india-rubber ring, which makes a perfectly gas or water tight joint. The appearance of the connector is very neat; and it gives a workmanlike finish to the tube. These metallic flexible tubes are made by the Société Industrielle et Commerciale des Métaux, and the new Poujade connection is sent out with them in all sizes.

THE biography of the late Sir William Siemens, authoritatively prepared, under the direction of his executors, by Dr. William Pole, F.R.S., will be published immediately by Mr. Murray.

THE Directors of the Sheffield Gas Company have presented their *employés* with bonuses of 5 and 10 per cent. respectively on their salaries—the former amount to those who have been in the service less than five years, and the latter to those who have served for more than this period—in recognition of their devoted attention to their duties.

It is reported that Messrs. Armstrong, Mitchell, and Co., of Newcastle, are about to try the economy and efficiency of gas power in their steel works; having given an order for the fixing of a "Stockport" gas-engine in one of their departments. It is understood that, in the event of this engine proving satisfactory, other orders will follow.

THE Society of German Engineers offer a prize of 5000 marks (£250) for the best essay containing a critical estimate of experimental investigations concerning the passage of heat through heated surfaces, in its relation to material, form, and position of the latter, as well as to the kind, temperature, and motion of the heated substances. The essays are to be in the hands of the General Secretary of the Society by Dec. 31, 1890.

Two more deaths are reported from contact with electric lighting wires—this time at the Valladolid electrical station. A carpenter who was doing some work in the place, although he had been told not to touch any apparatus, foolishly took hold with both hands of some high tension wires; and the electrical attendant, seeing that the man could not free himself, went to his rescue, and tried to pull him off. Both men received a shock, and were instantly killed.

THE municipal authorities of Hanover stipulate for certain conditions to be complied with as to the weight and size of lead pipes to be employed on the water-service before any connection is allowed with the town mains. Among other conditions it is provided that a pipe 1 metre in length and 12 millimetres in internal diameter must weigh 4.84 lbs. Similarly a pipe 20 mm. diameter must weigh 6.91 lbs.; 25 mm., 11 lbs.; 30 mm., 15.40 lbs.; and 38 mm., 22.44 lbs.

AMONG the new works announced by Messrs. Crosby Lockwood and Co., we notice the following: "The Mechanical Engineer's Office Book," by Nelson Foley; "The Number and Weight Calculator," showing in single tables the value at 421 different rates (from $\frac{1}{16}$ th of 1d. to 20s.) of any number of articles from 1 to 20,000, or any number of tons, cwt., qrs., and lbs., from 1 to 1000 tons, by Wm. Chadwick; "Plumbing," by W. P. Buchan; and "Modern Workshop Practice," by J. G. Winton.

THE greatest recorded wind pressures during the past quarter on the Forth Bridge were:—7 lbs. on the large gauge at Garvie Castle, on June 11 and July 11; 15 lbs. on the small gauge at Garvie Castle, on July 11; 16 lbs. on the small revolving gauge at Garvie Castle, on July 11; 8 lbs. on the small gauge at North Queensferry platform, on June 11 and July 11; 10 lbs. on the small gauge at South Queensferry platform, on June 11; and 22 lbs. on the small gauge at Garvie platform, on June 11.

Communicated Articles.

THE PARLIAMENTARY REGULATIONS AS TO GAS COMPANIES.

By WILLIAM LIVESEY.

It may be useful to those gas companies who contemplate applying to Parliament in the ensuing session to know that, by an alteration made last session in the Standing Orders, the notices which have to be advertised in the local papers during November are now only required to be inserted twice instead of three times as heretofore, but that there must be an interval of seven days between the two insertions; and the last must not appear later than the 27th of the month. It may also be useful to point out that the recent obligation imposed upon gas companies to raise all new capital by auction, together with the power to regulate dividends by the price (known as the sliding scale), have so disarranged all the old regulations of the Gas-Works Clauses Acts that, unless those Acts are altered, or some provisions made in the Special Acts to counteract the effect of these new regulations, they are likely to prejudice the companies in a manner not expected, and I take upon myself to say not intended.

Under existing regulations, gas companies are required to distribute new capital rateably among the present shareholders; and are allowed to create a reserve fund equal to one-tenth part of the paid-up capital, and to borrow on mortgage or debentures a sum equal to the one-fourth part thereof. If, therefore, a company under these regulations required to raise a further sum of (say) £10,000, they would issue shares to that amount; and then when the shares were paid up, they would be empowered to borrow a sum of £2500 (one-fourth), and to create a reserve fund of £1000 (one-tenth). But if the shares had to be sold by auction, the company would only issue £5000 instead of £10,000, as the premiums would be sure to make up the other £5000; and thus, although the whole of the £10,000 would be invested in the undertaking, the *paid-up capital* would only be £5000, and consequently the borrowing powers would only be £1250, and the reserve fund only £500. It may fairly be assumed that the authorities, in directing that all new shares should be sold by auction, had no intention of reducing the borrowing powers and the reserve fund in this way, and that if provisions are inserted in the Special Acts to obviate this effect, they will be allowed. A general provision in the Special Act to the effect that, in all cases where the powers to borrow or to create a reserve, insurance, or any other fund are limited by the *paid-up capital*, the premiums shall be reckoned as part of that capital, would meet the case.

The reserve fund of 10 per cent. under the Gas-Works Clauses Act, 1847, is chargeable to revenue, and is applicable to the following purposes:—

To answer any deficiency which may at any time happen in the amount of the divisible profits; and

To meet any extraordinary claim or demand which may at any time arise against the company.

Under the sliding scale, this fund is abolished, and instead thereof two other funds are authorized—viz., an insurance fund and a reserve fund, with separate powers to each. The insurance fund is still chargeable to revenue, but is limited to 5 per cent. upon the *paid-up capital*, and is applicable "to meet any extraordinary claim or demand" alone; its object being that if any unforeseen calamity were to happen on the works, requiring great expense to repair, the company should have an insurance fund to meet it, and not have to charge it on the consumer by increasing the price of gas. The reserve fund, being thus relieved of this casualty, is made applicable to supplementing dividends alone; hence it stands on an entirely different footing from that of the insurance fund, and consequently, instead of being made up and maintained by the revenue, as heretofore, it has to be made up and maintained by the shareholders themselves out of moneys they might otherwise appropriate to themselves as dividends, which, under the sliding scale, are practically unlimited. It is, however, optional on the part of the shareholders to have a reserve fund or not as they think fit. They can, if they prefer to do so, pay the dividends in full to which they are entitled as they occur, and leave the future dividends to take care of themselves.

The general provisions by which these two funds—that is, the insurance and the reserve fund—are authorized are to the following effect:—

Insurance Fund.—If the clear profits of the undertaking in any year amount to a larger sum than is sufficient to pay the standard rate of dividend, the excess beyond the sum necessary for that purpose may be invested to form an insurance fund, until the sum amounts to the one-twentieth of the paid-up capital of the company.

Reserve Fund.—Where in any year the dividends on the ordinary share capital or stock of the company shall exceed the standard rate (that is, the old maximum rates), . . . then out of the amount of the divisible profits in excess of such standard rate the company may create a reserve fund, and invest the same in Government or other securities, &c., &c.

There is no apparent necessity for the power to create these funds being clogged with these conditions as to the rates of dividend; and inasmuch as there is no power to create the funds in this form, except under these general provisions, the conditions are

obstructive rather than otherwise, and ought to be expunged, and the power to create the funds made absolute, irrespective of the rates of dividend, whether they are above or below the standard rates. If the profits were only 1 or 2 per cent., and a company considered it better to apply them to an insurance or reserve fund than to divide them, they ought to have the power to do so; but under these general provisions the right to create the funds might be called in question at any time.

The insurance fund being chargeable to revenue, the consumers have an interest in it. It is therefore only right that it should be invested in some readily convertible security. But the reserve fund, being made up by the shareholders themselves, at their own cost and out of their own moneys, the investment of it, or otherwise, ought to be left to their own discretion. If it answered their purpose better to keep it floating as working capital (with or without interest) than to call up new capital for the purpose, they ought to be allowed to do so. If it were all lost, the public would not suffer by it.

The general clause which authorizes the creation of a reserve fund under the sliding scale, provides that any reserve or other fund existing at the time shall be applied to, and form part of the reserve under the sliding scale. This at first seems to be in favour of the companies; but it may fairly be questioned whether it is so or not. Taking into account the object of each fund, it surely would be better for all parties that the insurance fund should be made up first out of any existing fund, and the balance only be applied to the reserve. In truth, it would benefit all parties if it were made compulsory that the insurance fund should be filled up before any extra dividends were paid. If the insurance fund were made up first, the revenue account would at once be relieved of all charges respecting it, and the profits be increased proportionately; and this would be far more remunerative to the company than investing the amount as a reserve at a low rate of interest, considering the very limited application of the reserve fund under the sliding scale. The having a large sum of money invested at a low rate of interest for this purpose does not commend itself as either a wise or an economical proceeding. The difference between a reserve fund under the Act of 1847 and under the sliding scale is not sufficiently taken into account.

There is also another point in which the sliding scale operates inequitably on both shareholders and gas consumers; and that is the dividend. The provisions of the sliding scale are, that for every penny of increase or decrease in the price there shall be, inversely, a decrease or increase of dividend at the rate of 5s. (or one-quarter) per cent., whether the maximum rate is 10 or 7 per cent. If, therefore, the maximum rate were 10 per cent., this increase would be at the rate of 6d. in the pound upon the amount receivable; but if it were at 7 per cent. only, the increase would be at the rate of 8½d. in the pound. Or if the price were reduced 4d., and the increase of dividend made 1 per cent., the difference between the two would be 2s. in one case and 2s. 10½d. in the other; and so in proportion for any larger amount. Or, to put the matter in another form, any well-established gas company can sell shares by auction so as to get all the money required for extensions at 5 per cent. If, therefore, a company required (say) £10,000, and their maximum dividend was 10 per cent., they would sell shares or stock amounting to £5000, and get another £5000 from premiums. But if their maximum dividend was only 7 per cent., the premiums would be less; and consequently the shares or stock would be more. So that, to get the same amount of money at the same rate of interest, the proportions would be £7000 shares or stock and £3000 premiums.

If, then, the company were able to pay an extra dividend of 1 per cent., the result would be as follows:—

£5000 at 11 per cent.	£550
7000 at 8 "	560

At first the new capital bears only a small proportion to the old; but as, when the new capital commences, the old is determined once and for ever, while the new capital increases every year, the latter soon becomes the larger proportion, and the extra charge something considerable. It is, therefore, obvious—paradoxical as it may seem—that it is more economical, both to the companies and the consumers, to issue new capital at 10 than at 7 per cent.

At the time when the sliding scale was under consideration, this difference was objected to by the Gas Companies' Association; but the authorities said: "Our object in making it is that all classes of shareholders shall have the same interest in, and benefit from a reduction in the price." And so it passed; but as it is now obvious that it does not have this effect, but that, on the contrary, it gives a far greater benefit to one class of shareholders than to the other (and to the new shareholders instead of the old), it ought to be discontinued. Either the increases and decreases on the two classes ought to be made specially proportional, or the 7 per cent. capital ought to be reduced to its equivalent in the 10 per cent., so as to make but one class.

Of late years it has been the practice to insert in Gas Acts a provision that, in the event of the profits not being sufficient to pay the maximum dividends on each class of capital, there shall be a proportionate reduction on each class. This, as a matter of course, is only intended to apply to companies under the ordinary maximum dividends; but nevertheless it has frequently been inserted in the Acts of companies under the sliding scale, which expressly provides that the increase or decrease of dividend shall be the same on each class of capital all round, irrespective of any difference in the maximum rates.

WATER BY MEASURE.

By METER.

(Concluded from p. 633.)

What, I ask, is the difference between the present charges for water and a charge by meter? Take a number of houses occupied by the working classes—say, 40 houses, the rateable value of which is £32 per annum. On an average, these houses are using 30 gallons per head per day, without stint or restrictions. This is equivalent to 1s. 6d. per 1000 gallons. This class of consumer will prefer to have water *ad libitum*, rather than be hampered with meters and other responsibilities. They are benefited by having an unlimited supply; and fever and disease are kept from our midst. If I take the same number of houses occupied by the rich, they would gain some advantage by having a meter supply; thus making a law which would benefit the rich, and, on the other hand, lessen the comforts enjoyed by the poor.

It is stated by meter advocates that the revenue has been increased by the adoption of the meter system in certain towns in America; but on inquiry, I find the consumption has been 150 and 170 gallons per head per day, and meters were introduced because it was impossible to sustain the pressure. They made no attempt, however, to stop the waste by systematic night inspection or any of the many methods in vogue in this country. The greatest evil they had to contend with was the unprotected pipes in the houses; and the tenants made it a rule to leave the taps running to prevent freezing. In the towns where the water supply was under the control of the local authority, it would have been a cheaper plan to have fined those leaving the taps running than to have resorted to the expensive and questionable plan of partial measurement. Of course, the adoption of meters would reduce this waste, and besides cause a saving in coal, &c., at the works. We are not told, however, what was the cost of the meters, or the rate charged per 1000 gallons; nor if every tapping was metered, or (as is the practice in many of these metered towns) whether only the water supplied to the large consumers and those found wasting water was measured. In most of the American towns where meters are used, a number of restrictions are taken into consideration—viz., (1) Only large water consumers have a meter—such as extensive flats and tenement houses, restaurants, railways, slaughter-houses, and other business premises. (2) If a man owns a house and pays a tax to a certain amount, he is provided with a meter free; but the man renting apartments upstairs pays for his meter. (3) Meters are used only where the returns are a certain amount per quarter. (4) Meters are not used for small consumers. (5) The authorities make a discrimination in allowing the use of meters, and obtain payment in advance; the minimum rate being £2 per annum to small consumers. (6) Meters are fixed, although a charge by assessment is made; and if the consumer is found to use more water than the amount of the assessment, then they are compelled to pay by measure. (7) Meters if set in dwellings must be furnished, and set at the expense of the city (New York); in all other cases the expense falls on the owner of the premises, and is a lien on the property.

How would a "Water by Measure" Bill of this character work? In numerous instances, the following would be the result:—Take a fashionable seaside resort, where most of the houses are kept by widows and maiden ladies. These people must stint the use of water, and work the meter as they are accustomed to do in the supply of gas. No one will admit that too much scrubbing and cleaning is done at present, although volumes of water are allowed to run to waste in sinks and closets, thus keeping the house comparatively sweet. These people in the first place would stop the few buckets of water required for the scrubbing of passages, steps, and pavements. Then the floors, cleaned all too seldom at present, would be still more neglected; and the rinsing of plates and dishes under an open tap must be stayed, and water used that is already causing an unpleasant odour to rise throughout the house. Again, the present unlimited supply of water to water-closets day and night, when the house is full of visitors, must be checked; and it does not require much foresight to predict what the state of these houses would be if stinted of a copious supply of water. In fashionable boarding houses plenty of water is used during the season. During two-thirds of the year, however, the house is doing little, and it is then when fevers will become prevalent through lack of sufficient cleansing, scouring, and flushing. But the water company must still be diligent in reading, cleaning, repairing, and protecting the machines from frost and injury; and there is no adequate payment for the same amount of trouble and expense incurred when little water is consumed. There is not only the sanitary side of the question to be considered, but the disasters to hot-water apparatus, kitchen boilers, baths, &c., would be very great. One can foresee the frequent visits of the medical man; a very high death-rate; and no advantage accruing to the class of people mentioned. Supposing that a house is closed for some weeks, and the tenants or lodgers return to an empty house, if they pay for the water by meter, all the stale water in the cistern would be used, instead of being drawn off; the dead water in the pipes would also be used, resulting possibly in diphtheria among the younger members of the family. We know of very many cases of this sort occurring every day. How much worse would be the result if all water was metered and paid for? It would be preferable, much easier, and more economical, to cleanse the house, cisterns, and pipes, flush the sinks, traps, and drains, without let or hindrance, than to send for the man to read the meter, and neglect all sanitary precautions necessary on moving into a new house. Running water is necessary in the pipes to preserve the supply pure; but by meter it would be

measured off drop by drop, and never can be as pure as if used through the pipes *ad libitum*.

It is stated that the waste of water is too great to be of service in a public sanitary point of view; the sewage having to be pumped up again. But these assertions are never given with figures that we may judge of their truth. Having had some experience in a town of 25,000 inhabitants, and ascertained that the quantity of water used is 30 gallons per head per day, I find that the authorities have used seven million gallons in flushing the sewers. Now if, as is stated by the meter advocates, the rate per head is to be curtailed to 15 gallons, then it is evident that, unless a far greater amount is used to keep the sewers perfectly flushed, fever must ensue, leaving out of the question the abominable state of a certain class of houses, and considering the amount of water said to be wasted and used, the valuable information so freely disseminated among the people, and the number of sanitary inspectors employed. If 15 gallons of water per head are supplied, or, as may be the case in a number of towns, 25 gallons are used, does it follow that the 10 gallons are absolutely wasted? Looking at it from a public sanitary standpoint, it cannot be useless, but rather a splendid system of flushing or cleansing the sewers, which, if not effected in this manner, must be done by the public authority.

In a paper recently read by Mr. R. F. Grantham, M. Inst. C.E., before the members of the Surveyors' Institution, on "The Water Supply of Villages," it is stated that less than 3 gallons per head per day is an ample supply for cottages,* while most water-works engineers have placed it at 20 gallons and even 30 gallons per head. Regarding the matter from a health point of view, which will be most assuring to the general public? Perhaps these workmen's cottages are contiguous to the semi-detached villas with their garden supplies, &c., consuming 40 gallons per head; but anything is considered by some people good enough for the poor, until disease and death make sad havoc among them. Then it is that plenty of water and great precautions are to be enforced. Whatever quantity of water may be considered as the fair average to be granted per head per day, in most towns, allowing for contingencies and protection from fire, &c., I contend that 30 gallons, and not less, is what we may very well appropriate, and what should be given in a really well-ordered, flourishing, and busy town, having every sanitary improvement, and where the authorities are specially desirous to maintain an exceedingly low death-rate. Ridiculous low rates per head may be quoted, but most of the readers of the JOURNAL must know that to be restricted to 5 gallons per head per day points to an insanitary state of affairs.

In all the arguments advanced for the use of meters, we find no schedule of expenses for inspecting, reading, and general superintendence of these machines. It appears to be taken for granted that the collection of the rates would go on as smoothly as at present, and be collected at the same cost; but experience has shown that the expense is certainly one-fifth in excess of the existing mode of collection, and is productive of endless lawsuits. A water-meter working under pressure is a different thing to a gas-meter. The question resolves itself into whether the works are owned by a company who must pay a dividend on the capital, or by a corporation incompetent to make a profit, and who borrow from other rates to compensate for blunders. The most economical, efficient, and satisfactory plan is that now in use, and which the corporations who have acquired water companies' properties have not sufficient courage to change, although advocated by experts before the transfer.

ON Saturday, the 13th inst., the members of the Liverpool Engineering Society inspected the Vyrnwy Water-Works of the Liverpool Corporation. The party were conducted by Mr. G. F. Deacon, M. Inst. C.E., under whose supervision the works have been carried out; and therefore the chief features of interest in connection with this vast undertaking were fully explained. The centre of attraction was, of course, the great masonry dam, which not long ago gave rise to so much controversy. The party also visited the Hirnant Tunnel, which is 7 feet in diameter and about 2½ miles long, and at its outlet is joined to the aqueduct. This tunnel extends to a building called the straining tower, which, from an engineering point of view, is one of the most interesting portions of the work. The principles of construction and the nature of the machinery to be used were fully explained. The aqueduct conveying the water from the tower to the existing Prescott reservoir is about 68 miles long, and will, when complete, consist mainly of tunnels and three lines of pipes, only one of which, however, is at present being laid down. At the close of the visit, the President of the Society (Mr. C. H. Darbishire) expressed to Mr. Deacon the thanks of the members for his courtesy in affording them an opportunity, on three different occasions, of inspecting the important works they had just visited. He said they all anticipated that success in them was already assured, and felt satisfied that they would for all time prove a lasting monument of the professional ability by means of which they had been created, and of the enterprise, courage, and sacrifices of the great commercial city of Liverpool in providing the necessary ways and means. Mr. Deacon, in the course of his reply, said one of the most pleasing things in connection with the construction of the dam was the fact that the resisting power of the masonry was greater than was in the estimate, and its stability was beyond question.

* See JOURNAL, Vol. LI., p. 286.

Technical Record.

MIDLAND ASSOCIATION OF GAS MANAGERS.

The Thirty-third General Meeting of this Association was held last Thursday, at the Grand Hotel, Birmingham. The President (Mr. Henry Hack, M. Inst. C.E., Engineer of the Saltley Gas-Works of the Birmingham Corporation) presided; and there was a good attendance of members. After the minutes of the previous meeting had been read by the Honorary Secretary (Mr. W. R. Cooper, of Banbury), and confirmed, a discussion arose on the report of the Committee with regard to the scheme for the endowment of technical lectures, which was agreed upon at the last meeting.* It was then decided that the Midland Association should work in conjunction with The Gas Institute for the furtherance of the scheme of technical education sanctioned by the larger organization. In consequence, however, of recent events, the immediate result of which has been to put a stop to further progress in this direction, the Committee of the Midland Association recommended that the Association should support a local scheme of lectures, to be delivered by one of the Professors of Mason's College, Birmingham. But this proposition was met by an amendment directing the postponement of action until it should be seen what The Gas Institute propose to do in the matter; and, after some discussion, it was resolved to defer taking any steps for another year. The adjourned discussion on Mr. J. T. Lewis's paper on "The Competition of Petroleum with Gas for Lighting Purposes," presented at the Bath meeting (see JOURNAL for May 22 last, p. 913) was then opened, and some interesting statements were made by various speakers on the subject, which will be fully reported in a subsequent issue. The discussion concluded with a cordial vote of thanks to the author for the painstaking way in which he had prepared his facts. Mr. C. Taylor, of Derby, then read a paper entitled "An Oft-repeated Question: Are High-Carbonizing Temperatures Convenient and Profitable?" The communication, which is given in another column, was well received; but, owing to shortness of time, the discussion was postponed till the next meeting. The formal business of electing officers for the ensuing year was next proceeded with. Mr. C. Taylor was unanimously elected President in succession to Mr. Hack, and returned thanks for the honour conferred upon him. The resignation by Mr. W. R. Cooper of the office of Honorary Secretary necessitated the appointment of a successor; and Mr. J. S. Reeves, of Bilston, was selected. Messrs. W. R. Cooper, W. Littlewood, and J. F. Bell were elected in place of the retiring members of the Committee. This concluded the general business of the meeting; and the members afterwards dined together.

THE COMMERCIAL VALUE OF SPENT PURIFYING MATERIAL.

In the notice of the papers read at the Boulogne congress of the Société Technique du Gaz en France which appeared in the JOURNAL for July 24 last (p. 162), brief reference was made to a communication by M. Chevalet, dealing with the question of the commercial value of spent purifying material, and indicating how this could be improved. The text of the paper has since been published in a French contemporary, from which the following full translation has been prepared:—

For some time there has been a demand for the spent materials employed in gas purification; and it has seemed to me to be of interest to inquire why certain of these materials have been accepted and others refused by buyers. According to the information I have been able to procure, these products are specially sought for on account of their richness in nitrogen; and before making a purchase, it is usual to ascertain the total quantity of this property, in whatever form, the stuff contains. The composition of spent purifying material is very variable, and very complex, as will be seen from the following analysis by Vivien de St. Quentin:—

	Per Cent.
Moisture	21.50
Mineral substances	33.00
Nitrogen—	
Volatile or ammoniacal	2.12
Soluble of the sulpho-cyanides	2.64
Insoluble or cyanic	1.12
Organic and volatile matters	39.62
	100.00

This analysis does not make any mention of the sulphur which always exists in these products, and in greater quantity in proportion to their age. M. Mallet states that he has obtained products which were found to contain from 40 to 50 per cent. of sulphur.

Spent purifying material is sometimes in demand for the extraction of the ammonia or of the sulpho-cyanides therefrom, or for burning out the contained sulphur. According to the requirements of the buyers, the stuff must possess different qualities. It is generally bought according to the total proportion of nitrogen in it; and it has been ascertained that good products yield from 8 to 9 per cent. Some, however, have been found to contain more; and these naturally fetch higher prices. Very often they contain only 3 per cent. of nitrogen; and in some cases only 0.80 per cent. has been found. Nitrogen fetches, in these materials, from 60 c. to 1 fr. per unit, according to its richness and to the position of the gas-works. It is therefore advisable to fix in the stuff the greatest practicable

quantity of nitrogen; for by so doing it will be possible to recover and even to make a profit on the purchasing price of the original material. In support of this statement, I will cite the Brussels Municipal Gas-Works, from which during last year there were sold 14,741 frs. worth of products, with an outlay of only 2932 frs. in the purchase of the original material. As in these works about 70,000 tons of coal per annum are converted into gas, the gross produce was 21c. per ton.

What must we do, then, to obtain spent purifying material rich in nitrogen? The question as thus put is a little complicated, for it depends largely upon the material originally employed. I am not in possession of any definite data on this point; but I can nevertheless give a few indications—

1. Before the gas reaches the purifying material, it should have been completely freed from tar, if it is desired that this material should last long, and be capable of absorbing a large quantity of nitrogen and sulphur.
2. Heavy and useless material, such as coke dust, tan waste, lime in excessive quantities, and oxides of iron having but feeble purifying power, should not be put into it to separate it.
3. The material should not be washed before being sold; for if this is done the ammoniacal nitrogen and the sulpho-cyanides are dissolved, and nothing is delivered to the purchaser but a damp mass, of value only for its cyanates and sulphur.
4. The stuff should be dried before being despatched. To this end it should be allowed to acquire heat in small heaps, in order that it may not take fire; and it must not be watered, as when intended for use again.

Of all the materials employed in gas purification, those which seem to absorb nitrogen most readily are those which are prepared with sulphate of iron and lime, or Laming's material, because they are capable of containing at the same time both ammonia in the state of sulphate, and cyanates, and sulpho-cyanides; while Lux's material, or those prepared with iron turnings, or natural oxides cannot assimilate ammonia at all, or only very slightly. The best base for the purifying material is unquestionably coarse deal sawdust. Buyers do not like tan waste, because it gives them a good deal of refuse in the sifting, and especially because it has a bad appearance; the purifying material being always black or green on account of the tannates of iron, which, with the salts of iron, always form tannates that are black or greenish. The worst material for selling again is decidedly that which is made with natural oxides. The products are heavy; and they do not absorb much nitrogen, nor last long.

In view of the greater desire now displayed in the industries to turn to account waste or unutilized material, it is of importance for gas manufacturers to look out for a purifying material that is capable of absorbing a large quantity of nitrogen in the form of cyanates and sulpho-cyanides, and even of sulphur. The result will be that such material, being rich, will bear the cost of transport, and of being dealt with in works for this purpose. The gas engineer who devotes his attention to this special detail of manufacture will find at the end of his financial year that purification, instead of being an expense, will be a source of profit, which will go to swell that which he obtains from the ammoniacal liquor produced when he thoroughly washes his gas.

THE STANDARD METRE.—The Committee charged with the supervision of the International Office of Weights and Measures, established at St. Cloud, have commenced their annual session, under the presidency of General Hanez, the Director of the Spanish Geographical and Statistical Institute. One of the problems which more especially concern the Committee is the verification of the metre. The present standard metre at St. Cloud is made of platinum and iridium. This is now to be verified; and it is proposed that the definite selection of a standard metre shall take place next year, when representatives of the twenty-two nations which have adopted the metric system will assemble in Paris. It is proposed to keep, in addition to the standard metres, two copies of it at St. Cloud, and to supply one copy to each nation, accompanied by a description of its manufacture, and a statement of possible error in length as compared with the original standard metre.

MR. ELLIS LEVER AND THE SALFORD GAS UNDERTAKING.—Mr. Ellis Lever having declined to meet the Sub-Committee nominated by the Salford Town Council, at their meeting on the 3rd inst. (see *ante*, p. 645), for the purpose of hearing from him certain revelations in regard to the conduct of the gas undertaking, has written to the Manchester papers in justification of his decision. He states that when he offered to give information to a Special Sub-Committee of the Council, he considered very carefully the conditions on which the offer should be made; and he had excellent reasons for putting the matter in the form he did. The non-acceptance of his condition as to the nomination of some members of the Sub-Committee by himself, he regards as an obstacle placed in his way by the Council for a specific purpose. He says he is still prepared to carry out the undertaking given in his published letter of Sept. 26; but his condition as to the nomination of the Committee must be observed. He deprecates the construction of his refusal as an indication that all the members of the Sub-Committee are obnoxious to him; but the fact of their all being either ordinary or *ex officio* members of the Gas Committee renders absurd, in his opinion, their appointment for the purpose he has in view.

* See JOURNAL, Vol. LI., p. 423.

SOUTH-WESTERN (U.S.A.) GAS ASSOCIATION.

The First Annual Meeting of this newly-formed Association was held at Galveston, Texas, on Aug. 20 last. The President (Mr. F. Beck, Superintendent of the Galveston Gas Company) delivered an Inaugural Address. In the course thereof he said that the first gas plant in the south-west section of the United States was erected at Galveston in 1859; and since then a gradual advance had taken place, so that at the present time there were in Texas alone 20 or more gas-works in successful operation, the largest having a maximum daily consumption of nearly 150,000 cubic feet. Attempts to introduce both oil and water gas had been made, but with no great degree of success. In 1879 the Brush Company commenced the supply of electric arc lights at Galveston, and later on added incandescent lights. Whilst confident that gas companies could compete favourably with, and earn better profits than, electric light companies, he held the opinion that it was best that the supply of electricity should be in the hands of the gas companies. Both gas and electricity, he said, were demanded by the public; and in their small towns a division of business between two lighting companies would render it difficult for either to secure fair returns on the capital invested. Having the advance of water gas, oil gas, and electricity to consider, the necessity for such an Association as they were commencing that day was evident. They worked with nearly the same kind of coal, and other circumstances were similar; so it would be greatly to the advantage of all concerned to discuss and compare together the various manufacturing results obtained. They would thus be able to get uniform statistics, and to reach the bottom figure in cost of manufacture and distribution. He expressed himself in favour of offering concessions for day consumption, and touched upon other practical questions. In concluding, he urged that commercial success could only be obtained by their controlling the supply of heat, light, and power; which meant that they must be prepared to supply at low rates what the public desired. It should therefore be the object of the Association to examine all processes without bias. A paper on "Gas Coals in the Texas Market" was read by Mr. Enfield; and this was followed by one on the "Computation of the Cost of Gas to Consumers and in Holder," written by Mr. Brockenborough, and read by the Secretary (Mr. T. D. Miller). Both papers were fully discussed. It was decided that the next meeting should be held at Austin, Texas, on the third Tuesday in March next.

AN OFT-REPEATED QUESTION: ARE HIGH CARBONIZING TEMPERATURES CONVENIENT AND PROFITABLE?

By CHARLES TAYLOR, of Derby.

[A Paper read before the Midland Association of Gas Managers last Thursday.]

Mr. President,—My time and attention have been so largely occupied lately with other necessary work, that I could gladly have avoided adopting your suggestion to provide a paper for the attention of members at this meeting. I, however, felt it my duty to obey your call if possible; and in casting about for a subject, I adopted, as most ready to hand, a question which, in one form or another, has been very frequently repeated—viz., that at the head of my paper. There are, I believe, many gas managers who still incline to the opinion that the disadvantages arising from the employment of high heats outweigh the advantages; and this fact provides me with an excuse for again presenting the question.

The disadvantages to which the advocates of low heats refer are enumerated somewhat as follows:—

1. Stoppages in ascension-pipes and hydraulic mains, &c., due to deposits of pitch.
2. Stoppages in manufacturing plant and in distributing mains and services, due to deposits of naphthalene.
3. Reduced quantity and quality of tar.
4. Reduced quantity of ammonia.
5. Reduced illuminating power.
6. Increased quantity of sulphur compounds.
7. Increased consumption of fuel.
8. Increased wear and tear of retort-settings, &c.

We probably agree that, subject to qualifications, these charges, or some of them, are correctly made out; and I propose to estimate, as closely as I can, the degree in which they prejudicially affect the cost of production, when the make of gas is raised, for example, from 9000 to 10,000 cubic feet per 20 cwt. of coal carbonized.

I may premise that the tendency to stoppages by pitch and naphthalene has been met, minimized, and modified in various ways—as by the rotative use of different qualities of coal, by reducing the seal of dip-pipes, by the separation of tar from the gas immediately upon their arrival at the hydraulic main, by water-jacketing, steaming, and the occasional lowering of temperature, &c. But these expedients are not always successful; and when they are found to be so, some cost and labour are involved in their application.

I estimate the disadvantages as follows:—

1. The element of stopped pipes, due to pitch, varies with the special circumstances of each works; but, so far as my experience and inquiries have extended, I am unable to put down the loss under this head at more than $\frac{1}{4}$ d. per 20 cwt. of coal, when carbonized at a temperature to yield 10,000 cubic feet.

2. A similar sum—viz., $\frac{1}{4}$ d. per 20 cwt. of coal—cannot, I think, be exceeded for cleaning out stoppages due to naphthalene, both inside and outside the manufactory.

3. I have found experimentally that an increase of 1000 cubic feet between about 9000 and 10,000 feet has decreased the production of tar by one-third to two-thirds of a gallon, while its specific gravity has increased .02 to .025. The money loss due to diminished quantity and increased specific gravity will vary as the demand for certain products or distillates preponderates; but, assuming the value of the tar at 1d. or 1½d., we may adopt 1d. as the loss per 20 cwt. of coal carbonized.

4. It is, I think, well recognized that low temperatures give low yields of ammonia; and Mr. Lewis T. Wright has shown that the maximum of this product is realized when coals are distilled to produce about 10,000 cubic feet of gas per ton. I calculate the additional ammonia due to an increase of 1000 feet of gas at about 7 per cent.; and its value at 0.75d. to 1.5d. per ton of coal.

5. On reducing a series of records by the same authority, I find that an increase of 1000 cubic feet of gas upon a production of 9484 cubic feet obtained from Derbyshire coals, gives a reduction in illuminating power of not exceeding one-fifth of a candle; and I value this at 2d. per ton of coal.

6. The increase of sulphur in the unpurified gas is found to be about 7.5 grains per 100 cubic feet when the production is increased by 1000 cubic feet. This works out to 28 per cent., which at a mean cost for purifying of 5.15d. per ton of coals (as stated in Field's "Analysis") gives 1.44d. per ton as the cost of purifying from the extra sulphur.

7. To my mind, it does not follow that the increased temperature necessary to give an extra yield of 1000 cubic feet must require a *pro ratâ* increase in the quantity of fuel; but as I do not wish to leave any consideration undervalued, the *pro ratâ* increase in the value may be taken at from 1d. to 2d. per ton.

8. If the extra heat implies also a *pro ratâ* increase in the cost of settings, &c., which I am not prepared to admit, we may put this also at 2d. per ton.

I estimate the cost of manufacturing and delivering 1000 cubic feet of coal gas into the holder, exclusive of interest on buildings, &c., as follows:—

1. When producing 9000 cubic feet of 18.3-candle gas=32,940 candle-units per 20 cwt. of coal—

	s. d.	s. d.
To 20 cwt. of coal delivered into works.	9 0.0	
„ Wages and salaries, carbonizing.	3 6.0	
„ Coke for fuel.	1 7.0	
„ Purifying.	0 6.0	
„ Wear and tear.	2 2.0	
		16 9

By residuals—

Coke.	2 2.6
Tar.	1 2.4
Ammonia.	0 10.7
Sundries.	0 2.3
	4 6

Net cost. 12 3

And 12s. 3d. ÷ 9000 = 1s. 4.33d. per 1000 cubic feet.

2. When producing 10,000 cubic feet of 18.1-candle gas=36,200 candle-units per 20 cwt. of coal—

	s. d.	s. d.
To 20 cwt. of coal delivered into works.	9 0.0	
„ Wages and salaries, carbonizing.	3 6.0	
„ Fuel (see item No. 7).	1 9.0	
„ Purifying (see item No. 6).	0 7.5	
„ Wear and tear (see item No. 8).	2 4.0	
„ Clearing pitch and naphthalene (see items Nos. 1 and 2).	0 1.5	
		17 4

By residuals—

Coke.	2 2.6
Tar.	1 1.4
Ammonia.	0 11.7
Sundries.	0 2.3
	4 6

Net cost. 12 10

And 12s. 10d. ÷ 10,000 = 1s. 3.4d. per 1000 cubic feet.

Hence, 32,940 : 36,200 :: 12.25s. : 13.46s.; and 13s. 5½d.—12s. 10d. = 7½d. profit per 20 cwt. of coal carbonized. This 7½d. upon a consumption of (say) 50,000 tons of coal per annum produces a sum of £1562.

DISCOVERY OF AN OIL SPRING IN CHESHIRE.—At Anderton, near Northwich, in the salt district, the Rural Sanitary Inspector has, it is stated, found a well of petroleum oil of great richness.

A TEST FOR SACCHARINE.—In a recent number of the *Chemical News*, Mr. D. Lindo described the following test for saccharine:—After placing the saccharine with concentrated nitric acid in a small porcelain dish, evaporate to dryness on the water-bath, or by moving the flame of a spirit-lamp to and fro under the dish; blowing on the surface occasionally to facilitate evaporation, and taking care that the heat does not rise too high. If the dish is not allowed to cool, and a few drops of strong solution of potash in 50 per cent. alcohol are added to the residue, a faint yellow colour only will be developed. Spread the liquor over the surface of the dish; and before it has settled to the bottom apply heat with the lamp, as above, quickly all over the under surface of the dish. If the vapour of alcohol happens to ignite, it must be at once extinguished. A great variety of colours will be developed in this way. As the dish cools and moisture is absorbed, the colours fade. By heating they can be reproduced, though not in the same perfection as at first.

THE RUSTING OF IRON.

In the JOURNAL for Aug. 28 last (p. 374), we noticed briefly a paper read by Professor A. Crum-Brown, at the meeting of the Iron and Steel Institute held in Edinburgh in the previous week, in which he described the chemical processes involved in the rusting of iron. The following is the full text of the paper:—

My attention was first called to the subject of the rusting of iron by observing what happens when a drop of rain falls on a clean bright surface of this metal. At first, for a short time, the drop remains clear, and the bright surface of the iron is seen through it; but soon a greenish precipitate forms in the drop, and this rapidly becomes reddish brown. The brown precipitate does not adhere to the iron, but is suspended in the water, and becomes a loosely adherent coating only when the water has evaporated. I may premise that, in speaking of rusting, I mean the formation of rust on the surface of metallic iron exposed to ordinary atmospheric conditions. I do not intend to treat of the corrosion of iron by substances such as sulphuric or sulphurous acid, hydrochloric acid, or any occasional impurities which may be present in the air. It has been conclusively shown that the necessary conditions for the production of rust are: (1) metallic iron, (2) liquid water, (3) oxygen, and (4) carbonic acid—both the latter being dissolved in the liquid water. Iron remains quite free from rust in an atmosphere containing oxygen, carbonic acid, and water vapour, so long as the water vapour does not condense as liquid water on the surface of the iron.

Let us now consider the action on iron of the three substances, liquid water, oxygen, carbonic acid, singly, and then two and two. Liquid water, quite free from dissolved gases, does not act on iron at ordinary temperatures. At high temperatures (very rapidly at a red heat) iron is oxidized by water or water vapour, and is converted into the magnetic oxide of iron. This magnetic oxide is formed on the surface of the iron as an adherent coating; and only when it is detached can the water gain access to lower layers of the iron. Oxygen gas alone does not act at ordinary temperatures on iron. At high temperatures it also converts the iron into the magnetic oxide, which forms an adherent coating. The same is the case with carbonic acid gas acting alone. At ordinary temperatures it is without action. At high temperatures the carbonic acid is reduced to carbonic oxide, and the iron is oxidized to magnetic oxide, which forms an adherent coating. Liquid water with oxygen dissolved in it does not act at ordinary temperatures on iron. This is shown by the fact that ordinary water, exposed to the air, does not rust iron if the water contains a substance such as lime or caustic alkali, capable of combining with carbonic acid and itself without action on iron. As long as the lime or the caustic alkali is there, no rusting occurs. When the lime or caustic alkali has been converted by the carbonic acid of the air into carbonate, then, and not till then, can the carbonic acid of the air dissolve as such in the water; and then, and not till then, does rusting begin. Water, containing carbonic acid dissolved in it, acts on iron at ordinary temperatures, forming ferrous carbonate, which dissolves in the carbonic acid water; forming, no doubt, ferrous bicarbonate. In this way artificial chalybeate water has been prepared by shaking up finely-divided iron with carbonic acid water. In this action, hydrogen gas is given off. Solutions have been thus prepared containing nearly 0.1 per cent. of iron. If oxygen is presently dissolved in the water, it will unite with the nascent hydrogen; and if we have sufficient water, iron, and carbonic acid, the whole of the dissolved oxygen will be thus consumed. The presence of dissolved oxygen quickens the solution of the iron; the tendency of the oxygen to combine with the nascent hydrogen supplying an additional motive to the action. Probably, in ordinary rusting, no hydrogen actually becomes free, as, under ordinary conditions, there will always be enough dissolved oxygen to convert all the nascent hydrogen into water. When a solution of ferrous bicarbonate is exposed to an atmosphere containing neither free oxygen nor carbonic acid, it loses carbonic acid, and insoluble ferrous carbonate is precipitated. If free oxygen is present in the atmosphere to which it is exposed, the ferrous carbonate is oxidized to ferric hydrate; carbonic acid being given off. This, if the water is not already saturated with carbonic acid, dissolves in the water.

We can now follow the whole process of rusting, and divide it into stages—these stages being really separable, if we take proper precautions, but in the usual case overlapping one another. We have, first, the formation of soluble ferrous bicarbonate; secondly, the conversion of ferrous bicarbonate into ferric hydrate, the white ferrous carbonate passing through green and black intermediate substances into the reddish-brown ferric hydrate—i.e., rust. We have to note that the carbonic acid that is dissolved in the liquid water, which is necessary for the process of rusting, is not used up in the process. It is given off during the oxidation of the ferrous bicarbonate to ferric hydrate, and is thus ready to act on the new surface of the metallic iron. The continuation of the process of rusting is not, therefore, dependent on new carbonic acid absorbed from the air, but the original carbonic acid, if not removed, can carry on the process indefinitely, as long as liquid water is present, and oxygen is supplied from the air. When the process is started, it goes on more rapidly, because the porous rust not only does not protect the iron, but favours, by its hygroscopic character, the condensation of water vapour from the air as liquid water. A piece of iron, therefore, which has begun to rust, will continue rusting in an atmosphere not saturated with water vapour—an atmosphere in which a piece

of clean iron will not rust, because liquid water will condense from such an atmosphere on the hygroscopic rust, but not on the bright iron.

NEW YORK WATER SUPPLY.—It is stated to be possible that the great Quaker Bridge dam for the New York water supply may not be constructed for another 20 years, as Mr. Eugene M. M'Lean, of the Controller's staff, has lately sent in a report to the Aqueduct Board, in which he states that though the dam will ultimately have to be built to impound the whole yield of the Croton watershed, estimated at 400 million gallons per day, he thought it would not be required for 25 or 30 years, and ought to be left to the next generation to construct. The cost of the Quaker Bridge dam and reservoir he estimates at £3,190,000; whilst reservoirs capable of serving the city for 30 years to come could be constructed in the upper watershed for £1,032,000.

THE MADRID GAS COMPANY AND THE SUPPLY OF ELECTRICITY.—Writing on the 15th inst., the Madrid correspondent of *Industries* says: The price of gas in Madrid is 9s. per 1000 feet; but the consumption does not even reach 1000 feet per inhabitant per year. The consequence is that the 500 fr. shares of the Company were quoted a few days ago at 380 frs.; and it was expected that there would soon be a further fall, as the electric light has been compulsorily adopted in the theatres, and is also making progress in clubs, restaurants, &c. Notwithstanding this the shares of the Company have suddenly gone up to 448.50 frs. The only way for accounting for this is that, although it has not yet been made public, the Company's claim to have the sole right to establish mains for all lighting purposes is likely to be admitted by the Municipality. Should this be the case, the Company would supply electric light at a rate equivalent to gas at 9s. per 1000 feet.

AN ELECTRIC GAS LIGHTER AND EXTINGUISHER.—An invention by which the turning on and shutting off of gas flowing to a burner is effected by the heating action of an electrical current, and in which the gas is ignited by an incandescent wire, has been patented by Mr. L. Hogan, of Lebanon, Kentucky, although, according to *Iron*, the novelty of the arrangement is doubtful. In combination with a gas-burner is a casing which has a collar fitting on the supply-pipe; two cylinders filled with mercury being mounted in the casing. The lower ends of the cylinder are of reduced size, and are provided with pistons having downwardly extending rods. One of these piston rods rests on the free end of a U-shaped spring, to which is attached a valve-rod passing to a valve in the supply-pipe; the free end of the spring, when pressed down sufficiently to open the valve, being caught by one arm of a right-angled spring catch lever, on the other arm of which rests the piston-rod of the second cylinder. Three conductors are required to operate the burner. To turn on the gas, the current is sent through the right-hand mercury cylinder, by means of an electrically insulated conductor surrounded by heat-conducting material, whereby the expansion of the mercury will press the piston down, and open the valve in the supply-pipe; the end of the spring which presses on the valve-rod being then caught and held by the catch lever. A looped platinum wire is supported in the circuit near the tip of the burner, and is sufficiently heated by the current to ignite the gas. To extinguish the gas, the current is sent by the left-hand wire through the other mercury cylinder; the expansion of the mercury pressing down its piston, and releasing the catch lever by which the valve in the supply-pipe is held open—the circuit being completed by the middle conducting wire rather than by the circuit of greater resistance through the platinum coil.

A NEW OIL-LIGHT FOR OUTDOOR USE.—A drawback experienced with certain forms of outdoor petroleum lights for use on railway sidings and in goods yards and similar situations is that, the combustion being imperfect, a quantity of the vaporized petroleum escapes into the air. This not only means waste, but in some cases damage to surrounding property by the distribution of the oil spray. In order to overcome this defect a new form of industrial lamp, known as the "Jupiter" light, has been devised. It consists of a double chamber, the upper portion of which contains the oil, while the lower one receives the compressed air which passes upwards through a central tube into the oil chamber. Over the latter is placed a metallic double cover of conical form, through the top of which the illuminating flame passes into the atmosphere. The oil chamber is connected by a pipe with a reservoir of crude petroleum, and the air chamber is similarly placed in connection with a receiver in which air is compressed at a pressure of about 20 lbs. per square inch. In starting the lamp, a small quantity of spirit is poured on the surface of the heavy oil contained in the oil chamber; the spirit is then lighted, the covers placed over the flames, and the compressed air turned on. Passing through the centre of the flame and over the surface of the oil, the air causes a high temperature to be rapidly reached and maintained, and an induced current to be produced. The internal conical cover soon becomes highly heated, and thus conduces to the perfect combustion of the oil, so that no smoke is produced nor does any vaporized oil escape into the atmosphere; the inlets for the supply of oil and compressed air being carefully proportioned to ensure this result. The action of the induced current is to raise the gas of the heated oil and at the same time to draw in the necessary supply of air for perfect combustion. A trial of the light took place last Tuesday night on some waste ground on the Thames Embankment; the appliances shown ranging from 100 to 3000 candle power.

Register of Patents.

GAS-LAMPS.—Thomas, T. C. J., of Hornsey. No. 11,305; Aug. 18, 1887. [8d.]

This invention has reference to regenerative or recuperative lamps, or apparatus constructed with inverted burners, and so arranged that air for supporting combustion has its temperature raised on its way to the flame by contact with surfaces heated by the escaping hot gases and products of combustion. An early type of this lamp was described in the specification of Clark's patent, No. 3015 of 1863, which was modified by the present inventor's patent of 1885, No. 883.

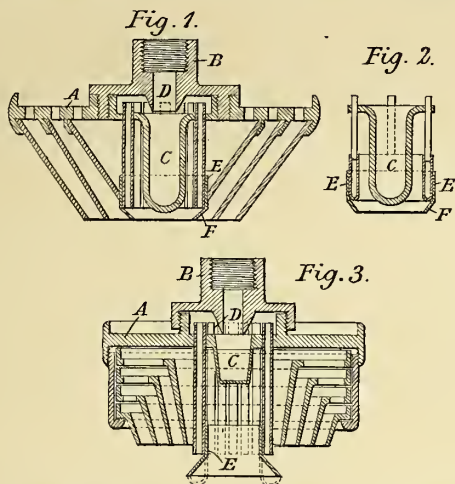


Fig. 1 of the accompanying illustrations is a vertical section, illustrating an air-heating chamber combined with a burner of Argand type made according to this (1887) invention. Fig. 2 illustrates a modified form of Argand burner. Fig. 3 shows in vertical section still another modified construction.

In fig. 1, the air-heating chamber comprises a series of concentric nozzles, pipes, or annular divisions in the form of inverted truncated cones combined with an Argand burner composed of a ring of tubes. A is a perforated plate or partition, with downwardly projecting ribs or flanges. B is a nipple or casting provided with a flange or collar to screw into the plate or partition A. By means of it, the air-heating chamber and attached burner are secured to the gas-supply pipe and to an air-supply chamber in the manner described in a former specification (No. 579 of 1887). There is a box screwed into the flange or collar of B, and formed with a tubular part or pocket C, for the collection of dust and dirt separated from the gas supplied to the burner and scale from the gas-pipe. It also serves to carry the tubes constituting the burner. To facilitate the separation of the dust and solid matters from the gas, and thereby prevent choking of the burner, the under side of B is formed with a downwardly projecting flange or tube D, that causes gas flowing to the burner to first pass downward into the pocket C, and afterwards to rise before entering the tubes. With this form of burner, air is admitted both to the centre and to the exterior of the gas-flames. E is a guard surrounding the lower ends of the pipes; and serving to prevent air passing to the central space within the burner at the lower part. F is a nozzle-like guide or deflector, to direct the issuing gas to a focus. The air admitted to the inner space of the air-heating chamber passes between the tubes to the central space, and issuing thence tends to give an outward direction to the flame; whilst the air admitted to the outer spaces is caused on issuing to impinge upon the gas in an angular and downward direction, so that there is a tendency to focus it.

In fig. 2, the burner is in the form of an annular gas chamber of the ordinary kind, perforated at the bottom, and connected to a gas box or chamber by pipes as shown. Each nozzle, pipe, or division (instead of being formed as part of a single truncated cone) may be further bent inwards at its lower end, so as to form part of another cone.

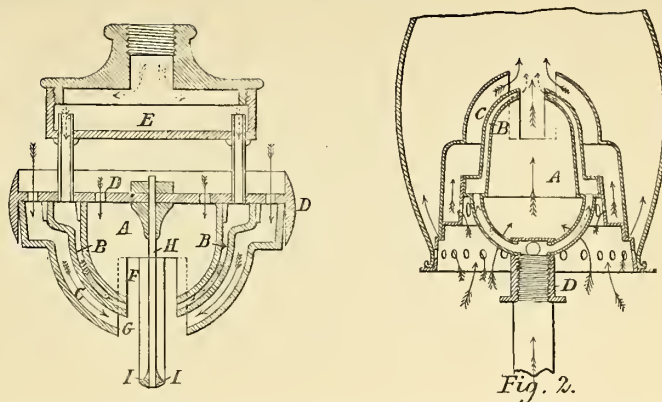
In fig. 3 the conical nozzles, pipes, or annular divisions are each formed with or carried by a perforated ring-like flange or extension provided with an upwardly extending flange. The nozzles are secured in position below the perforated plate A by a tube formed with a flange to support the lowest flange (which is not perforated), and arranged to screw into a rib or flange on the plate A. This construction admits of the nozzles being readily secured together and taken apart when desired. The pocket C in this arrangement is cast in one piece with the plate A. The guard E is secured within the ring of tubes; and a guide or deflector is provided to direct gas issuing from the burner in an outward direction.

GAS-LAMPS.—Thomas, T. C. J., of Hornsey. No. 11,306; Aug. 18, 1887. [8d.]

This invention has reference to lamps (applicable also for heating); the construction or arrangement of burner being such as will produce a divided or duplex flame, to be used either inverted or otherwise, with air for supporting combustion having in some arrangements its temperature raised on its way to the flame by contact with surfaces deriving heat from the escaping hot products of combustion.

Fig. 1 shows in vertical section an inverted gas-burner, suitable (according to this invention) for use in the closed combustion chamber of an ordinary regenerative or recuperative lamp; and fig. 2 is a vertical section of the burner when arranged for use with a chimney or globe open at the top.

In fig. 1, A is an inner air chamber; B, a gas chamber; and C, an outer air chamber. These chambers are mainly formed by three concentric castings or metal casing of approximately hemispherical form, secured at their ends or bases to a perforated plate D. E is a gas-box, with socket for attachment to a gas supply pipe. It is connected to the plate D by tubes which place the interior of the box in communication with the gas chamber B. The inner casings are each formed



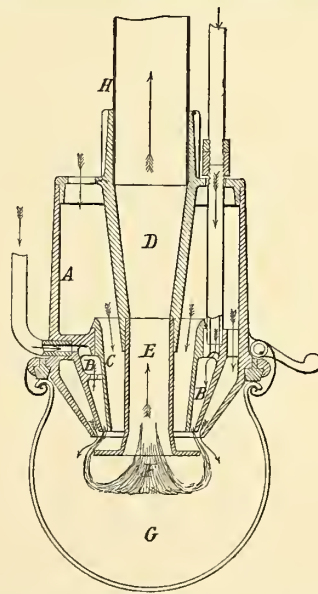
with a slot or opening F, and the outer one with a slot G. The spaces between the casings at the two ends of the slots or openings are closed, in order to prevent air passing between the two at these parts. H is a plate or partition dividing the inner air space, and projecting through the slots or openings F G; and provided at each side with an outwardly curved guide or deflector I. The arrangement is such that the gas issues from the gas chamber B towards each side of the plate or partition H in a stream having the contour of an arc of a circle or approximately so.

If the burner shown be secured to the gas and air supply pipes of a suitable regenerative gas-lamp so that the air descends through the inner and outer air chambers A and C in the direction of the arrows shown by full lines, and the gas in the direction of the arrows shown by dotted lines, two flames of peculiar form will be produced; each being curved outward and upward, and having a curved or arc-like cross section. The form of the flame will, however, depend to some extent upon the arrangement of the lamp and of the exit apertures for the hot gases and products of combustion.

In fig. 2, the plate D, gas-box E, and plate or partition H, shown in fig. 1, are dispensed with; and the burner is connected by tubes to the socket D, which is arranged to be secured to the upper end of a gas supply pipe, so that the gas issues upwardly from the burner. The casings are slotted as before; and the intermediate one is provided with a series of holes for the passage of air to the outer air chamber C, and with another series of holes for the passage of air to the interior of a chimney or globe which is open at the top, and supported on a flange or gallery at the lower end of the casing. With this arrangement, two approximately flat semicircular topped flames will be obtained, with an air current at the outer side of each, and with an air current between them.

GAS-LAMPS AND BURNERS.—Quaglio, J. von, and Westphal, C., of Berlin. No. 14,837; Oct. 31, 1887. [8d.]

This invention relates to gas-lamps or burners having a downwardly directed flame with central chimney; and it consists principally "in an improved form of gas-jet applicable to such lamps or burners, and generally in the arrangement and combination of parts of the lamp."



A is the cylindrical casing of the lamp forming the air chamber, and narrowed below to the shape of a hollow inverted truncated cone. In the lower portion of the casing is placed the burner, consisting of the outer inverted truncated conical wall B connected to the outer cylinder at intervals by stays, and projecting inwardly at its upper edge so as to make a flange, which forms a secure joint with the second part of the burner—viz., the inverted truncated hollow conical part C—of greater steepness than the part B, and extending downward so that its lower edge is level with the lower edge of the latter, and at a short distance therefrom in order to form with it an annular jet for the issue of the gas. The gas-pipe may either pass laterally as on the left of the illustration, or vertically downward as shown on the right side, into the upper portion of the space enclosed between the parts B and C. Down the centre of the cylindrical chamber A extends the chimney D, preferably made in one part with a flange, the rim of which is fastened inside the upper edge of the cylinder A, whereby the chimney is supported, and a cover is formed to the cylinder by the flange. The latter may or may not be

perforated for the admission of air into the cylinder. The chimney extending down to near the upper edge of the burner body terminates in, and is continued downward by the tube E, which is made of refractory or heat-withstanding material. This tube extends downward to a suitable distance below the lower rim of the burner, and is then flanged outward to form a flame distributor. There is a flange on the lower edge of the cylindrical portion of the casing A, and a recess is left in the under edge thereof to receive a ring of asbestos material. The rim of the globe G is held firmly against this ring by springs or hooks.

The air entering into the chamber A passes downward on each side of the annular burner, and issues to the flame F; the latter passing outward and downward into the chimney and flue H. To equalize the pressure of gas in a burner of this kind, flanges or plates may be so placed therein as to divide the annular body into two separate portions with passages connecting them. The gas is thus more or less restrained in its passage from the annular space in which it first arrives from the pipe into that from which it issues to the flame.

GAS HEATING-STOVES.—Jackson, W., of Aberdeen. No. 15,167; Nov. 7, 1887. [8d.]

According to this invention, the chamber constituting the casing of the stove is fitted with a burner, the gas for which is supplied through an atmospheric arrangement. The interior of the chamber is fitted with a number of inclined tubes or passages opening at each end to the outside of the chamber, but having no communication with the interior of it. These pipes (by which the air is heated) are preferably arranged in tiers one above the other, and are placed at such an angle that the air of the apartment enters them at one end, becomes heated in them, and passes out from them at the other end; so that circulation of the air of the department through the stove is secured.

GAS-ENGINES.—Davy, C., of Sheffield. No. 15,658; Nov. 15, 1887. [8d.]

This invention has for its object to diminish the consumption of gas or vapour in gas and other engines, by maintaining a higher temperature in the jacket surrounding the working cylinder and combustion chamber—and consequently in the walls of the cylinder and chamber—than is possible when water is used as the cooling agent in the jacket; and avoiding at the same time the danger of overheating which might ensue were no cooling jacket employed. The highest temperature practically maintainable in the jacket, says the patentee, is necessarily lower than the boiling point of the liquid employed therein; and hence it follows that if water be so employed, an excessive amount of heat is abstracted from the working cylinder and combustion chamber, which entails a correspondingly wasteful consumption of gas. His invention therefore consists in a mode of maintaining a much higher (mean) temperature in the jacket—and consequently in the walls of the working cylinder and combustion chamber—by the employment, as the cooling agent, of a fixed oil such as olive oil, the boiling point of which is much higher than that of water at atmospheric pressure.

In carrying out the invention, it is desirable to provide against the oxidation of the oil which would occur, and the objectionable odour which would be given off, if the hot oil were exposed to the atmosphere; and to this end it is necessary that the hot oil should circulate in a closed (or practically closed) system in such a manner that the oil will be sufficiently cooled to prevent the temperature in the jacket rising beyond the desired limit—i.e., beyond the boiling point of the oil, or beyond such a temperature that the piston and rings would become overheated, whichever temperature is the lowest; the circulating system being provided with means of accommodating the variable expansion of the oil without exposing the hot oil to the air.

ALTERING AND ADJUSTING THE OUTLET LIQUID LEVEL IN TANKS OR OTHER VESSELS.—Cutler, S., of Millwall. No. 16,221; Nov. 25, 1887. [8d.]

This invention has for its object the construction of apparatus whereby the outlet liquid level in tanks or other vessels may be altered and adjusted with precision; being especially adapted for application to vessels used in dissolving solid matters.

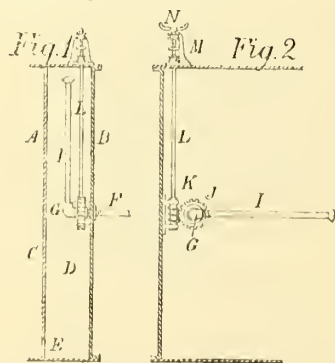


Fig. 1 is a side sectional elevation of the tank and the partition used when liquids and solids have to be divided (but which partition is not necessary when liquids of different specific gravities are to be dealt with); and fig. 2 is a transverse sectional elevation of the same tank in which no partition is shown.

When necessary a partition A is placed across the tank or vessel B used so as to divide it into two chambers C and D; each communicating with the other at the upper part by reason of the partition not reaching quite to the top. There is also a communication from one to the other near the bottom, by one or more holes E, so that the liquid portion of the mixture may flow into the smaller or outlet chamber D, while the solid matter is retained in C. At a convenient height in the side of the smaller or outlet chamber D is inserted a pipe F, with a specially formed elbow G capable of being partially revolved. To one end of this elbow there is fitted the pipe F, for conveying the out-flowing liquor to its appropriate receptacle. To the other end of the elbow is fixed a radiating hollow arm I. Attached to the elbow there is also a worm-wheel J, which is actuated by a worm K fixed to a spindle L that passes

through the tank, and through the arm of a bracket M fastened to the top thereof; the part of the spindle projecting above the arm being furnished with a handle N, or hand-wheel.

On turning the handle N, the spindle L and worm K will revolve and impart motion to the worm-wheel J, which, being fixed to the elbow G, will cause the radiating hollow arm I to assume any desired angle to the vertical; and consequently its top will be raised or depressed to the requisite level. The liquid contents of the tank may be drawn off to a level corresponding with the height of the top of the hollow arm I, which may be altered or adjusted at pleasure.

THE ARRANGEMENT OF GAS WASHERS OR SCRUBBERS WHEN MORE THAN ONE ARE EMPLOYED.—Cutler, S., of Millwall. No. 16,222; Nov. 25, 1887. [6d.]

This invention—which has for its object the convenience in use, and economy of construction, together with reduced area of ground required for gas washers or scrubbers where a number are employed for the same or similar operation—consists in making one very large vessel, and dividing it by partitions into as many compartments or chambers as are required to effect proper purification. The exterior form of the vessel may be (in plan) a long parallelogram, in which case the house for containing the necessary distributing apparatus extends from end to end of the top of the vessel; or it may be a shorter parallelogram with a central partition subdivided so as to form the requisite number of chambers. Another arrangement may be made by having a vessel of the form of a parallelogram divided by a certain number of partitions, with offsets arranged so as to serve as additional chambers; or the chambers may be made of a hexagonal or octagonal shape, but so grouped together as to admit of one or more sides of one chamber serving as the side or sides of other chambers. By these means it is claimed that great economy in construction is effected, while the area on which the washers stand is much reduced, and the convenience for arranging the appliances for distributing the liquid with which they are supplied is greatly increased.

MIXTURE AND TREATMENT OF MATERIALS FOR ENRICHING COAL GAS AND IN REMOVING OR PREVENTING STOPPAGES IN ASCENSION-PIPES.—Bennett, W. H.; communicated from J. Lamy, of Paris. No. 17,558; Dec. 21, 1887. [6d.]

This invention has for its object the manufacture of a compound for the enrichment of coal gas, and for the prevention and removal of stoppages in ascension-pipes.

The patentee proposes to take any variety of shale or lignite, or brown coal, or cannel, together with shale oil, or any other suitable oil, and grind them together under very heavy pressure, so as to pulverize and intimately amalgamate together the shale and oil. A shale, brown coal, lignite, or cannel is preferred that is capable of yielding the largest quantity of gas; and the oil preferred is that which contains the greatest amount of paraffin or paraffin scale. A good oil to use is one having a specific gravity of .930 to .950; a flashing point of 120°; and a setting point of 65° Fahr. But others may be employed—such as those known as intermediate oil, gas oil, still bottoms, blue oil, green oil, or any waste mineral oil, or oleaginous matters; and in some cases it may be preferred to grind and amalgamate together with the shale and oil a proportion of bituminous coals, so as to improve and strengthen the quality of the coke left after distillation in the retorts.

The proportion in which the oil and shale are mixed depends on the use for which the composition is employed. If for enriching coal gas, about 30 to 40 gallons of oil per ton of shale are used; but if for preventing or removing the stoppages in ascension-pipes, about 50 to 60 gallons to the ton of shale are more suitable.

When the compound is used for enriching coal gas, the quantity of the mixture to be added to the ordinary coal with which the retorts are charged must be proportionate to the quality of the gas it is desired to make; and the effect is that the rich gases eliminated from the compound unite with the poor gas from the coal so intimately that no undue condensation ensues. If, however, it is used for preventing or removing stoppages in the ascension-pipes, a hole is made through the carbonaceous substance in the pipes; and the retorts are then charged with the compound alone, and without any admixture of common coal. The result is that the rich gases given off soften, melt, and liquify the carbonaceous matter, so that it falls down the pipe into the mouthpiece and may thus be easily removed.

APPLICATIONS FOR LETTERS PATENT.

14,675.—FITZPATRICK, H. D., and ROSE, G., "Improvements in the method of and apparatus for manufacturing gas from mineral or other oils." Oct. 12.

14,707.—HIBBERSON, J., "Improvements in valves, taps, or stopcocks, for gas, water, or other fluids." Oct. 13.

14,723.—DICKSON, J. H., and SCHWABEN, H. W., "Improvements in valve mechanism for dry gas-meters." Oct. 13.

14,831.—WILLIAMS, H., "Improvements in mechanism for governing the speed of gas and similar motor engines." Oct. 16.

14,872.—ROSE, J. M., "Improvements in the manufacture of gas." Oct. 16.

14,878.—KING, J., "Improvements in apparatus for taking off the gas from gas-retorts and delivering it into hydraulic mains, and for preventing the tar or liquors which condense in the ascension-pipes from returning to the retorts." Oct. 16.

14,925.—WALKER, W. T., "Improvements in apparatus to be used in the purification of coal gas." Oct. 17.

15,009.—GREENE, T. A., "An improvement in regenerative lamps." Oct. 18.

PROPOSED ELECTRIC LIGHTING OF LEEDS.—The Leeds Corporation have recently received a number of applications from electric lighting agents and syndicates, with a view to the installation of the electric light in certain districts of the borough; and it is expected that the whole subject will shortly be brought before the Town Council. In the meantime the Electric Lighting Committee have instructed the Borough Engineer (Mr. T. Hewson, M. Inst. C.E.) to prepare a scheme for lighting a sectional area of Leeds, and supplying the light to all shopkeepers and others who may require it.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

HELPS'S PATENT PIPE EXTRACTOR.

SIR,—As my Directors had adopted this simple but valuable invention, I read with dismay Mr. E. H. Thorman's letter in your last issue.

Upon inquiry, I find that the clip which was made "about 33 years ago" was practically of the same character as that which I, with others, had also tried and proved useless. The apparatus was fitted with *two* screws to force the pipes apart; whereas the Helps arrangement is designed for, and produces a totally different effect with, one screw. The pipes are (as we have proved here) quickly extracted by their own weight and jarring, when lifted against the point of the screw which takes up the slack after each lifting of the pipe.

I think, therefore, that Mr. Thorman must have misunderstood your description of Mr. Helps's new arrangement.

Richmond, Oct 19, 1888.

THOS. MAY.

THE EDINBURGH AND LEITH GAS-WORKS PURCHASE.

SIR,—Will you allow me to correct a very strange mistake in your Edinburgh Correspondent's "Notes" of last week?

His statements are to the effect that I was entirely opposed to the purchase of the gas-works by the Town Council. This to me is unaccountable. I thought every citizen of Edinburgh was aware that, so far from being opposed, I proposed the purchase of these works by the Town Council in 1863. My plans were then fully considered; and I hold a letter of thanks for them from the then Town Clerk. In 1865, I again addressed a letter to the Council, advocating the purchase and removal, on the grounds of their ineligible situation, incapacity of expansion, and insanitary tendency. At that time, the project was deemed revolutionary; but who does not see now that, had it been then adopted, the citizens would not only have bought cheaper, but have been in possession of a lucrative property instead of one which—at its enormous cost—must for ever afterwards be a heavy burden on the community. I was, therefore, one of the foremost pioneers of the purchase; and the recent schemers were merely appropriators and appliers of the ideas I had then, and have ever since pursued.

But there was certainly a difference between us. My aim was, primarily, the benefit of the community; and I accordingly advised a purchase on fair terms. They, as they avow, had two objects—the benefit of the community, and the Gas Companies too; and they advised a purchase on what I considered most unfair terms. They proposed to give, and have given, the Companies about three times the value of their works, so far as the city's requirements go. That is what I object to; and as I have, in various communications in your columns, expressed my objections in detail, I need not here repeat them.

I must, of course, presume that they have escaped the notice of your correspondent. He cannot, however, but know that, subsequent to the publication of my opinion that it would have been better and vastly cheaper to construct new works in present circumstances, than to buy old and exhausted ones, there was a wide expression of opinion (professional and unprofessional) to the same effect. He also knows that I affirmed that £300,000 would supply an entirely new plant in an eligible situation; and I have no hesitation in adding that, if the tinkering method he applauds be preferred to this, a mistake as great and serious for the community as the deferring of the purchase from 1865 until now will be committed.

Edinburgh, Oct. 19, 1888.

JOHN ROMANS.

CONONLEY WATER COMPANY, LIMITED.—This Company has lately been registered with a capital of £2000 in shares of £1 each, to supply water to the inhabitants of the township of Cononley, in Yorkshire.

THE ASSESSMENT OF THE FALMOUTH GAS-WORKS.—The appeal of the Falmouth Gas Company against the assessment of their works, which some time ago was referred, by consent, to Mr. Morgan Howard, the County Court Judge, has resulted in the reduction of the amount from £550 to £332 8s. 6d., the question of costs to be settled by the parties.

THE ARBITRATION BETWEEN THE WAKEFIELD CORPORATION AND THE RURAL SANITARY AUTHORITY.—Last Saturday the Solicitors to the Wakefield Union Rural Sanitary Authority received the award of Mr. E. Cousins, C.E., of Westminster, the Arbitrator in the dispute which took place some time ago with reference to certain water-mains belonging to the Corporation in the district of the Authority, and which the latter proposed to acquire. The Corporation claimed £53,000 for the pipes, fittings, and other apparatus, &c., and the Authority offered £1038. The Arbitrator awards the Corporation £1544, and directs that his costs, amounting to £311, shall be paid them and the Authority jointly. He does not make any order as to the costs of the arbitration and reference, which, it is said, are very heavy.

THE PUBLIC LIGHTING OF BIRKENSHAW.—At the meeting of the Birkenshaw Local Board last Thursday, the Gas Committee reported that they had taken steps with the view of obtaining particulars as to methods of lighting the district otherwise than by gas, and several letters and proposals were laid before the meeting. Among them was a communication from the Stringfellow Patent Lighting Company, London, offering to light the public lamps at £1 10s. each for the winter, each lamp being estimated at burn 1000 hours. At this stage Mr. W. Oddy was introduced to the meeting. He said that while his sympathies were with the ratepayers, he thought the Board should light the public lamps. He had waited on the Gomersal Gas Company, and they represented to him in the course of the interview that their last dividend was only at the rate of 4½ per cent., but at the present rate of consumption the next would be only 2½ per cent.; and between the consumers on the one hand and the shareholders on the other, the Directors felt very much inclined to give up altogether. He suggested that the Board should enter a protest against the price asked by the Company for the public lighting; but still light up for the winter, and in the meantime give consideration to any other projects for lighting the lamps that might be brought before them, so as to be able to entertain another scheme if necessary next winter. If this were done, there would be no risk to life and limb through the streets being unlighted during this season. Mr. Oddy having withdrawn, the members generally expressed the opinion that, in view of the feeling evinced by the ratepayers, they could not take the course suggested by him. Ultimately it was decided to obtain a lamp from the Stringfellow Company, and have it fixed in a prominent place in the district for trial.

Legal Intelligence.

WEST RIDING QUARTER SESSIONS.

TUESDAY, OCT. 16.

(Before Mr. BASIL T. WOODD, Chairman, and a Bench of Magistrates.)

THE AFFAIRS OF THE RASTRICK GAS COMPANY.

Our readers will remember that at the Spring Sessions (see JOURNAL for April 17 last), an application was made to the Court, on the petition of certain ratepayers of Rastrick, for the appointment of an accountant to investigate the affairs of the Rastrick Gas Company, with the view to an order being made for a reduction in the price of gas. A similar petition had been presented at the previous sessions, but had failed on a technical objection. As the result of the second application, Mr. J. W. Close, of Leeds, was chosen to carry out the investigation; and he now submitted a report setting forth the results of his labours, which extended over 115 days, and embraced an examination of the accounts of the Company since its formation in 1864. The report was as follows:—

I have examined and ascertained the actual state and condition of the concerns of the Company, and find that on the 11th of July, 1864, a Company, called the Rastrick Gas Company, Limited, was registered and incorporated under the Companies Act, 1862, with Memorandum and Articles of Association, and that by the Rastrick Gas Act, 1865, such Company was dissolved, its Articles of Association made void, and its assets and liabilities transferred thereby to a new Company, called the Rastrick Gas Company, to which by such Act enlarged powers were given. The capital of the Company was fixed by the Act at £25,000; and power was given to the Company, by section 20 of such Act, to borrow on mortgage a sum equal to one-half of the paid-up capital when £10,000 had been subscribed for and issued, further powers of borrowing being given in certain proportions as further capital was subscribed for and paid up.

The paid-up capital of the Company, at its commencement in 1865, was £4845; and in 1877 it had been increased to the sum of £14,000.

Section 31 of the Gas-Works Clauses Act, 1847, requires that surplus profits, after providing for the maximum dividend of 10 per cent., shall from time to time be invested in "Government or other securities," and that the dividend and interest arising from such securities shall be similarly invested, in order that the same may accumulate at compound interest until the fund is equal to one-tenth of the nominal capital of the Company, when it is to form a reserve fund to answer any deficiency which might at any time happen in the amount of divisible profits, or to meet any extraordinary claim or demand which might at any time arise against the Company; and the following section provides that no sum of money shall be taken from such fund for the purpose of meeting any extraordinary claim without the certificate of two Justices in that behalf being first obtained. In the year 1877 the reserve fund amounted to £1177 9s. 9d., of which the sum of £500 was invested in Government securities, and the sum of £500 with the Brighouse Local Board; and the Company, having occasion for further money for new works, sold out the Government securities, and borrowed a sum of £670 from the reserve fund, notwithstanding the prohibition contained in the 32nd section of the Act of Parliament above mentioned, and in the following year the further sum of £511 5s. was also borrowed from the same fund. Both these sums have since been paid back to the fund; the last payment being made in February, 1887, and such fund now stands at the sum of £1800, of which the sum of £1289 13s. 8d. is stated to be invested on deposit with the London and Yorkshire Bank, Limited, and £510 6s. 4d. with the Clifton Water Supply Company. In ascertaining the amount of the reserve fund, interest is debited against the Company thereon from time to time, and the fund has not, therefore, suffered in amount by the irregularity referred to; but the course adopted appears to me highly reprehensible, and the investment on deposit with the bankers is, in my opinion, irregular, and not one contemplated by the section of the Act of Parliament prescribing the mode of investment of the reserve fund to which I have already alluded. The nominal capital of the Company is £25,000; and by section 31 of the Gas-Works Clauses Act, 1847, the Company is entitled to create a reserve fund of 10 per cent. on that amount. The amount at which the fund now stands is £1800, which is £700 short of the maximum sum.

The Company seems to have been a prosperous one, for within two years of its existence it paid a dividend of 6 per cent., which went on increasing until 10 per cent. was reached in the year 1872; and for the last twelve years the maximum dividend of 10 per cent. has been paid. So soon as the dividends began to reach the maximum amount, the Company commenced to write large sums for depreciation off the capital item for gas-fittings (which mainly comprise gas-meters), although no authority is to be found in any Act of Parliament for such a course, and notwithstanding that the form of account provided by the Gas-Works Clauses Act of 1871 makes no provision for depreciation except for works on leasehold lands, but, on the contrary, permits to be charged items for the repairing, renewing, and refixing of meters to the revenue account. In this way the Company depreciated in six years an item of £562 2s. by the sum of £542 1s. 10d.; leaving £20 only as the capital value of what six years before was £562 2s., and notwithstanding that in the meantime the revenue accounts had been debited with items for repairs, &c.

The investigation of the Company's accounts has occasioned more trouble than need have arisen, the same having been indifferently kept prior to 1881. Since then, however, the accounts have been intelligible, and much more easily investigated.

In the year 1885 the Company made a larger profit than at any other period of its existence, and found itself possessed of a sum which, with the balance brought forward from the preceding years, would have allowed of a dividend of 17½ per cent. being declared; but, instead of applying this sum towards making up deficiency of dividend in previous years, or adding it to the reserve fund, as provided by section 31 of the Act of 1847, the Company proceeded to write off £1000 for depreciation of plant, and made the profit of that year appear so much less, although there is no authority for such a course, and notwithstanding the early expenditure charged in the revenue account for maintenance of the plant. I find, also, that various sums have been charged to revenue account, which unquestionably should be charged to capital account, and these sums amount to £957 1s. 11d.; but, on the other hand, sums amounting to £279 16s. 3d. have been charged to capital, instead of revenue—leaving a sum of £677 5s. 8d., which the Company is entitled to divide as profit in excess of the amount shown by its accounts. In addition to the items mentioned, there is also a sum of £50 improperly retained by the Company as a fund for bad debts, which is divisible profit; and there is also improperly charged in the revenue account items for income-tax amounting to £621 13s. 4d., which ought to have been deducted from shareholders' dividends, and will therefore need taking into account in reduction of the deficiency of maximum dividend in previous years.

Put shortly, the result of my investigation shows that at the end of 1886 the Company was possessed of divisible profit in excess of the amount

shown by the accounts to the extent of £2269 7s. 6d., made up as follows:—

Depreciation on gas-fittings	£542	1	10
Depreciation of plant	1000	0	0
Items of capital charged to revenue	677	5	8
Fund for bad debts	50	0	0
	£2269	7	6

At this time there was needed to make up the deficiency in maximum dividend for previous years the sum of £2095 14s., less the sum of £629 13s. 4d. applicable in reduction thereof paid by the Company on account of the shareholders by way of income-tax; leaving the sum of £1466 0s. 8d. payable on this account, and to this there needs adding the sum of £700, required to make the reserve fund equal to 10 per cent. of the nominal capital of the Company.

The matter, therefore, stands thus at the end of 1886—

Amount of divisible profit in excess of that shown by the Company	£2269	7	6
Deduct amount required to make up maximum dividend and reserve fund	2166	0	8
Balance	£103	6	10

At the commencement of the year 1887, the Company had, therefore, a sum in hand of £103 6s. 10d., and in that year a profit of £1655 2s. 11d. was made; making a total of £1758 9s. 9d. divisible, which is insufficient to pay the maximum dividend of 10 per cent. on £18,000 (the paid-up capital).

It has been suggested to me, on behalf of the petitioners, that deductions should be made on account of the sums paid for Directors' fees and Manager's bonus, which during the existence of the Company have reached the sum of £1293. But, having regard to the form of account provided by the Act of 1871, in which such items are expressly mentioned, I think that the items are properly entered; but whether the amount is fair or not, I am not in a position to say, nor do I think that the sum of £223 4s. 4d., made up of items under the head of repairs, but which, in reality, consist of wines and cigars for the Directors' use, should be disallowed, as suggested by the petitioners.

By section 35 of the Gas-Works Clauses Act, 1847, under which the Court derives its powers to inquire into the state and condition of the Company's concerns, it is provided that, in case the whole of the reserve fund has been and then remains invested, and in case dividends to the amount limited have been paid, the Court may make such a rateable reduction in the rate for gas as in the judgment of the Court will, when reduced, ensure to the Company a profit as near as may be to the prescribed rate, which, in the case of the Rastrick Company, is 10 per cent. on the paid-up capital. In the Hanley gas case, reported in the Law Reports (19 Q. B. Div., p. 481), where neither the whole of the reserve fund had been invested nor the prescribed amount of dividends had been paid, it was decided that there was no power to order a reduction; and the same state of things exists in the present instance. But apart from this it seems to me that it would be undesirable to order a reduction, having regard to the fact that in 1887 the Company did not make a profit equal to 10 per cent. on its paid-up capital, even if the Court came to the conclusion, notwithstanding the Hanley case, that it had power to make such an order.

I beg, in conclusion, to state that the Company and its officers have afforded me all the assistance I have desired of them; and I have no complaint to make of any document having been withheld.

Mr. KERSHAW and Mr. C. M. ATKINSON appeared for the petitioners; Mr. HEATON CADMAN represented Mr. Close; Mr. E. TINDAL ATKINSON, Q.C., and Mr. BAIRSTOW watched the proceedings for the Company.

Mr. KERSHAW alleged that there had been many improper things done by the Company, which had been a very prosperous one, and had paid 10 per cent. dividend for the past 12 years. Some time ago, the Company finding themselves in a very prosperous condition, resorted to the practice of putting down to revenue what ought to have been charged to capital. These sums came to £957; but, on the other hand, sums amounting to £279 had been charged to capital instead of to revenue, leaving a balance of £678, which the Company were entitled to divide as profit in excess of the amount shown by the accounts. It was also alleged that the Company had accumulated a reserve fund of £2500, and not £1800 as stated by Mr. Close in his report.

Mr. E. T. ATKINSON, on behalf of the Company, contended that the carrying of the investigation over a period of 24 years was contrary to the Act of Parliament under which the inquiry was authorized. What the Court had to deal with was merely the profit made in 1887. His clients had no desire whatever to limit the inquiry; but he must insist that neither the petitioners nor the Court had any authority to investigate the accounts of preceding years, except in regard to their bearing upon those for the past year.

The CHAIRMAN remarked that, as he understood, the Court had to be assured as to the amount of profit made in 1887.

Mr. Close having given evidence as to the correctness of the figures contained in his report,

The CHAIRMAN asked him whether he was satisfied that the clear profit for the year 1887 was £1655.

Witness replied that he was.

The CHAIRMAN said that under these circumstances the Court could not order any reduction to be made in the price of gas.

It was subsequently decided that the Company were to pay the Accountant's expenses; the other costs to follow the event.

LORD MAYOR'S COURT.—WEDNESDAY, OCT. 17.

(Before the Recorder, Sir T. CHAMBERS, Q.C., and a Special Jury.)
WELLMAN v. INCANDESCENT LIGHT COMPANY.—A QUESTION OF COMMISSION. This action was brought by the plaintiff to recover a sum of £27 11s. 3d., which he claimed to be due to him for introducing the defendants' lights to Willis's Rooms, St. James's. The Company contended that no contract had been entered into, and that no money was due.

Mr. W. WRIGHT and Mr. M'CULLAUGH appeared for the plaintiff; Mr. A. COCK and Mr. CHAPMAN for the defendants.

Mr. WRIGHT, in opening the case, said the plaintiff was a gas-fitter, carrying on business in Great Russell Street, Bloomsbury; and the action was brought to recover a sum of money which he maintained he had earned by way of commission. In 1886 or 1887 Willis's Rooms were being attended to by the plaintiff, so far as the lighting arrangements were concerned. About this time he was spoken to by the Chairman of Willis's Company as to some alterations being made in the lighting of the place, as the existing arrangements were considered to be bad. Plaintiff had seen the incandescent light at the Hotel Continental and the Hotel Métropole, and he unhesitatingly recommended the light to Willis's Company. He went to the defendant Company's offices; and he saw a person who was represented to be the Assistant-Manager.

Mr. Cock disputed the authority of Mr. Hulme, whom plaintiff saw.

Mr. WRIGHT said he could prove that Mr. Hulme was the Assistant Manager at a salary of £300 a year. Plaintiff told him that he had an opportunity of introducing the incandescent light to Willis's Rooms; and asked what commission would be allowed. He thought that about 150 lights would be required. Mr. Hulme promised that he should be put on "trade terms," and said the list of these terms was not then printed, but would be ready shortly, and undertook to send him a copy. This he afterwards did. Plaintiff acted under the direction of Captain Clarke, the Chairman of Willis's Rooms; and the Incandescent Company obtained the business and put up the lights, which he believed had been very successful. Mr. Hulme expressed his gratification, as the Company had only just been started (this was in March, 1887, and the Company was only registered on Feb. 14), and they were anxious to get known. He (the learned Counsel) was confident that if they had been able to get hold of Mr. Hulme, the matter would have been settled long ago. By the "trade terms" their commission would be 25 per cent. The defendant Company had put up lamps to the amount of £110 5s.; and 25 per cent. on this would come to £27 11s. 3d. Plaintiff applied several times for his money; and on one occasion had a reply saying that he would certainly receive some "consideration" for his services; that Mr. Hulme had disappeared; and that they had been hoping he might "turn up" again, which was the cause of delay. In reply to another letter, the defendants stated that the matter should be settled as soon as they received the amount of their account from Willis's Company. They had actually received the money from the Company, but had not settled the account.

Mr. Wellman was then examined, and generally corroborated the learned Counsel's statement. On being questioned as to his interview with Mr. Hulme,

Mr. Cock interposed, and stated that Hulme was appointed at a salary of £300 per annum from March 20. His appointment as Assistant-Manager dated from April 26. He had since absconded.

Examination resumed: Witness's men assisted in putting up the lights at Willis's Rooms; and the work he did was equal to about three weeks for one man. He called on Mr. Carey, the Secretary of the Incandescent Company, in July; and at that interview he claimed that the arrangement made with Mr. Hulme should be carried out, and Mr. Carey promised that this should be done.

In cross-examination, witness admitted that he had only received instructions to report on the electric lighting of the rooms, though he had had a large number of questions put to him at various times by Captain Clarke. The lighting of the rooms by electricity was altogether wrong; it was always failing. All orders for incandescent lights for the rooms went through witness's hands, though he had never paid for any.

Mr. Cock said that all the lights were delivered direct to Willis's Company, and were paid for by them. [The learned Counsel here read the circular specifying the "trade terms."]

A JURYMAN asked whether Willis's Company were allowed the discount.

Mr. Cock: Yes.

The JURYMAN: Then why? They are not in the trade.

Cross-examination continued: The time his men were occupied in preparing the chandeliers for the incandescent lights was to be paid for by the discount he obtained on the lights, and was not work done under his contract with Willis's Company. He had been at some trouble in promoting the light.

Re-examined: Captain Clarke asked him to go and make arrangements as to the incandescent lights.

Mr. Cock submitted that there was no evidence to go to the jury.

The RECORDER agreed that there was no question for the jury. How could the plaintiff ask for the benefit of 25 per cent. discount? Discount is a sum of money granted in reduction of a bill incurred by a customer for goods. Here was plaintiff suing for discount like a customer.

Mr. WRIGHT said that with due respect to his Lordship, he did not care whether it was called discount or commission. The plaintiff went to the Company and asked what terms he should be put upon for introducing the light; and he was told "trade terms."

The RECORDER: The evidence does not support the particulars.

Mr. Cock, in reply to a juryman, said that the account was paid by Willis's Company on Nov. 2 last year.

Mr. WRIGHT: You promised that the matter should be settled as soon as the account was paid.

The RECORDER: You did not buy anything of the Incandescent Company. No contract was made with them; it was a mere introductory promise, and meant this: If you will push the sale of the lights, and will become our customer, we will give you the trade discount. The plaintiff would not come under the trade terms until he actually became a customer. He should therefore nonsuit him.

LAWFORD'S GATE (GLOUCESTERSHIRE) PETTY SESSIONS.

MONDAY, OCT. 15.

(Before Mr. F. TOTTELL, Chairman, and a Bench of Magistrates.)

PROSECUTION BY THE BRISTOL GAS COMPANY.

To-day Mr. R. T. Lucas, of Tudor Lodge, Sned Park, Bristol, was summoned by the Bristol Gas Company for having refused permission to an officer of the Company to examine the gas-meter on his premises, and also with having improperly connected the meter with the service-pipe.

Mr. BRITAIN appeared on behalf of the Company; Mr. DICKINSON represented the defendant.

Mr. BRITAIN stated that application was made by a collector, on the 18th of July, for payment of the gas account up to the 6th of June. The money was not paid; and another application was made on the 3rd of September. The account not having been settled, the defendant was served with the statutory notice that his supply of gas would be discontinued. As the money was not forthcoming, one of the Company's servants cut off the gas. After this the Company, having reason to suspect that the pipes had been improperly connected, sent an officer to examine the meter; but he was refused admission. The same man again called at the house, and was again refused admission. On another occasion a man was admitted, and found the supply-pipe connected from the meter, and 4200 feet of gas consumed. The summonses were accordingly taken out.

Mr. DICKINSON said the defendant possessed a number of valuable horses. During the summer months he was away from home, and (as was necessary) gave stringent instructions as to who should be admitted to the premises during his absence. The gas account was sent in, and was probably laid aside, Mr. Lucas being absent. Shortly after the gas was cut off, the money was paid; and then Mr. King (brother-in-law of the defendant), who had been left in charge of the house, thought that, as the account had been settled, they had a right to connect the service-pipe with the meter; and this was accordingly done. The reason the men were not allowed to enter the house was because Mr. Lucas had given such stringent orders to his servants about the admission of strangers during his absence; and the officers of the Company were all strangers except the last, who was admitted because he usually examined the meter.

Mr. BRITAIN expressing his willingness to accept this explanation, the case was dismissed; the defendant having agreed to pay costs, and given a promise that the offence should not be repeated.

Miscellaneous News.

THE HACKNEY DISTRICT BOARD OF WORKS AND THE LAYING OF GAS-MAINS.

STEAM-ROLLERS AND GAS-PIPES.

At the Hackney Town Hall on Thursday last, Sir DOUGLAS GALTON, K.C.B., held an inquiry on behalf of the Board of Trade, under the powers conferred upon them by the Metropolis Gas Act, into a dispute which has arisen between The Gaslight and Coke Company and the Hackney District Board of Works as to the laying of a gas-main in the area over which the latter body has jurisdiction.

Mr. DANCKWERTS (instructed by Messrs. Bedford, Monier-Williams, and Robinson, of 6 and 7, Great Tower Street, E.C.) appeared for The Gaslight and Coke Company; Mr. R. ELLIS (Vestry Clerk), Mr. LOVEGROVE (Surveyor of the Hackney district), and Mr. GROCOTT for the Board.

Mr. DANCKWERTS, in opening the inquiry, called attention to previous cases of a similar character, in which Kensington, Islington, and Chelsea were concerned, and in each of which settlements were come to. The piece of road in question in the present instance was in the Manor Road, Stoke Newington—from the Bethane Road down to Bouverie Road. They had at present an 18-inch gas-pipe which came from a westerly direction, and ended at Bouverie Road. What they wanted to do was this: They found the requirements of the inhabitants of the district necessitated a greater supply of gas; and they wished to continue this 18-inch pipe from the Bouverie Road to about opposite the Bethane Road. Roughly speaking, the distance was 650 feet. Along the Manor Road under each of the footways, they had a 4-inch gas-main; and along a portion of the road, as he had mentioned, they had an 18-inch main, which ended at Bouverie Road. This main was laid last year, he believed; and, of course, after receiving the consent of the Vestry under the Act of Parliament to which he should call attention later on. The pipe was placed at a depth of 2 feet below the surface of the road. The water-main was 3 feet deep at the Bouverie Road, and 2 ft. 4 in. at the Bethane Road end. The 18-inch gas-main proceeded along the south side of the road; and they merely proposed to continue it at the same depth. The position in which they could lay the pipe was extremely limited; it must be above the 30-inch water-main in the road. The Company, as far back as April 28 last, sought permission from the Vestry to extend the main; and they received a reply on May 10, stating that the Board could not consent to the proposal, unless the Company agreed that no part of the pipe should be less than 2 ft. 6 in. from the surface of the road. He (the learned Counsel) was strongly of opinion that the Vestry had completely mistaken their functions in this case. In their reply to this letter, on May 14, the Company said that the depth at which the Board required the Company to lay the pipe was entirely outside their experience; that it was a condition which they had never been required to carry out; that their standard depth in the roadway was 2 feet from the surface of the road to the upper side of the pipes; that the mains were equally safe from damage; that the roadway was less disturbed in the laying, and in any subsequent work that might be required; and that consequently consolidation took place more rapidly and effectually. On May 22, an answer was received, which stated that the Committee of the Board adhered to the resolutions set out in their letter of May 10, "unless your Company will hold this Board harmless for any damage which may have been done by the Board's steam-rollers should the main be laid at a less depth than 2 ft. 6 in." He (the learned Counsel) did not think the Board had any right to make such a stipulation, or have any regard to the steam-roller requirements whatever. He considered the steam-roller requirements were absurd with respect to this case. The Inspector might be aware that there had been a controversy between certain Vestries of London and The Gaslight and Coke Company with reference to the use of steam-rollers. Nearly all the Vestries had at some time or other attacked the Company—using the expression, of course, figuratively—in connection with the steam-roller question. In the case of *The Gaslight and Coke Company v. The Vestry of St. Mary Abbots*, Mr. Justice Field decided that, there being no statute authorizing the Vestries to use steam-rollers, they employed them at their peril; that this was not one of the modes of repairing roads contemplated by the Act of Parliament; that the Gas Company had the right to have their pipes under the roadway; and therefore that they had a right not to be wantonly injured by the Vestries. This decision was upheld by the Court of Appeal. The Court of Appeal laid down this principle—that the Vestry had their duty to perform, which was to keep the roadway in a condition of repair to bear the ordinary traffic; and that the only thing which the Gas Company had to consider in laying their pipes was—of course, subject to any express statutory directions, and to their own necessities—to lay the pipes so that they should be safe against the ordinary traffic which was to be anticipated on the road. The Court granted an injunction prohibiting the Vestry from so using their steam-rollers as to injure properly laid pipes of the Company; leaving, of course, the question of what was "properly laid" to be determined in each case. He only referred to this case because it had been dragged, so to speak, into this controversy by the Vestry; and he would show why they sought to impose this condition of 2 ft. 6 in. upon them. A number of cases with other Vestries were pending at the time the Kensington one was decided; and amongst others was that in which the Vestry of Chelsea were concerned. Nearly all of them, with one or two exceptions, accepted the decision in this case. The Vestry of Chelsea were at the time insisting upon pipes being placed at a minimum depth of 4 feet below the surface of the roadway. The Company negotiated with them, and entered into an agreement. They agreed to put down all their mains and pipes for the laying of which they had to go to the Vestry for their consent in the way determined by this agreement; the Company not admitting any right in the Vestry to refuse their consent on the ground of the depth at which they laid their mains. It was expressly protested there that there was no such right; the Vestry contending that they had the right. They agreed to abstain from asking for an injunction against the Vestry on these terms, and that they should lay their pipes at a minimum depth of 20 inches. He ventured to say there was as much traffic in Chelsea as in the district now in question; and yet the Vestry were fully satisfied with the depth of 20 inches, and had not only agreed to accept this, but that they would pay all damage which should be done to the Company's pipes, or that the Company might have to pay to others where any of the pipes laid at this depth were broken by the Vestry's roller. The date of this agreement was Dec. 3, 1885. Thereafter they offered to make a like agreement with the other Vestries. But the Vestry of St. George's, who had also a dispute with the Company, which stood over pending the decision of the St. Mary Abbots case, decided to go on with the action; and the matter was accordingly tried before Mr. Justice Grove and a special jury—the result being again in the Company's favour, and they obtained an injunction against the Vestry upon the same principles as were down in the Court of Appeal in the Kensington case. The Vestry of St. George's were not satisfied with this; and they went to the Divisional Court, and tried to raise the controversy again, but failed.

So that in four separate Courts the Company had established their views against the Vestries. Still, this old controversy would again and again crop up, he could not help saying, much to the detriment of the ratepayers of the Metropolis. He believed the Marylebone Vestry tried to get some legislation upon the subject; but they failed. Returning to the correspondence with the Hackney Board, he said the Company wrote to the Board on May 22, expressing regret that the Committee adhered to their resolution of withholding their consent to the Company laying the main unless they placed it at the depth of 2 feet 6 inches, and pointing out that they were attempting to impose a condition which the Company were advised was quite outside the powers of the Board. If, the letter continued, the Vestries were to be at liberty to fix the depth at which mains were to be laid, it would become an impossibility for the Company to carry out these obligations; and if they were to understand that the Committee refused permission unless they agreed to this condition, the Company would have no alternative but to apply to the Board of Trade, which would be an expensive and somewhat lengthy proceeding. It was obvious, the learned Counsel remarked, that the persons who were best acquainted with the methods of laying pipes were gas companies' advisers; and they had to bear in mind all the statutory obligations which they had to observe in connection with the supply of gas and the laying of mains. The Company were obliged to supply gas at a particular pressure in every house; and therefore it was of great consequence that the mains should be so placed as to enable them to satisfy these statutory obligations. There were something like 30 parishes in London; and every surveyor in connection with these parishes had his own idea as to the depth at which pipes should be laid, with a view especially to the use of these excessive steam-rollers. Some of them, he believed, went in for a minimum depth of 6 ft. 6 in.; some, 4 feet; others, 15 inches and 20 inches; and some 2 ft. 6 in. If the Company were to observe all these requirements, it would be impossible for them to carry on their business and to satisfy their customers. It was essential that they should be able to get at a gas-pipe readily; and if a pipe was laid deep, it required a very much longer time to get at it, and there was necessarily a greater disturbance of the surface of the road. If a leak occurred and the pipe was laid too deep, the discovery of the escape was very much later, and the gas penetrated in all directions, causing explosions and dangers which did not occur when the pipes were not placed so low. Experience showed that all the pipes which had been laid for long periods in the Metropolis were safe from all ordinary traffic; and it had been shown that the larger pipes—these 18-inch pipes—were practically safe against any weight that could be brought upon them. It was impossible to crush them, so long as they were evenly laid on a good bed. With small gas-pipes, they had discovered that there was really no depth at which they would be safe from steam-rollers if subsidence occurred, because the nature of the soil of the streets of London was very often bad. Even if the Vestry had the right to make these requirements—

Mr. ELLIS (interposing) observed that the Vestry had not said they had the right to determine the depth.

Mr. DANCKWERTS replied that the Vestry made it a condition of their consent. Even supposing the Vestry had the right to make it a condition of their consent, it was in this case an absurd requirement on their part; and it became all the more absurd when they had regard to the particular circumstances of the case. Here they already had a pipe in the road at a depth of 2 feet; and the Company only sought to continue it for a very short distance. Were they to be compelled to suddenly descend to a greater depth, and consequently have to introduce all sorts of "dodges" in order to enable them to do it? They had to go to the Vestry in connection with this matter under the 109th section of the Metropolis Management Act, which required them to give notice to the Vestry or Board before breaking up the surface of the road. The sole object of this requirement was that the Vestry should, if they thought right, take precautions for the safety of the public while the streets were being broken up, and also have an opportunity of seeing that the surface was properly reinstated. And then it was provided that "no gaslight company should at any time break up or open any such pavement, surface, or soil for the purpose of laying down any new mains or pipes without the consent in writing of the said vestry or district board." Therefore, all they had to get was the consent of the Vestry to the breaking up of the surface of the road. The Company could lay the pipes at their own risk; but the Vestry must not break the "properly laid" pipes. By the decision in the Court of Appeal, they had only to have regard, in laying pipes, to the ordinary traffic. Therefore, he contended the Vestry had no right to dictate as to depth; they had no right to make it a condition of their consent that the pipes should be at a certain depth. The Acts of Parliament gave the Company the power to break up the streets and to lay their pipes under them; and all the Vestry had the right to say was that to-day or to-morrow was an inconvenient time to break up the surface, and some other period would be better. It was simply in breaking up the roads for the first time that consent had to be obtained. Once the pipes were laid, the Company had merely to give three days' notice before opening the road. The Vestry might just as well dictate the metal of which the pipes should be made, or their size, or that the pipes should be bedded in this or that way, or any other conditions which the ingenuity of Vestries was equal to suggesting. The Metropolis Gas Act of 1860 gave the Home Secretary the power of saying that the Company could lay their pipes without the consent of the Vestry; but by the Act of 1868 the Board of Trade had been substituted for the Home Secretary. Now, they refused the authority of the Board of Trade to lay down this pipe without the sanction of the Board. The learned Counsel then referred at length to the 50th section of the 1860 Act, which, he said, compelled them in such cases as this to go above the water-pipes; and he afterwards quoted various portions of the judgments in the steam-roller cases to which he had previously alluded.

Mr. ELLIS observed that before witnesses were called, he should like to say that his Board did not consider this was a question calling for scientific evidence. He indorsed almost every word which the learned Counsel had said respecting the cases which had been decided on the steam-roller question. A very ominous observation was made by his friend when speaking of the laying of gas-pipes. He used the words "one inch." Supposing the Company were intending to put the pipes in the ground only 1 inch, did they contend that they had a right to do it if they gave the Vestry the statutory notice? If this was so, it narrowed it to a very small limit. When the Company went to the Vestry to obtain their consent, they naturally, in the interest of the public and the ratepayers, said they must see that what the Company were going to do would not damnify the public in any way. The Company said it is not a question of damage in any shape or way, but a mere question of assent or dissent. The learned Counsel had not read the last two letters which had passed between the parties, and all the Vestry had done throughout was to protect the public as much as they could. If the Company would hold the Board harmless from any damage done by the steam-roller if the main was laid at a less depth than 2 ft. 6 in., then they would give any assent required. But the Company studiously refused to do this.

Mr. DANCKWERTS: Because you have no right to impose upon us any such condition.

The INSPECTOR said he thought the contention was that the Company were bound to lay the pipes at such a depth as would make them perfectly safe against ordinary traffic; but under the judgment of the Court of Appeal, they were not bound to make them good against heavy or other steam-rollers.

Mr. ELLIS quite agreed with the interpretation of that point. The Company, he went on to say, considered that a depth of 2 feet was quite sufficient; but they would not agree to the Vestry's condition—to hold them harmless for any damage done by the steam-roller to the pipe, if laid at this depth. If they would not agree to this, then the Vestry said they must go to some higher authority for permission to open the street. He did not think any of the Metropolitan Vestries or Boards would take that risk in future, considering that they had had to pay for the breaking of these pipes many times during the last few years.

Mr. DANCKWERTS observed that they were not bound to pay for the damage if the pipes were not laid properly.

The INSPECTOR said it seemed to him to be necessary that the reasons should be stated why the Board objected to give their consent.

Mr. DANCKWERTS said that all he required was a simple authority from the Board of Trade to lay the pipe. So far as he knew, the Vestry undertook no legal responsibility whatever in giving their consent.

Mr. ELLIS remarked that the correspondence showed plainly why the Board objected to give their assent. If the Company were satisfied that 2 feet was a sufficient depth, then let them take the responsibility. If the Board of Trade thought their contention unreasonable, that the main should be laid 6 inches deeper, when the Company were satisfied there was no danger, then there was an immense amount of responsibility taken off the District Board's hands.

Mr. DANCKWERTS: None at all.

Mr. ELLIS said he did not see why the Company could not come to an arrangement with the District Board the same as they did with the Chelsea Vestry.

Mr. DANCKWERTS expressed his readiness to execute at once an agreement in the same terms.

Mr. ELLIS said the Board would be willing to take the whole of the agreement with the exception of some few points.

Mr. Corbet Woodall was then called, and examined by Mr. DANCKWERTS. He gave it as his opinion that 20 inches was an ample covering for gas and water pipes. At this depth they were quite safe from damage from ordinary traffic; and any increased depth added very much to incidental differences attaching to them. He had seen the road in question; and the 18-inch main laid at a depth of 2 feet would be absolutely safe. The only cause that could lead to damage would be a faulty foundation due to a settlement upon a deep sewer or anything of that sort, which would certainly not be provided against by an extra 6 inches. It would have to be a considerable settlement to endanger an 18-inch main. He might perhaps mention that some few months ago he saw a trench opened, he believed it was in Leadenhall Street, where the ground was absolutely hollow for a length of 14 or 15 feet, and a width in some places of 10 feet. The whole of the surface was carried partly by the arching of the concrete, and partly by the gas and water pipes underneath. This had happened through filling in an entrance into a main sewer. There had been a settlement, which had loosened the joint of the water-pipe; and the escaping water had caused the earth to settle round about. It was quite impossible to provide against this kind of thing. It would be extremely embarrassing to have to lay some mains at a greater depth than others. It was essential that gas-pipes should drain in one direction; otherwise there would be an accumulation of moisture, which would cause an obstruction to the passage of gas. They must therefore be laid with a fall in one direction; and at the end of these inclinations receivers must be placed to take the deposited moisture. The multiplication of these receivers was a decided objection. It was desirable to keep the gas-main as near the surface as was safe. Where pipes were laid at too great a depth, leakage must occur at one point, and make itself evident at some 100 yards away. He could not remember a single case in which a pipe had been broken by ordinary traffic. In his opinion, the responsibility of laying the pipes should rest entirely with the Gas Company. The cost of the extra depth of 6 inches would be a very small matter indeed, and could not weigh for a moment against the other questions of safety to the public, and the convenience of the conduct of the business of the Company. It was, of course, most important to the Company to secure the safety of their pipes. The traffic in this particular road was simply that of a respectable middle-class neighbourhood. To break such a pipe as it was proposed to lay would require a very considerable strain.

Cross-examined by Mr. ELLIS: He had never given evidence on behalf of road authorities. His experience had been entirely on the part of gas and water companies; nevertheless, he tried to look at these questions fairly and impartially. If the pipe in question was properly bedded, and had a covering of 20 inches, he should not be at all afraid of the steam-roller. He had no objection to this opinion going down as his evidence for use on any future occasion.

Mr. ELLIS remarked that Mr. Danckwerts had just made a suggestion to him; but probably it would be advisable for him not to fall in with one suggestion or the other. If on the consideration of these matters and the report he should be able to lay before his Board, they thought the case was sufficient to leave where it was, and decided to leave it in the Inspector's hands, then he would communicate to the gentlemen on the other side. If not, there would have to be another sitting he supposed. He wished to remark that, in opening the case, he said on the part of the Local Authority that they wished—as his friend put it—to shunt the matter on to the Board of Trade; but that was not the exact object. Their desire was to satisfy themselves and the public that everything had been done to protect their road in the position they were placed in.

The INSPECTOR remarked that if it was necessary, he would shortly name another day for the continuation of the proceedings; but if it was not found to be essential, he would then report direct to the Board of Trade.

THE PUBLIC LIGHTING OF FLEETWOOD.—A meeting of ratepayers was held in Fielden Public Hall, Fleetwood, on Monday evening last week, to hear the report of the deputation appointed some time ago to inquire into the cost and methods of lighting in other towns. Mr. T. Seed presided, and was supported by nearly all the members of the Board of Improvement Commissioners. Mr. Tildsley, Clerk to the Commissioners, read the report, which gave many interesting details concerning the cost of electric lighting. One conclusion the Committee had arrived at was that in a town like Fleetwood, where the cost of gas is more than 4s. per 1000 cubic feet, the introduction of the electric light would ensure a considerable saving. The Committee recommended that immediate steps be taken with a view to learning the cost of introducing the electric light or water gas. It was resolved—"That the Improvement Commissioners be requested to take into consideration the recommendations made in the report, with a view to the introduction of the electric light or other light into Fleetwood."

GLASGOW CORPORATION GAS TRUST.

THE PROPOSED PURCHASE OF THE PARTICK, HILLHEAD, AND MARYHILL GAS-WORKS.

A Special Meeting of the Town Council of Glasgow, sitting as the Gas Trust, was held last Thursday, for the consideration of the minutes of the Gas Committee bearing upon the purchase of the business, works, and plant of the Partick, Hillhead, and Maryhill Gas Company. The recommendations of the Committee, briefly stated, were as follows:—(1) The holders of the 5½ per cent. preference stock (£30,000), to be paid the amount of their stock, and 10 per cent. premium. (2) The holders of the ordinary stock (£99,300), to be paid the amount of their stock, less 10 per cent. discount. (3) The Gas Trustees to assume the debenture debt and the other liabilities of the Company, and to be entitled to all assets.

Lord Provost Sir JAMES KING moved the adoption of the minutes; and in doing so said he would not go into detail, or into any of the figures, with which he had dealt at the private meeting of the Council on the preceding Thursday. He explained that the bargain would not be binding until it had been accepted by the shareholders of the Company; and therefore he did not think it was desirable that they should show their hands by stating fully all the facts and figures which had weighed with the Committee and also with the Company after receiving the report of the Committee in coming to their decision. He might say that none of them would desire to make a purchase of the concern in question by itself; but they did think that, in the event of the boundaries of the city being extended, the presence in their midst of another authority having powers, like themselves, of supplying gas to the community, would be very objectionable. They considered it was desirable that it should come into the hands of the Corporation, and that the whole supply of gas throughout the entire city should be undertaken by the Council. It seemed to them there was no time more favourable than the present for carrying through such arrangements; and while the sum which had been conditionally agreed upon was large, and a very liberal one, they did not think there was any prospect of its being obtained compulsorily or by private agreement afterwards, on terms more favourable—if, indeed, it could be obtained on equally favourable terms. The sum which it was proposed to give was £172,870, of which £50,500 did not go into the hands of the Company, but would be applied in taking up the debentures from time to time as they fell due. The amount to be paid to the Company, therefore in the event of the bargain being carried out, after the Annexation Bill was passed, would be £122,370, which they could divide in the form they thought best. Besides paying this sum, they were to take the responsibility of £4700, which was being expended in the improvement of the works and the erection of a new gasholder, and to allow the Company £500, being the balance of their profit and loss account subject to the audit of their professional auditor. On these terms, the Committee met with the Directors of the Company; and he (the Lord Provost) believed he could say the whole of the Corporation were all but unanimous in recommending that the bargain should be agreed to, so far as they were concerned. Reserving to himself the right of going into figures afterwards, he formally moved the approval of the minutes.

Ex-Bailie URE (who, as the Convener of the Sub-Committee on Works, was one of the negotiators with the Gas Company) also reserved to himself the right of explaining afterwards.

Lord Dean of Guild WALLS remarked that disputes had previously occurred as to the right of making any reservations; and he thought all statements should be completed there and then.

Mr. CALDWELL seconded the motion.

Bailie McFARLANE said that he had been given to understand that a good part of what was said at the private meeting of the Council had gone forth to the public, and had been freely discussed. Under these circumstances, he would request the Lord Provost to go into his figures at that stage of the proceedings.

Preceptor OSBORNE asked where a report of last meeting's proceedings had appeared, as he had not seen it.

Bailie McFARLANE replied that the proceedings had gone out to the public; and some of the objections which he had made had appeared in print. Who was responsible for this he could not say. Those remarks had been the subject of conversation in the city; and therefore it seemed they were pretty widely known. He then moved that the minutes be not confirmed, on the ground (1) that it was unnecessary to acquire the Partick, Hillhead, and Maryhill Gas Company's undertaking; (2) that Mr. Hawkley's report on the subject was not a sufficient basis for negotiation; (3) that the terms proposed were excessive; and (4) that the acceptance of the terms would cause a serious loss to the Gas Trust annually. So far as the details of the agreement were concerned, he had no fault to find. The first point which he wished to take up was whether or not it was necessary for the Corporation as the Gas Trust to acquire the works. As a general principle, it was desirable that there should be only one gas undertaking supplying gas to the City of Glasgow at large. There came, however, the serious question whether they ought, as a matter of policy, to continue to extend their gas-works as they were doing. He considered they should now draw the line as they saw fit. It came to be a question whether they should be like some huge octopus throwing out its tendrils on every side, and driving all into its capacious maw. As a matter of fact, they did not require the works in question. Referring to the Gas Company's balance-sheet of 1888, he pointed out that the account for coals last year was £300 less than in the preceding year, and that there had been an additional £3400 worth of gas produced. While £300 less had been paid for coals, yet there had been no substantial reduction in the cost of the higher priced coal. Then there was the fact that the total income had been lessened to the extent of £1600 or thereby, in consequence of the reduction of 2d. per 1000 cubic feet in the price of the gas. Comparing the illuminating power of the Corporation gas and that of the Company, he said the standard in Glasgow was 23·1 candles; whereas the standard of the Company's gas was from 17 to 18 candles, and it had been as low as 14½ candles. On the question of assets, he showed that the works, pipes, and meters of the Company were valued at £180,000; and he pointed out that Glasgow was already furnished with pipes quite sufficient to supply in large measure all the demands that might be made upon them. Another strong argument which had been used, he said, was that they were only being called upon to pay about £23 per million cubic feet of gas made; whereas the price paid for the old Companies' works was from £39 to £40 per million feet; and the price recently paid for the Edinburgh and Leith gas undertakings was about £34 per million feet. But in comparing the concern under consideration with the works taken over in 1869, they were comparing things that were entirely different. When they acquired those works twenty years ago, they got a huge monopoly into their hands; and if they considered the different rates for gas they would find that the relative prices were against the Maryhill works. Again, looking to the financial position, if they included the cost of concentrating the work at Dawsholm, they would require to spend £200,000. Against this, however, they had to consider the revenue, which last year amounted to £31,000, and which left a gross revenue of £9200. During the present year, however, they had reduced this by £1800, by taking 2d. off the price

of gas—making the surplus £7400. After allowing for depreciation and other outlays, the sum of £2900 was left to pay the interest on the £200,000, which was less than 1½ per cent. On these and other grounds, he submitted his amendment.

Baillie GRAY seconded the amendment; and in doing so, took exception on general grounds to the whole question being brought up now. In the first place, he did not consider that the Boundaries Committee had any business in going into the matter without a remit from the Town Council; and he further thought that the whole procedure in connection with the matter had been far too hasty. As to the terms of the bargain, it was proposed to take up the 19,800 ordinary £5 shares, which had paid no dividend for some years, except in 1885, when they paid 2½ per cent. Now the valuation which the shareholders themselves placed on the stock last year was £37,720. After the evidence of Mr. Osborne before the Boundaries Commissioners as to the probability of the works being taken over, the value rose to £76,680; and now it was recommended that they should pay £89,870. In regard to the preference stock, there were 6000 £5 shares, valued last year at £27,750, and for which it was recommended that they should pay £36,000. In addition, they were not sure of the debts that were to be assumed. They had not the accounts of the Gas Company before them; and they had very little information to enable them to come to a proper decision on the subject.

Mr. W. WILSON supported the amendment. He thought that to carry out the proposal of the Committee would be a serious blunder; and he referred to the rise in the price of the Company's stock from 40s. to about 90s. per share. The shares he believed to be in the hands of a few "wire-pullers," who would be the gainers by the transaction. They were about to spend £150,000 in extensions at the Tradeston Gas-Works, which he considered was enough. He was sure that while they wished for annexation, they could not but feel that they might pay too much for it; and he had therefore much pleasure in supporting the amendment of Baillie M'Farlane.

Mr. PATON observed that the question under consideration was, of course, one in which it would appear that they were endeavouring to bring all round, so as to accomplish a certain purpose; but if those gentlemen opposed to the bargain had paid the same attention to it as the Gas Committee, they would have come to a like conclusion. They had to keep in mind that, after all, it was to a large extent buying the goodwill of a business—the annual revenue being something like £36,000 or £37,000—and a business, too, in the best part of the city. It was a quarter of the city where the quantity of gas required was likely to be larger than in any other part; and consequently they might reasonably expect that the annual revenue would be doubled in a few years. The Partick Company could give advantages to customers which the Corporation, bound by statutory regulations, could not do. The result was that the Company were getting the gas supply in almost every new building, simply because they could provide the pipes, which the Corporation could not do. He had listened with some astonishment to the remarks of Baillie Gray, when he said at the private meeting that the Committee went further than they were authorized to do. While he had a little sympathy with that remark, they ought to recognize that the Committee on that occasion acted for what they considered to be the very best interests of the city. They knew that the matter was one which was in its initial stages, and when it could not be talked of publicly. It might or might not have been a little irregular at the beginning; but it must be admitted as having done very good work. It also seemed as if Baillie Gray said that, on account of the action taken by the Corporation, the value of the Gas Company's shares had risen from 41s. or 42s. to 90s. He considered that Baillie Gray was not acting fairly towards the Council in the matter. There were other causes for the rise in the value of the stock besides the action of the Corporation. It was well known that in recent years the Partick Company had encountered serious difficulties, and had been unable to pay a dividend; but these difficulties had now been very largely surmounted, and last year the Company, he was informed, actually paid a dividend of from 4 to 5 per cent. The principal cause of the rise in the value of the shares was that the Company had now emerged out of its difficulties, and the shareholders and the public thought there was a fair prospect of the concern in the future being able to pay a good dividend. They knew very well that if annexation was to take place, they would have to give the Company a *quid pro quo* in some manner or other; and he thought it would be better if the Town Council took advantage of the present favourable opportunity than go to arbitration.

Baillie SHEARER objected to the proposed purchase; and he expressed a fear that they were paying too dear for their "whistle" in connection with the extension of the boundaries.

Baillie SIMONS, referring to the terms on which they were to acquire the works, remarked that Mr. Hawksley's report had not been founded on the present market value of the shares, but on ten previous balance-sheets—not one, as Baillie M'Farlane would lead them to infer. After the Annexation Bill passed through Parliament, they would be compelled to buy the works; and he would like to know if they could possibly make more favourable arrangements under compulsory powers than at present. Were they to acquire the works, they would be a source of profit, apart altogether from the question of smoothing the way for annexation.

Several other members having spoken, chiefly in support of the proposed purchase being made,

The LORD PROVOST said that if a decision were not come to at that meeting, the question would have to be decided by the new Council, which was not desirable. As to the winding up of the Company, he observed that the expense would probably not be more than £200, unless there was litigation, and that could only be between the different classes of shareholders, and not between the Company and the Corporation. Replying to a question, his lordship went on to say that the purchase depended entirely on the proposal for the extension of the municipal boundaries being carried. He pointed out that the gross profit of the Company last year was £14,100. If from this they took off £2500 paid in respect of debentures, and £1650 for interest payable on the £30,000 of preference stock, they would have a sum of nearly £10,000, which they could allocate as they liked—between depreciation on the one hand and to the shareholders on the other. The price to be paid, he did not think unduly large. It was not a purchase he would recommend apart from annexation; but if the Annexation Bill was passed, a settlement of the question on the terms proposed, while a full and liberal one towards shareholders of the Company, would not, he thought, give the Corporation cause of regret.

The motion was agreed to by 30 votes against 9.

The LORD PROVOST subsequently stated that they were not under any obligation whatever to go to Parliament in the present year to sanction the terms of purchase agreed upon. If they decided not to go on just now, the Directors of the Company could have no ground of complaint against them; but he would like it to be understood that, in the event of the Annexation Bill failing, they would, of course, not continue with the application. Taking all things into consideration, however, he was himself in favour of serving the notice to go on this year.

Mr. URE agreed with the Lord Provost, and said that in the works Committee several re-arrangements had already been kept back with a

view to seeing whether they were to have possession of the works and it was putting them to considerable inconvenience.

Some further discussion took place; and it was eventually agreed, that a Private Bill to sanction the purchase should be promoted this year, only contingent on the passing of the Boundaries Bill to be proposed by the Government.

THE CHARGES IN CONNECTION WITH THE HALIFAX GAS COAL CONTRACTS.

On Monday last week, Mr. Alderman Riley's Solicitors forwarded to the Mayor of Halifax (Mr. Alderman J. Booth) a draft of the indemnity which they proposed should be given to Mr. Riley by the Corporation. The draft was revised by the Town Clerk, and returned amended. The main difference between the terms of the indemnity as drawn by Mr. Riley's Solicitors and that given to Mr. Fox is, we believe, that Mr. Riley seeks to confine his accusers to proving that he has corruptly received money by way of commission or bribe on coal or other goods purchased by the Halifax Corporation for the gas-works. This, it is thought, was hardly likely to be entertained by the Town Council; and it is understood that the Town Clerk has altered the form of indemnity. The matter is to come before the Council at a special meeting to-day, when a proposal may be made authorizing the Mayor to sign the deed of indemnity to be given to Mr. Riley.

The Mayor, addressing last night week a meeting in connection with the municipal elections, alluded at some length to the "gas scandal," with the object of justifying the action of the Council in giving an indemnity to Mr. Fox. Proceeding, he said Mr. Fox must now prove his case or bear the brunt himself. He believed the bulk of the people expected that, these charges being put in the form of a very strong libel, those concerned would take action. But they knew that Mr. Carr would not fight—he had said he would not. They had also had a letter from Mr. Wrigley, who was implicated as the coal agent who had contracted to supply a particular kind of coal and had sent a different quality, and he said he would not fight. He (the Mayor) thought that as time went on they would find that none of the accused persons would fight. Then the question arose, Was the matter to quietly subside because these people would not take action? He thought not. There were other resources open. He thought it would be the duty of the Corporation to sue Mr. Wrigley for the difference in the value of the coal contracted for and that supplied. That was one step. He thought another would be to ask the Lord Chancellor to send down a Commissioner to examine people on oath, and take evidence that would get to the bottom of the whole matter. If the thing was unsound and corrupt, let it be known. He (the Mayor) would certainly do everything he could to "bottom" it thoroughly. The people of Halifax might feel assured, and take it from him, that if it was possible to find out and get clear knowledge of what had taken place, he would do everything that lay in his power to accomplish it. In a subsequent speech the same evening, his Worship suggested that the Corporation ought to adopt a Standing Order providing that no member should occupy the position of Chairman of a Committee for more than three years. If they had passed such a resolution half-a-dozen years ago, the members of the Gas Committee would not have had such blind confidence as they had shown.

At a meeting held last Thursday evening, Mr. Binns, a member of the Gas Committee, said that when the charges were made Mr. Bairstow raised the question in the Committee, and insisted on the Committee being informed of them. They were peremptorily told by the Town Clerk that they had handed the matter over to a Committee of three gentlemen, and now had nothing to do with it any more than the other Committees. Therefore they thought they were politely "shut up," because the Town Clerk was their legal adviser. The Mayor had gone about and done just as he pleased—investigating what he thought proper. There was a policeman placed in the office at the gas-works. The Committee did not know, until the Council meeting a few days previously, who was to be charged, and therefore they had indeed been "dumb dogs." The Committee included gentlemen above suspicion, and they hoped everything would be done to bring to light any malpractices which had been going on. They had been kept in the dark, and had to wait the unravelling of events; and they therefore thought their best policy was to keep their mouths shut until they heard the charges against them. A long array of questions, all on the "gas scandal," was sent up in writing for Mr. Binns. Replying to them, he said he did not know of any commission being paid to the Chairman of the Gas Committee. He was not aware, until the statement was made, that every truck of coal was not weighed. He had seen the weighing-book, the entries in which went back for two years, and he did not think that there were three where the coals were recorded as being under weight. He explained that the difficulty about weighing every ton of coal coming into the works arose through the delay and inconvenience caused to the Railway Company in shunting. As to testing the quality of the gas, the Committee at their last meeting appointed Mr. Ackroyd, Borough Analyst to take two observations a week, and report them to the Committee. Tests of the quality of the coal had been made by Mr. Carr, and these tests, when required, had been laid before the Committee. Mr. Carr, for some reason, had abstracted a number of pages from the test-book. The Committee had not given any orders for the weighing-machine to be mended, and he was not aware that it had been out of order for three months. He was not prepared to say they had received an inferior class of coal to that specified in the contracts. His own honest conviction was that not a single pennyworth of coal went into the gas-works but what was of legitimate market value.

Mr. Bairstow was present at another meeting held on the same evening, and also alluded to the subject. He explained that, though a member of the Gas Committee, he had not, on account of a personal difference with the Chairman, taken a very active part in conducting the works. The late Manager (Mr. Carr) thought fit one day to "interview" him (Mr. Bairstow); and he gathered certain information from Mr. Carr. After hearing his explanations, he asked him if that was all he had been guilty of; and on being assured that it was, he said, "If that be so, I should be the last man in the world to visit the sins of the whole country upon your head, if there's nothing else to be charged against you." He added that, as the Mayor had undertaken that Mr. Carr should have an indemnity provided he justified himself, he (Mr. Bairstow) promised to help the Mayor in paying any expenses that might be incurred. Other things had arisen since then; and the meeting would not expect him to say more upon the subject. Being asked whether, on the occasion of the construction of the last gasholder, Mr. Carr did not get £700 in addition to his salary, Mr. Bairstow said he had not the figures at that moment, but Mr. Carr did get a commission. ("Shame.") No; it was not a shame. ("He was a servant.") But Mr. Carr did not go into the service of the Corporation to construct a gasholder. He worked entire nights on the plans for it. He should say that by employing Mr. Carr on the work the Corporation saved 2½ per cent. on the value.

Alderman Ramsden, who was one of the three members of the Investigation Committee (the other two being the Mayor and the Town Clerk), also spoke at a public meeting on Thursday evening. He said it must be remembered that as yet they had only suspicion, accusation, and remarks

about certain persons as to certain things being done; but these were very serious indeed, and, as he thought, very well based. Beyond this he thought it would not be fair for him to go. The inquiry they had to undertake was to ascertain where the guilt lay, and, if possible—and surely it was possible—to bring forth sufficient evidence to satisfy all of them as to the truth of those accusations. If the statements were untrue, those who were innocent should be completely cleared in the eyes of the public, and those who were guilty should be punished as they deserved. Accusations of a grave character had been made; and it was naturally expected that the persons who were accused would in some way or another proceed to defend themselves. If they failed to do this, then the difficulty arose as to what should be done. He was of opinion that not all those who were accused would enter the Courts of Law, where there might be an opportunity of ascertaining the guilt or innocence of certain persons. Failing this, he still thought “the resources of civilization” would not be quite exhausted as to the means of getting at the truth. Charges had been made of supplying to the Corporation a smaller quantity of goods, and goods inferior in quality, to those which had been bought and paid for. Surely there was some process in the law by which this could be proved, and, if proved, some method by which at least there should be disgorgement—a giving up of that which had been unlawfully obtained. But there were other ways, even if this course should not be resorted to. There was said to have been an interference with the property of the Corporation at the gas-works—an interference with books; and surely this was an unlawful thing. If books containing entries which should be valuable to the Corporation had been tampered with, even to the extent of cutting out the leaves, there were means by which punishment might be accorded to the persons proved guilty. Throughout England this matter was looked upon at the present time with extreme anxiety, because in other boroughs charges were being made, or would be made before long, quite as serious as those in Halifax. For himself, this scandal was about the most painful thing he had ever had to do with.

Another member of the Gas Committee (Mr. Bramley) told his constituents that Mr. Carr served them faithfully for 13 years, so far as they knew, and had the full confidence of the Council and Committee. The way in which he had been held up to the public was surely a great punishment to him; and if he did not go into a Court of Law to clear his character, he (Mr. Bramley) was not going to blame him. The course that was being pursued—providing indemnities and finding work for lawyers—was a method of which he did not approve. So far as he could see, it was not leading to any satisfactory result; and the probability was that some other course would have to be adopted. Any reasonable and just course he would support with all his heart.

At a meeting last Wednesday evening, Mr. Brook, who was also on the Gas Committee, said he was informed that the Mayor and Town Clerk had gone to London to make some inquiries, and probably to ask that a Commissioner might be sent down to investigate the matter. He had been one of the three appointed to superintend the work during the time Mr. Carr was away from home, and though at the works almost daily, and having everything open to his investigation, he never observed anything that led him to think affairs were not straight and fair. The Gas Committee had been almost in the hands of the Chairman and Manager during the past ten years, and he thought it was a fault for a Chairman to remain so long on any Committee, as it did not give the other members an opportunity to rise to such a position. To his mind matters would turn out better than was expected. The contracts for coal, so far as he was concerned, had been gone through fairly, and the opinion of experts taken.

ROCHDALE CORPORATION GAS SUPPLY.

THE RECENT CHARGES IN CONNECTION WITH THE COAL CONTRACTS—THE PRICE OF GAS.

At a Ward Meeting held, in view of the forthcoming municipal elections, at Rochdale on the 11th inst.—Mr. J. LEACH in the chair—the subject of the coal contracts of the Corporation Gas Committee, which, as will be remembered, recently gave rise to some discussion in the Council, were referred to.

Mr. PARKER said he thought some explanation was due from him as to the very disturbed and excited state of public feeling which had been caused in the town by Mr. Evans making known at a public meeting a private conversation which had taken place between that gentleman and himself respecting the town's affairs. On meeting Mr. Evans, he (the speaker) told him that he agreed with the Council in everything they had done since he joined them, saving the acceptance of the coal contract recommended by the Gas Committee. He had been greatly blamed for saying what he did to Mr. Evans; but he was prepared to defend everything he had stated to him. The only thing that needed explanation was the difference in price between the coal the Committee had decided to buy and that which they might have purchased, and to which he had drawn attention. The prices charged by the Wigan Coal and Iron Company, whose contract the Committee had accepted, were 9s. 3d. and 7s. 6d. per ton; whereas the prices he had alluded to were 7s. 3d. and 6s. 6d. The average prices of the two lots of coal were 8s. 4d. for that of the Wigan Coal and Iron Company, and 6s. 10½d. for the other. The cheaper coal would produce 9240 cubic feet of 18-7-candle gas per ton; and if its price and illuminating and producing powers were considered, it would be found to be rather over than under 1s. below the cost of that of the Wigan Coal and Iron Company. The Chairman of the Gas Committee had referred to some coal which was 11d. a ton cheaper than that accepted by the Committee, and had said that this coal would only produce 17-candle gas. He (Mr. Parker) adhered to his original statement that that coal would produce 9300 cubic feet of 18-62-candle gas per ton. In the Council Chamber, Mr. Alderman Baron stated that an increase of one candle in the illuminating quality of the gas made was equal to a difference of 2s. 6d. per ton in the price charged for the coal. If this were so, the Gas Committee had refused to accept a coal the value of which was 7s. 6d. a ton more than that of the Wigan Coal and Iron Company, because it would make 9860 cubic feet of 21-candle gas per ton; and by so doing they had caused a loss of £1750 to the gas consumers of the borough. This was apart from the loss of 1s. per ton on the 20,000 tons of coal previously mentioned. He (the speaker) had practically been forced into this matter by the remarks made by Mr. Evans at the public meeting; but he certainly still adhered to everything he had said before.

Mr. Duckworth criticized the action of the Gas Committee in proposing an increase of salaries, and said he could only account for the proposition on the ground that the Committee were flush of money. It would be better if the Committee had less money to spend, and if the townspeople were supplied with gas, not at cost price, but at a price nearer its price to the Committee. If the reduction in the price of gas could not be obtained without increasing other rates, then let those rates be increased, so that the people might know what it was they had to pay for. At present the Committee were subjected to a strong temptation to use money in a way they would not do if they had less money to spend. He did not charge the Committee with either wilful waste, indiscretion, or

want of judgment; he was simply pointing out something to which they were liable by force of circumstances. Shopkeepers were compelled to do their business after dark, and to use gas for attraction and display as well as for business. Gas was an absolute necessity to them; and yet in Rochdale they had to pay almost double what they ought to be charged for it. This was, to his mind, a very great injustice.

Alderman PETRIE said he had thought Mr. Parker had not another word to say on the subject of the coal contracts; but he chose to stick to his text, and had again asserted that there was a coal which was very much cheaper than the coal the Committee had bought, and that it would produce quite as many thousand cubic feet of gas per ton. Well, Mr. Parker took care not to mention the name of the coal or that of the people who sold it. Mr. Parker had not told the Committee where it was to be obtained; and he (the speaker) denied the truth of the statement that there was such a coal as he mentioned at the price, producing as many feet of gas per ton. It was utterly false; there was not a word of truth in the statement. Wondering how Mr. Parker came to say such a thing, he obtained a clue to it from another statement Mr. Parker had made. He spoke of a coal to which the Committee thought he was referring—the coal that was 11d. a ton cheaper than the coal they had bought—and stated that this coal would make 19-candle gas. He said so because he had seen it advertised. Well, to take an advertisement of what a coal would do was simply absurd; and if Mr. Parker knew how to go about the business rightly, he would never dream of doing that. The information the Committee had was that which the proprietor of the coal himself gave. He told them the number of thousand cubic feet of gas it would make, and said it would yield gas up to 17-candle power. When choosing coal, taking its proprietor's statement as to what it would do, and then testing it, the Committee found that in nine cases out of ten the coal did not quite justify the statement. In fact, it often came a long way below it. But in this case, even on the proprietor's statement that the coal would produce 17-candle gas, it was put out of the books altogether; it would not do for the Committee.

Alderman SIMPSON said he could not endorse Mr. Duckworth's statements as to the price charged for gas supplied by the Corporation. The object of a recent public meeting was to urge the Council to reduce the price of gas to 2s. per 1000 cubic feet; but only that day the Gas Committee had received a communication from one of the local associations saying “Don't lower the price of gas at all.” As the Corporation had to trade in both gas and water, they ought to make the two undertakings balance each other. The Corporation already charged an extra price to gas consumers outside the borough; and if the charge was lowered within the borough, he feared that the extra charge to outside consumers would have to be given up. People beyond the borough were supplied with Corporation water at less than cost price. Was the Corporation to give them also the advantage of having gas at a reduced price, and tax the residents in the borough to make up the deficiency so caused?

A vote of thanks was accorded to the retiring councillors, and the proceedings closed.

EDINBURGH AND LEITH GAS COMMISSION.

At their Meeting on Monday last week, a variety of questions engaged the attention of the Edinburgh and Leith Gas Commissioners. With respect to the petition of the *employees* at the Leith works to be put on the same footing as to wages as the Edinburgh workmen (see *ante*, p. 600), the Works Committee, to whom the matter was referred, reported that they had made a remit to the Engineers to report generally on the subject of hours and wages of the men. In connection with an application for a supply of gas to a mill at Colinton, it was estimated that the necessary piping would cost £1960. If the residents at Colinton undertook to use gas, it was suggested that the pipe should be laid at the Commissioners' expense; and the gas supplied at 4s. 2d. per 1000 cubic feet. It was reported that tenders had been entered into for the supply of coke at 6s. and 6s. 6d. a ton. It was agreed, on the recommendation of the Finance Committee, to pay the parliamentary expenses of the burgh of Leith (£1009) incurred in connection with the Gas Bill; also to settle with the Edinburgh and Leith Gas Company for the payment of stores (£23,000). Certain financial arrangements in connection with this matter were explained by the Clerk, who stated that the £28,000 of mortgages at 3½ per cent. asked for had all been subscribed. He also mentioned that he had written to the Leith Company, asking if they would accept payment in instalments, but they had declined. It was resolved that the system of book-keeping of the Edinburgh Company should be adopted, subject to such modifications as experience might suggest. Mr. Beveridge, it was reported, had decided that the Companies were entitled to interest on the price of their stores from Aug. 1. A statement from Messrs. Davidson and Syme was read concerning the final accounting with the Edinburgh Gaslight Company. One of the items referred to was a sum of £2163 14s. 6d., which represented deposits by consumers, some of which dated as far back as 1849. It was also mentioned that a sum of £635 for retorts was open to discussion. The documents, which were of a bulky nature, were sent to the Finance Committee. In regard to the account of the Parliamentary Agent for the Gas Bill (Mr. Beveridge), it was stated that this amounted to £4719 8s. 6d., of which he had been paid £3000 on account. It was agreed to pay a further £1000 on account; and to arrange for having the accounts taxed by the Auditor of the Court of Session. A communication was read from the burgh of Leith, asking that the supply of gas to the public lamps should be put on the same basis as in Edinburgh. The question was remitted to the Works Committee for consideration. A number of other matters of a routine nature were disposed of.

THE TESTING OF SWANSEA GAS.—At the meeting of the Swansea Town Council last Wednesday, the Town Clerk (Mr. J. Thomas) presented a report on the subject of the existing regulations in regard to the testing of Swansea gas. He pointed out that the only legal testing-place is at the works, and that any examination made elsewhere would be valueless in a Court of Law. At the same time he recommended the Council to consider the advisability of having their photometer put in proper order, and of appointing a duly-qualified examiner to make tests of the gas for the general satisfaction of the Corporation and consumers. The consideration of the matter was deferred for a month.

THE DINSMORE GAS PROCESS AT WIDNES.—At the last meeting of the Widnes Local Board, Mr. Gaskell, in moving the confirmation of the Gas Committee's minutes, remarked, in reference to the Dinsmore gas process, to which the Engineer (Mr. Isaac Carr) had alluded in his report, as mentioned in the *JOURNAL* last week, that the 13,000 cubic feet of gas per ton of coal which they were obtaining was produced with the use of only half their tar. If they could have used the whole of the tar, the quantity of gas might have been larger, and the quality better. In addition, the gas contained less sulphur compounds, other than sulphuretted hydrogen, than the ordinary gas, and was of a more permanent composition. He believed that such results as these had never before been attained in any gas-works on a manufacturing scale.

THE BIRMINGHAM GAS UNDERTAKING.

A VINDICATION OF THE CORPORATION MANAGEMENT.

An interesting pamphlet, constituting a retrospect and a vindication of the management of the gas undertaking by the Birmingham Town Council, has just been prepared by Mr. H. J. Manton, who, as a member of the Gas Committee and Works Sub-Committee, has had exceptionally favourable opportunities of making himself acquainted with the entire working of the concern. The history covers a period of twelve years; the purchase of the undertakings of the two Gas Companies having been completed on Dec. 31, 1875. A statement is given of the growth of the capital account, the separation of several outside districts, and the development and improvement of the works. Mr. Manton recalls the statement made by Mr. Joseph Chamberlain in March, 1874, of what would have been required to be spent by the old Companies for extension of works, and uses it as a basis of comparison with what has actually been done.

Mr. Chamberlain is reported to have said, "that the sale by the Staffordshire Company had increased during the previous ten years by 5 per cent. compound, and that of the Birmingham Company by 6 per cent. compound. Assuming 5 per cent. compound to be the average, the Companies would, in 14 years following, have had to raise, for extension of works to meet the demand, the sum of £1,000,000." During the period of Corporation management the alterations and extensions at the works have been very large. The Saltley works have been increased; and the Windsor Street station has been almost entirely reconstructed. The Fazeley Street station has been abandoned, and the site let. The Swan Village and Adderley Street works have been put into substantial repair. Considerable amounts have been written off for antiquated and abandoned plant. Neither of the larger works are complete; but as they at present stand in regard to producing power, the comparison with their daily capacity at the transfer is as follows, in millions of cubic feet:—Total capacity of the works in 1875, per day 15,047,000 cubic feet; total capacity of the works in December, 1887, 20,500,000 cubic feet; the completion of the purifying plant at Saltley, equal to retort and storage capacity, will add 1,500,000 cubic feet; and the filling up of the Windsor Street retorts, 4,050,000 cubic feet—making a total productive power of 26,050,000 cubic feet. The estimated capital expenditure required to provide for this increase during the next seven years is £45,000; a further estimated expenditure of £130,000 will complete the Windsor Street works, and bring up the total production per day to 32,500,000 cubic feet. Thus, for an actual net expenditure of £293,409, and an estimated expenditure for completion of £175,000—making a total of £468,409—the Gas Department will be enabled to meet the requirements of the next 12 or 15 years, at less than half the amount which was expected to have been spent up to the present date.

Passing next to the question of the gas sales, Mr. Manton states that the estimate was an increase of 5 per cent. compound per annum. The sale of gas in 1875 was 2327 millions. Over the same area as at the present time it was 2120 millions. The sale of gas in 1880 was 2676 millions. In 1887 it was 3378 millions, which is upwards of 4 per cent. per annum compound on the sale of 1875 over the same area. Thus it will be seen that while the estimate formed as to the increase of the public requirements for gas has not been quite realized, the corresponding outlay on capital account has been much less in proportion and the economic administration of the managers of the department verified.

Mr. Manton then goes on to speak of the charges for gas; and to compare them with those of other corporations and commercial companies; pointing out, as regards the former, that meter-rents are an item that is frequently overlooked in comparisons sometimes made to the disparagement of Birmingham, and that there are other local circumstances needing to be remembered before such comparisons are trustworthy. He shows that the difference between the highest price in 1875 under the Companies and that of 1888 under the Corporation is 11d. per 1000 cubic feet. The average difference is as follows:—1875, 3s. 1½d.; 1876, 2s. 10d.; 1880, 2s. 7½d.; 1888, 2s. 2½d. Thus it is apparent that the advantages gained by the public from the purchase of the gas undertaking have not been obtained by undue hardness of prices for gas, and may briefly be recited as follows:—Returned to consumers in the shape of reduction of prices from 1876 to 1880, on the basis of the prices of 1875, £210,000; reduction of prices from 1880 to 1887, on the basis of the prices of 1880, £365,000; contributions to rates and public purposes, £352,000—total, £927,000. As proving that this result has been obtained by efficiency and economy of administration, Mr. Manton quotes, from Field's "Analysis" for 1886, figures relating to the gas undertakings at Leicester and Nottingham. In the former town the manufacture of gas is carried on under the nearest conditions of similarity with Birmingham—little canal being used, the illuminating power being the same, the same proportionate capital invested, and the undertaking acknowledged to be well managed. Nottingham, however, differs from Birmingham in the use of 29 per cent. of canal, while the illuminating power of the gas is 1½ candles higher. The following are the figures cited, which show the cost per 1000 cubic feet of gas sold in the three places, namely:—

	Leicester.	Nottingham.	Birmingham.
Salaries and distribution wages	1.61d. ..	2.24d. ..	1.36d.
Total working expenses, including salaries, wages, and depreciation	11.36 ..	12.26 ..	11.59
Coals	5.46 ..	5.23 ..	5.22
Interest and sinking fund . .	8.65 ..	8.56 ..	7.29

Mr. Manton then goes on to vindicate the engineering and economic administration of the Gas Department, and sums up his case as follows:—"In concluding this survey of the financial and economical administration of the Birmingham gas undertaking, those now entrusted with its management readily bear testimony to the great ability which their predecessors brought to bear upon it, and the extent of the work done. The old Companies were about to launch out into extensive operations. The new managers were compelled at once to deal with the requirements of a rapidly-increasing town, to provide for an increase of producing power which should cover the probable wants of a generation. They were necessarily new to the work; and yet their successors are unable to point to errors of any magnitude, or expenditure on reckless experiment. The outlay they authorized has been made mainly on existing lines; and the departures therefrom, and from ordinary methods of production, have been chiefly in the direction of mechanical provision for the saving of labour and for the comfort of the employees—relieving them from that part of the carbonizing which is most physically trying to health and endurance. The table shows that there has been a substantial improvement in the quality of the gas over that supplied by the old Companies or stipulated by Parliament; and comparison of the cost of official supervision with other corporations and gas companies tells favourably for the Birmingham gas undertaking. Whatever success has been attained in approach to administrative completeness is due to the manner in which the Gas Committee have been served by its staff—the servants of the department—as well in the able reorganization of the office as in the conceptions of the Engineers. The employment of engineering experts would probably have increased the cost of plant; and the control of any Committee over the

outlay of such professional assistants would necessarily be less than its control over its servants. That the early managers were wise in their decision the event incontestably shows. It has been, both in Parliament and outside, a subject of discussion as to whether it is wise for the local authorities to supersede private associations in the supply of gas and water to the community. The opposition in respect of the supply of water being under public control has always been weaker than in respect of the supply of gas. At a very early date this was recognized by the House of Lords in the insertion of a clause in a Company's Bill obtained in 1854, giving power to the Corporation to buy the water undertaking within two years, and limiting the dividend upon new shares to a maximum of 6 per cent. The whole subsequent course of water legislation as affecting Birmingham, and the acquisition of the works, has had this basis—that the supply of water, being a sanitary necessity, the Sanitary Authority (having acquired the control), should not administer with a view to a profit; thus eliminating from the water undertaking the character of being a trade concern, which it possessed in the hands of a joint-stock Company. As to the gas supply, these conditions and limitations were wanting. The Corporation acquired no monopoly either of the supply of gas or of the method of lighting. Anyone can make for himself, if it pay to do so, or choose any other illuminant that pleases him. The manufacture is then conducted essentially on conditions such as existed under the Companies; and in no sense is it justifiable to regard the gas undertaking as a branch of the general corporate administration. That this was the light in which the Council of 1875 regarded the new property is clear from the manner in which they treated the new Committee, and the complete and entire confidence they reposed in it, by committing to it the delicate work of arbitration with outlying authorities in the event of any of them desiring to purchase the portion of the gas-works within their jurisdiction, and by bestowing on the Committee all the powers conferred upon the Council by the Gas Act of 1875—reporting from time to time thereon. This delegation was further important, inasmuch as it conferred on a Committee the control of a capital of more than two millions, and the exercise of a large patronage and influence, but accompanied by an immense responsibility, and demanding an arduous and disinterested devotion on the part of its members. To the responsibilities attaching to the conduct of a large trading concern have been added anxieties arising out of the connection with a Corporation which of necessity has been of a political character. In the hands of a representative authority, it may be difficult on all occasions to decide matters apart from the effect of such decision on political necessities; and to the usual arguments and conditions which would affect a rise or a fall of prices, have been added arguments as to the claims or otherwise which the common fund of the borough had upon the revenues arising out of gas manufacture. To steer a clear and a wise course when such occasions arise has been a task which would have taxed the ablest of administrators. Still it can justly be claimed that the revenues of the gas undertaking have relieved the strain on the borough fund, which has arisen out of a possibly too generous outlay in town improvements, maintained the efficiency of the works, observed a generous policy towards the officers of the staff, and provided for the comfort of the workpeople by lessening the demand on them for unremitting labour, and softening the most arduous conditions of their daily tasks, without putting a price on their commodity which was unjust to the customers of the concern."

THE PROPOSED AMALGAMATION OF MANCHESTER AND SALFORD.

In May last an Association was founded, under the presidency of Mr. Oliver Heywood, to consider the advisability of amalgamating the city of Manchester and the borough of Salford. About 1200 members enrolled themselves, and from them were formed two Executive Committees—one for the city and the other for the borough. These Committees presented their report at a meeting of the Association held on Monday last week. It was a document of considerable length, and dealt with the general question under the following heads:—The financial position, the sanitary condition, the commercial and industrial interests, and the moral and intellectual welfare of the community. As far as financial matters were concerned, the Committees had the assistance of Mr. Guthrie, the well-known Accountant of Manchester, who specially reported on the questions submitted to him for consideration. He divided his report into five parts. Part I. deals with the Manchester balance-sheet of 1886-7 and the Salford balance-sheet for the same period; setting forth the assets and liabilities of the respective Corporations. Part II. was devoted to the question of the rates, methods of assessment, and cost of administration. Part III. described the nature and probable cost of projected works, and their effects on the rates. Part IV. showed the effect of amalgamation on the separate interests of Salford, Broughton, and Pendleton. Part V. set forth the conclusions upon all the financial considerations involved in the amalgamation. According to the Manchester balance-sheet for 1886-7, the total assets were £9,409,387; the liabilities, £6,999,980. The surplus of assets over liabilities was therefore £2,409,407. The Salford balance-sheet for 1886-7 showed the total assets of the borough as a whole to be £1,748,983; the liabilities, £1,578,893—surplus of assets, £170,090. The excess of assets in the case of Manchester is about equal to the total rateable value for one year of all the property in the city; in other words, it amounts to 20s. in the pound. In the case of Salford, the excess of assets over liabilities is less than one-fourth of the total rateable value of the borough for one year (£750,678), or equal to 4s. 6½d. in the pound. The assets were, however, Mr. Guthrie ascertained, over-estimated to the extent of £241,067. Consequently, the total assets of the borough must be reduced by this amount. This changes the surplus of £170,090 into a deficit of £70,976. Instead, therefore, of there being a surplus equal to 4s. 6½d. in the pound on the rateable value of the borough, there is a deficit equal to 1s. 10½d. The Committee did not, however, deem it necessary to take into account this deficit in considering the effect of amalgamation. Such deficit might have some significance for Salford as a separate Corporation; but under amalgamation the joint city, Manchester and Salford, would still have a large surplus of assets over liabilities. Accepting the figures of the published accounts for 1886-7, the aggregate assets would be £11,158,370; the aggregate liabilities, £8,578,873—surplus, £2,579,497; or equal to 16s. 3½d. in the pound on the rateable value of the joint city. Thus the loss to Manchester on amalgamation on the capital account would be 3s. 8½d. in the pound, and the gain to Salford 11s. 9½d. in the pound.

In Part II. of Mr. Guthrie's report, the method by which the revenue of the city and borough is raised is disclosed. It is pointed out that the rates in both places are relieved by profits on the trading departments of the respective Corporations. It is remarked that when the profits are derived from trading outside the limits of the municipalities, a direct and unqualified relief to ratepayers is effected. When the trading is done within, the profits derived take the form of indirect taxation of ratepayers, and are equivalent to an addition to the rates. Thus gas and water might be supplied at actual cost price to the ratepayers; and in that case a levy of so much more in the pound would have to be made, sufficient to make

up the profit now obtained by trading. In Manchester, upwards of £70,818 profit was made in 1886-7 on various items—markets, tramways, gas, and miscellaneous—and applied in relief of the rates. This is equivalent to a rate of 7d. in the pound. Were it not for this profit, the rate levied would have been 3s. 9½d., instead of 3s. 2½d. The Gas Department shows a profit of £21,989—a comparatively small sum; but no charge is made by this department for the lighting of the street lamps, which costs £28,955. In Salford, trading profit, from like sources as those in Manchester, with the addition of £6036 from profit on water, amounted to £37,735. This is equivalent to a rate of 1s. 0½d. in the pound. Were it not for this profit, the average rates in Salford would have been 4s. 8½d. in the pound, instead of 3s. 8d. as levied. The Salford Gas Department charged £11,054 for lighting the street lamps; consequently her trading profits appear relatively larger than Manchester, where no charge was made in respect of this item. It is evident that high charges for gas and water may realize a profit to relieve the direct rates; but direct rates bring before ratepayers more clearly the cost of administration, and enable them to exercise more perfect control over the finances. The strict taxation of Manchester, *plus* trading profits and including redemption of capital, is 3s. 6½d. in the pound on the rateable value; and that of Salford, 4s. 7½d. by the last accounts. Amalgamated, the strict taxation would be 3s. 9½d. This is, however, subject to certain balances on revenue account; the Manchester city fund having an unexpended surplus of £20,046 2s. 7d., equal to 2d. in the pound on the rateable value, in relief of subsequent rates, while the borough of Salford and all its separate districts carry forward deficits to be made up out of future rates. The Manchester gas account exhibits a debit to profit and loss account amounting to £45,857 7s. 3d. (since reduced out of profits to £27,931 14s. 3d.), standing against a surplus and sinking fund of £740,007 10s. The water-works revenue account shows a deficit of £1393 9s. 8d. (since paid off). The Salford district water-works fund exhibits an old unappropriated surplus of £10,383 15s., accumulated prior to the passing of the Salford Improvement Act of 1870.

On the subject of the water supply, the Committees report that Manchester has provided the water supply for an extensive district, comprising altogether 36 townships, including those of the city and borough. The arrangement for a certain limited supply to a portion of Salford, one of the townships, called the Salford district, is a very liberal one; 1½ million gallons daily being supplied, at a sum equivalent to 2½d. per 1000 gallons, and an additional ½ million at 3d. per 1000 gallons. Broughton and Pendleton do not share in this excellent bargain (excepting a small portion of Broughton, formerly a part of Salford district). They derive water direct from Manchester, and are treated as out-townships; yielding a profit to the city on the water supplied to them. The net cost to Manchester of all the water consumed is 6½d. per 1000 gallons. In supplying 2 million gallons daily to the township called Salford district, Manchester loses about 3½d. per 1000 gallons. The Salford district in trading with this supply, which costs less than 3d. per 1000 gallons, makes a profit of £6036. For all excess above the 2 million gallons Salford has to pay 8d., or in some cases 9d. per 1000 gallons; but the Joint Legal Committee have reported that there is no legal obligation on the part of Manchester to supply any water to the Salford district beyond 2 million gallons per day, excepting for flushing sewers and cleansing streets. Consequently, Salford, unless she provides a water supply of her own, must ever be dependent on Manchester; and there is no legal limitation as to the price which Manchester may charge for water supplied for domestic or trading purposes in the Salford district, beyond the daily supply of 2 million gallons, which she already exceeds. In anticipation of the future development of the population of Manchester and Salford, a uniform rate for water becomes an important consideration for Salford. The Thirlmere scheme, when carried out, will place at the command of Manchester a practically unlimited supply of the best water in the country. Should Salford increase her industries and population, as well she may, the participation in an unlimited water supply at small cost becomes a factor of paramount importance, as an inducement for manufacturing to be established, by which the unoccupied and profitless land within the borough may be covered with rateable property. It would be incorrect to assume that Salford is secure from further anxiety as to water, while Manchester is incurring a large expenditure to provide for the future. If Salford is to acquire that prosperity which her position warrants, she should either endeavour to join Manchester and fully participate in the advantages of a perfect water supply at cost price, or she must run the risk of paying even more heavily in the future than she now does in Broughton and Pendleton for that element so essential to the promotion of manufactures, and absolutely necessary for the domestic comfort of her population. It is equally important that the gas supply should be uniform within one community like Manchester and Salford. At present, and for many years past, Manchester has enjoyed not only lower general rates, but a considerably lower gas-rate than Salford. The difference has been equivalent to a rate of 4½d. in the pound on the rateable value of the city, or an annual saving to the ratepayers of £43,594.

In considering the effects of amalgamation upon the separate interests of Salford district, Pendleton, and Broughton, treating the borough as a whole, it appears that they would be variously affected, but each would gain. The allocation of differences in all the rates, together with the assimilation of gas and water charges, would result under amalgamation in a net gain to the three districts on the rateable value as follows:—Salford district would gain in rates 4½d. in the pound; Broughton district would gain in rates 5½d. in the pound; Pendleton district would gain in rates 1s. 5½d. in the pound. Taking into account the increase of rates in 1887-8, and adding to Manchester and Salford respectively the cost of public works, the following prospective result is shown:—Manchester would lose on amalgamation 1d. in the pound; Salford borough as a whole would gain 3½d. in the pound; Salford district would gain 0½d. in the pound; Broughton would lose 0½d. in the pound; Pendleton would gain 1s. 1½d. in the pound. It must be noted, in connection with these figures, that Salford relieves the rates out of gas profits by a larger proportionate amount than Manchester. Taking into account the amount paid by the ratepayers by way of profits in the gas and other departments, and the amount of rates applied in the creation of permanent assets, the actual cost of administration at the present time, 1887-8 (with that year's additions to rates), would show an advantage on the side of Manchester of 10½d. over the borough of Salford as a whole; over the Salford district, of 1s.; over the Broughton district, of 0½d.; over the Pendleton district, of 1s. 2½d.

Viewing the financial question from every side, the Committees consider that there is no difficulty in amalgamating the city and borough. On capital account the united city would show a smaller excess of assets over liabilities than the city now possesses, owing to the Salford liabilities being actually greater than the assets. On the rating, Manchester would stand under somewhat less favourable conditions; and, including the cost of the projected sewage works, there would be a slight loss on amalgamation. Salford would have the advantage under amalgamation of lower rates than she has had to pay for many years past, with the additional benefit of cheaper gas. The only question, apparently, that can arise to

affect the rates adversely for Salford is the cost of the increased water supply for the district, under the Thirlmere scheme, with which Mr. Guthrie has dealt very fully in his report. This work, however, is as essential for Salford as for Manchester—more especially if the borough should extend industrially, as it is reasonable to hope, with ample water supply, she may. It is anticipated that the Thirlmere works will be completed in from three to four years. Interest upon expenditure in respect thereof will be added to the cost during the construction of the works; but redemption of loans must commence as from the 1st of January, 1891. It may be expected that towards these payments considerable contributions will be made out of trading profits, and by a decrease in the expenditure in connection with the Woodhead supply. Some increase in the revenue of the city, by an improved condition of trade, may also be looked for to afford additional means of meeting the expenditure. Should, however, these sources of income prove inadequate, the deficiency would have to be provided out of the city funds; and any additional rates for this purpose ought to fall upon the whole of the population, which on amalgamation would be entitled to enjoy the invaluable benefits of an unlimited supply of pure water. Were Manchester and Salford to unite in obtaining parliamentary sanction to the consolidation of the numerous redeemable loans they have incurred, and get an extension of time for the repayment of money spent in public works, there is no ground for expectation that the present generation will be burdened to any appreciable extent beyond the present rates. On the contrary, it may be anticipated that, with a moderate general increase in the prosperity of the trades for which the district is famous, the value of rateable property in a united city will be so enhanced that, were even a more liberal expenditure for the welfare of the citizens—and especially of the poorer classes—from time to time undertaken, even lower rates than the present might be found sufficient. It is difficult to represent in figures the actual economy which would result from single administration; but it is obvious that in all departments of the enlarged Municipality less expenditure would be incurred in administration than is at present required by the separate Municipalities. Hitherto the application to Parliament of one Corporation for increased powers has been watched or opposed by the other at considerable expense. Were the conflicting interests of the city and borough merged in the one object of promoting the welfare of the homogeneous population forming Manchester and Salford, parliamentary powers would be obtained more promptly and at less cost. Manchester may well covet the enhanced importance she would obtain by amalgamation with Salford. She would rank much higher as one of the largest cities in the empire, her commerce and industries would be represented to the world in greater magnitude than heretofore, and her facilities for more rapid growth in the future would be increased.

In the "Conclusions" to their report, the Committees say: "From the exhaustive inquiry which your Committees have pursued continuously during the last five months, there is but one conclusion possible—viz., that amalgamation of the city and borough will conduce to the welfare of the whole population, and ought forthwith to be carried into effect. The cost of administration will be reduced, or at least greater efficiency will be secured without higher expenditure than at present. Sanitary reform will be accelerated, and the opposition or indifference of divided authority removed. The commercial and industrial interests, instead of receiving partial attention as at present, will be considered as affecting the united population. The educational and intellectual institutions will become wider spread to embrace the large section of the population now disregarded in the many projects contemplated in the city for the benefit of the people. All remedial and ameliorative measures which the larger life and spirit of a great city promote will embrace Salford equally with the rest of the city. The policy of Manchester, in relation to questions affecting both communities, but, of vital importance to Salford, will cease to be exclusive; and the influence and financial power of the larger Corporation will be used to promote the common welfare of the whole of the inhabitants of Manchester and Salford. . . . The new Local Government Bill contains provisions for the union of two towns as one county, which meets the possible wishes of the inhabitants of Manchester and Salford; and your Committees earnestly hope such desire may be speedily expressed in favour of one government in the midst of a united people. A greater dignity and greater attraction will be offered to the cultured and experienced men of Manchester and Salford to enter the Corporation of the amalgamated towns with a view to making a great centre of northern commerce and industry the home of a well-employed, well-housed, and well-conditioned population. It remains now for the ratepayers of the city and borough to pronounce their decision, in order to effect without delay the amalgamation which your Committees unanimously recommend. There are no legal obstacles, no surrender of privileges, and, looking to the future, no material sacrifice of a financial character."

Two resolutions had been drafted for submission to the meeting. The first was—"That the report of the Joint Executive Committees now read be received, approved, and adopted." The second was—"That this Association, having carefully inquired into and considered the question in all its bearings, is of opinion that the amalgamation of Manchester and Salford will conduce to the general welfare of the inhabitants of the two towns, and that an Executive Committee be appointed to take forthwith such steps as they may deem necessary to carry out the recommendation for amalgamation contained in the report of the Association, and that they be instructed to represent the views of the Association to the respective Corporations to induce them to apply to the Local Government Board, or if necessary to Parliament, for powers to amalgamate the city and the borough." These were separately put to the meeting, and unanimously carried.

GAS LIGHTING IN THEATRES.—The stage of the Parc Theatre, Brussels, has recently been lighted by means of the Wenham "Safety" gas lamp; and we understand that the experiment is a complete success. This is an important move in the right direction, as the use of a number of naked lights over the stage is, as every one knows, a source of great danger; and seeing that the Wenham lamp is entirely enclosed, this risk is overcome. These lamps have also recently been used with great success at the Promenade Concerts at Covent Garden.

THE DARK STREETS OF LONDON.—At the meeting of the Bermondsey Vestry last Monday, the Chairman (the Rev. C. D. Lawrence) moved—"That the General Purposes Committee be instructed to bring up a report, as soon as possible, as to the lighting of the less frequented streets, alleys, and open places of the parish." He said he thought it was the duty of the Vestry, as the long winter evenings came on, to see to the efficient lighting of the public thoroughfares. The Chief Commissioner of Police had called attention to the lack of light in the streets in some districts; and the Vestry should act upon the hint given to improve it. To carry out a system of better lighting might involve additional labour and expense; but he was sure all would be willing to secure the safety of the district. He considered that local authorities could not spend too much money in ensuring an adequate supply of water, air, and light. After a discussion, the motion was adopted.

THE GAS-WORKS AT THE HANWELL SCHOOLS. SCHOOL MANAGERS AS GAS MAKERS.

For some time past the Managers of the Central London School District have been dissatisfied with the cost of manufacturing gas at their schools at Hanwell, which they consider excessive. A few weeks back they decided to call in Mr. W. F. Broadberry, of the New Southgate Gas-Works, to inspect their gas plant at Hanwell. A report has since been received from Mr. Broadberry; and it was brought up for consideration at the meeting of the Managers on Monday last week. The excessive cost, in Mr. Broadberry's opinion, was occasioned by the fact that the carbonizing arrangements at the works have been neglected. He found that there were four 5 ft. 6 in. retort arches, which were 8 ft. 6 in. long; these being set with 15-inch iron retorts, only 7 feet long, the make of gas from which was frequently less than 2000 feet per retort per 24 hours. He recommended that two of these arches should be provided with clay retorts—viz., four 16-inch circular retorts and one 20-inch by 14-inch oval retort, all 8 ft. 3 in. long. A setting of this description, he asserted, could be depended upon to make 17,000 cubic feet of gas per 24 hours, and also to produce from 9700 to 10,000 cubic feet per ton of coal carbonized, as against 7985 feet, which appeared from the accounts to have been the average quantity obtained per ton during the last two years. The average amount of gas now made per annum was 4,277,000 cubic feet, and to produce this 535½ tons of coal were carbonized. With the suggested improved setting, he calculated that there would be an immediate saving of 100 tons of coal per annum. He also recommended that screened Silkestone gas coal from South Yorkshire should be used, instead of the Durham unscreened he saw at the works. The former, he remarked, was a preferable coal; and taking into consideration the locality of the works, it should be obtained at about 9d. per ton cheaper. He urged that attention should be at once given to various valves about the works, which were set fast. With regard to the tar yielded by the coal carbonized, the accounts indicated that only 7 gallons per ton had been obtained, while the amount should have been 12 gallons with the low heats employed; the remainder having been presumably lost through the store-tank being unsound. With the setting recommended, the unsaleable tar could be burned under the retorts in lieu of coke, and the coke so saved used at the schools, and credited to the gas-works. He saw no reason why gas should not be manufactured at the holders for 2s. 7d. per 1000 cubic feet. In the course of the discussion which followed the reading of the report, it was stated that a supply of gas for the schools could be procured at a cheaper rate from the Brentford Gas Company; and one member incidentally mentioned that the gas during the last twelve months had cost them 4s. 10d. per 1000 cubic feet to manufacture. The report was subsequently referred to the Farm Committee for consideration.

THE RENEWAL OF THE LONDON COAL AND WINE DUTIES.

At the Meeting of the Metropolitan Board last Friday—the Right Hon. Lord MAGHERAMORNE in the chair—the Works Committee presented the following report:—"Your Committee have to report that, in pursuance of the reference made to them by the Board on the 28th of September, a Sub-Committee have had an interview with the Coal and Corn Finance Committee of the Corporation of London on the subject of the coal and wine duties. The Corporation Committee stated that their object in seeking the interview was to ascertain whether the Board would, as it had done in previous years, join the Corporation in giving notice of a Bill to be introduced into Parliament next year, providing for a renewal of the duties. It appears to your Committee desirable, for the following reasons, that the Board should co-operate with the Corporation. It is believed that the majority of the inhabitants of the Metropolis would look with favour upon a renewal of the duties. In January next the inhabitants will be called upon to elect the persons who are to compose the new County Council of London; and it is right that the Council, the members of which will thus be directly elected by the ratepayers, and will presumably be in a position to know and express the ratepayers' views, should have an opportunity of deciding whether it is expedient that the coal and wine duties should be renewed. When Lord Randolph Churchill, speaking as Chancellor of the Exchequer in November, 1888, to the Board and the Corporation, stated that the Government were not prepared to assist the two bodies in obtaining a further continuation of the duties, he intimated that, if it were made clear that a large majority of the inhabitants of London desired that the duties should be continued, this circumstance might lead the Government to modify its decision. If, therefore, the new County Council, coming fresh from the ratepayers, takes the same view as that taken by the Board and the Corporation, it is quite possible that the Government may modify its previously expressed opinion, and may be induced to support the Metropolitan authorities in asking Parliament to consent to the duties being renewed. The Board, therefore, in giving notice jointly with the Corporation of the intention to introduce the Bill, will only be preparing the way for such subsequent action as the County Council, when it comes into office, may determine to take. Your Committee accordingly recommend that the Board do join the Corporation in giving notice of the intention to introduce a Bill for the renewal of the coal and wine duties."

Mr. E. R. COOK, in moving the adoption of the report, pointed out that the Board now stood in a position, as regarded the introduction of Bills into Parliament, totally different from that which it had ever before occupied, inasmuch as they would be acting for a body which was to succeed them. It seemed to him that the Board should be rather liberal in the way of giving notices of Bills; and thus show that they had a desire to hand over the affairs of the Metropolis to the new body in as good a working order as possible. With reference to the coal and wine duties, this was not a question of public improvement, but of public policy. The present Government, through Lord Randolph Churchill, had said that on this question the people of London would have an opportunity of expressing an opinion about it, which they could do through the new body. If, in the opinion of the new Council, it was suggested that the coal duties should be renewed, he had little doubt that the Government would agree thereto.

Mr. EDWARDS questioned the advisability of going on with the matter, in view of the fact that two successive Governments had decided against the duties.

Mr. RICHARDSON said it had been stated that the country would receive, under the new Local Government Act, an addition of from two to three millions of money to their funds. If this were so, the ratepayers would have a *quid pro quo* for the loss of the coal and wine duties. It therefore seemed to him somewhat strange for the members of the Board to put their names on such a Bill as was proposed, before making inquiry as to whether or not it was a fact that the country would receive the additional amount mentioned.

Mr. RUNTZ was doubtful if any such benefit would be derived as had been mentioned by Mr. Richardson, because of the onerous character of the new obligations imposed by the statute in question. He was of opinion that the Board should afford the new Council, which would be a directly representative body, an opportunity of bringing the matter forward by giving notice of the Bill.

Mr. MARK H. JUDGE moved, as an amendment—"That, under present circumstances, the City Corporation be informed that the Board cannot join them in giving notice of a Bill in Parliament for the renewal of the coal and wine duties."

Mr. PURDY seconded the amendment.

The CHAIRMAN, however, ruled the amendment out of order, as being a direct negative to the motion.

Mr. COOK hoped that the Board would continue the policy it had adopted on this question for some years past. He said there were 160 towns in England having coal dues, mostly for the improvement of harbours and other matters connected with commerce; and he maintained that the Metropolis ought to have the dues for effecting street and open space improvements.

The report was approved by 29 votes to 5.

THE VALUE OF GAS SECURITIES.

[From *Money*, Oct. 17.]

In view of the vicissitudes which gas stocks have undergone during the past ten years, it is interesting to take a retrospect, especially when the present value is borne in mind. *Money* has so consistently championed the cause of gas, in spite of innumerable obstacles, that it is no way surprising that we from time to time receive letters couched in appreciative terms, and acknowledging our steadfast adherence to the immutable virtues and merits of gas as the illuminant *par excellence*. The following is a sample of many communications from grateful shareholders who have been induced by our advice in the past not to part with their gas holdings:—

To the Editor of "Money."

Sir,—On the 8th of October, 1878, there appeared in *The Times* a telegram from America, stating that Mr. Edison had just solved the problem of the electric light, and could divide it to any extent. This telegram was used by the promoters of electric light companies to its full extent; and numbers of holders of gas stocks took fright, and threw their property on the market—causing a panic which lasted for a considerable period. A decade has passed away; and during that time gas has had a regular and steady increase of prosperity. The prices of the Metropolitan Companies' stocks have risen fully 100 per cent. This must be very gratifying to you, who from the first have used your utmost endeavours to prevent holders from parting with a valuable security; and I am sure the best thanks of those who did not sell in a fright are due to you, and from no one more so than the writer, who was then, and is still,

A SHAREHOLDER IN EIGHT GAS COMPANIES.

Oct. 8, 1888.

Before the date mentioned by our correspondent, there were already vague rumours floating about as to the coming revolution to be effected by the introduction of the electric light; and the "bears" of gas stocks were at work endeavouring to depress the price of the securities. In September, 1878, the quotation of The Gaslight and Coke Company's "A" stock fluctuated between 168 and 183. In October of that year, owing to the telegram alluded to by our correspondent, the price of this stock sank as low as 140; while the highest quotation for the month was only 173. Owing to the success which attended the "bear" tactics the range of prices in 1879 averaged 155½. And so the game went on for a year or two; the "bears" doing all they could, upon one pretence or another—their bogey, which they trotted out persistently, always being the electric light—to depreciate the market value of gas stocks.

It was not until 1881 that anything very decided was done, calculated to give even a colourable pretext to the croakings that the enemies of gas had for so long indulged in. In the issue of *Money* of the 6th of April, 1881, there appeared an article entitled "The Electric Light Scare Again," in which we observed that "within the last few weeks the gas stock 'bears' have once more trotted out their turnip-headed ghost to alarm feeble folk, and make them believe that the end of the gas world had at length arrived." We then showed how the bears were discomfited and utterly routed, and how amusing it was to watch the "wily jobber cunningly endeavouring to persuade the broker that he could only take his client's stock for the account as a favour, the next day exhibiting his poverty of stock by asking the broker if he would like to deliver for cash; thus showing he had other engagements he could not meet." Our advice then, as it has ever been since, was to strongly urge gas shareholders not to be scared into parting with their securities. What was the result? In our issue of the following week, April 20, 1881, we wrote as follows: "On Tuesday, the 12th inst., The Gaslight Company's shares were quoted 175½-176 in the Official List, a rise of 5 from the artificial price to which they had been knocked down by the 'bears' within the previous few days. But there came a day of reckoning for these gentlemen; and it happened to be on the very next day, which was the settling-day on the Stock Exchange, and the state of affairs was speedily disclosed by a rise on that morning to 179½-180, notwithstanding the recent glorification of the electric light." Those were the days of the electric light scare. To-day the holders of gas stocks are wiser; and the present price is now 250—thus endorsing our correspondent's opinion—that during the past decade there has been an appreciation in the value of these stocks of 100 per cent.

THE ELECTRIC LIGHTING EXPERIMENT AT BARNET.

THE CONTRACTORS ON THEIR DEFENCE.

In the *JOURNAL* last week (p. 690) we made reference to the experiment in electric lighting which is now being carried on at Barnet, and reproduced, from a local paper, a comparative statement of the promises and performances of the contractors, as drawn up by a resident. Our readers will recollect that the latter fell far short of the former. The contractors (Messrs. H. F. Joel and Co.) have since sent to the *Electrical Review* what may be regarded as their "statement of defence;" and we therefore accord to those portions of it bearing directly upon the lighting arrangements the same publicity that we gave to the charges made against them. Messrs. Joel and Co. say: "This [Barnet] is the first installation of town lighting by incandescence lamps in series, and we had enormous difficulties in obtaining the novel fittings in the short time at our disposal. Our contract was not signed until July 6. We did not obtain the official plan showing the position and number of the lamps until some time after, and we found that we had to fit up 71 street lamp-posts, five miles of overhead wires, nearly one mile of underground wire, dynamo, engines, &c., in about five weeks. We asked the Local Board for six months in which to do the work permanently. This they were unable to grant, as the Gas Company's contract expired at the end of August, and we had to light up on the 1st of September. Under such circumstances, we were compelled to use temporary appliances, which we are now replacing by permanent plant, and we expect shortly to have our duplicate sets of engines, dynamos, &c., in proper working order. Our contract is for 71 32 candle-power lamps, but we have substituted many 50 candle-power lamps in the High Street, &c., in order to make a good display; and the opinion of competent and unbiased persons is that the light is a success, and we are much gratified at the orders we have received for private lighting, and the general good feeling shown towards us by the townspeople of Barnet."

The South Barracas (Argentine) Gas Company was registered recently with a capital of £100,000, in £10 shares.

LINES TO THE ELECTRIC LIGHT AT THE GREAT WESTERN RAILWAY TERMINUS.

BY A MISANTHROPIC GAS-HOLDER.

[From the *St. James's Gazette*.]

Twinkle, twinkle, little Arc—
Sickly, blue, uncertain spark;
Up above my head you swing,
Ugly, strange, expensive thing!

Now the flaring gas is gone
From the realms of Paddington,
You must show your quivering
light—
Twinkle, blinkle, left and right.

When across the foggy air
Streams the lightning's purple
glare,
Does the traveller in the dark
Bless your radiance, little Arc?

When you fade with modest
blush, (rush,
Scarce more bright than farthing

Would he know which way to go,
If you always twinkled so?

Cold, unlovely, blinding star,
I've no notion what you are,
How your wondrous "system"
works,
Who controls its jumps and
jerks.

Yours a lustre like the day!
Ghastly, green, inconstant ray!
No; where'er they worship you,
All the world is black or blue.

Though your light perchance
surpass
Homely oil or vulgar gas,
Still (I close with this remark)
I detest you, little Arc!

METROPOLIS WATER SUPPLY.

According to the returns furnished to the Registrar-General by the London Water Companies, the average quantity of water supplied daily to the Metropolis during the past month was 168,890,449 gallons, against 165,182,640 gallons in the corresponding month of 1887. The number of houses served last month was 742,869, or 227 gallons per house, and 29.1 gallons per head of the population. In August, 1887, the number of houses supplied was 730,258; and the quantity of water allowed for each person, 29 gallons. Of the entire bulk of water supplied last month, 83,491,556 gallons were drawn from the Thames, and 85,398,893 gallons from the Lea and other sources.

In his report to the Registrar-General on the quality of the Metropolitan water supply last month, Dr. E. Frankland makes the following remarks:—"Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies and by the Tottenham Local Board of Health, was:—Kent, 0.6; New River, 0.9; Colne Valley, 1.3; Grand Junction, 1.3; Chelsea, 1.4; Tottenham, 1.4; West Middlesex, 1.6; Lambeth, 1.6; Southwark, 2.2; East London, 2.4. The Thames water sent out by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies contained in every case less organic matter than the August samples; the proportion present being exceptionally small for river water. All the samples were clear and bright. The water principally derived from the Lea, and distributed by the New River Company contained even less organic matter than any of the Thames waters; whilst the proportion of organic matter in the East London Company's supply, although small in absolute amount, was slightly greater than that in the Thames-derived waters. Both samples were clear and bright. The deep-well waters of the Kent and Colne Valley Companies and of the Tottenham Local Board of Health contained, as usual, only a very small quantity of organic matter. The Colne Valley Company's water was not softened to quite the usual extent."

In the course of their report to the Official Water Examiner for the Metropolis (General A. De Courcy Scott, R.A.) on the composition and quality of daily samples of water supplied to London last month, Messrs. Crookes, Odling, and Tidy say: "The analyses of the waters of the past month show them to have been of high quality; a manifest reduction in the dissolved organic matter being apparent. Thus, during August, the average oxygen required per gallon for the Thames-derived waters, when examined by the oxygen process, was 0.071 grain, whilst for September it was 0.043 grain. In like manner the organic carbon shows a reduction from 0.120 grain per gallon in August to 0.104 grain in September. The unusual meteorology of the summer, referred to in a previous report, has had its influence (as we should have expected) on the character of the waters. They have, however, throughout been of excellent quality. Of 175 samples examined during September, 165 were found to be absolutely free from any trace of visible suspended matter."

BRADFORD CORPORATION WATER SUPPLY.

THE FUTURE SOURCES OF SUPPLY.

In the course of a lecture delivered at Bradford, on Monday evening last week, by Mr. R. Shackleton, on "The Past, Present, and Future of the Bradford Water Supply," he said, with regard to the first part of his subject, that he had nothing but admiration for the Bradford Town Council of 1854. At that time bad trade prevailed in the district and the country; but the Council had the courage to enter into negotiations which laid a good foundation for the future with regard to water-works. From 1854 to 1874, £1,000,000 was spent; and the result was that 7½ million gallons of water per day were obtained—the cost being 4d. per 1000 gallons. This was a splendid step in the right direction; and it formed a foundation upon which a system could have been built in order that the water-rates might be kept down. But from 1875 to 1877 this state of things was changed, and the price of water was increased to 14½d. per 1000 gallons. He asked if this did not show that something was very seriously wrong, and that money had been thrown away almost in cartloads. He thought it would not need much to convince anyone that some very serious blunder had been committed. The lecturer proceeded to quote statistics relating to the quality of water consumed daily by some of the large manufacturing firms in Bradford, with a view of showing that the industries of the borough had been heavily handicapped, and that the rates had been increased, by reason of the expenditure on the water-works. He pointed out that owners of cottage houses paid a water-rate equal to about 18d. in the pound; and that the occupiers of warehouses paid rates varying from about 18d. to 3d. in the pound, under certain modifications. He was in Glasgow the previous week, and found that the water-rate was only about 1d. in the pound. This seemed to him to be a very serious difference. He did not like to "cry over spilled milk," but he was of opinion that a lesson ought to be learned from the blunders of the past, and that an attempt should be made to do better. With regard to the future supply, the only schemes that held the field were the Grimwith and the Nidd. He explained the first scheme of the Water-Works Engineer (Mr. A. R. Binnie, M. Inst. C.E.) with regard to the Nidd. The cost of this scheme was £876,000, and for this there would be 5 million gallons of water per day. The increase in the consumption in the borough was at the rate of 200,000 gallons per day from the 1st of January in each year. The interest on the money expended and the sinking fund, at 4½ per cent., was £35,478. A deficiency would thus be made which would require a rate of 9d. in the pound for the first year, 8d. for the third year, 7d. for the fifth

year, and 4d. for the tenth year. Mr. Binnie's Grimwith scheme would cost £523,000; the quantity of water given being 4½ million gallons per day. The amount of interest on the expenditure and the sinking fund was £23,535. To pay off the money it would require a rate of 6d. in the pound for the first year, 5d. for the third year, 4d. for the fifth year, and 1d. for the tenth year; to which sum must be added the manorial or unexhausted mineral rights. Mr. Binnie put down at £188,000 the cost of the new conduit at Grimwith. From this sum he (Mr. Shackleton) contended that £141,000 ought to be deducted as unnecessary expenditure. A further sum of £120,000 should be taken off the original amount of £523,000; thus making a total of £260,000 that ought to be deducted. This sum of £260,000 would give a rate of 2½d. in the pound in the first year, of 1½d. in the third year, and of ¾d. in the fifth year. In the tenth year there would be a profit of about £790,000. All these calculations were based upon the assumption that water cost 6½d. per 1000 gallons. Referring to a visit recently paid to the Nidd district, he said they obtained a sample of quite clear water from the river; but three hours later a sample which was more like ink than water was drawn from the same place. This change had been brought about by rain. The Nidd scheme was therefore a dangerous one; and without hesitation, he called the Grimwith scheme the best for Bradford for the present. He wanted to secure, with respect to the water supply, both quantity and quality, and the expenditure of as small a sum of money as possible until the revenue increased. After the Grimwith scheme was exhausted, he would draw upon the waters of the Nidd, and store them.

STOCKTON AND MIDDLESBROUGH CORPORATIONS' WATER SUPPLY.

At the Meeting of the Stockton and Middlesbrough Water Board on Monday last week—Mr. Alderman T. Hugh Bell in the chair—a discussion took place on a suggestion made by Mr. J. Mansergh, the Water Engineer, that the Board should proceed with the construction of the Blackton reservoir. Alderman Bulmer expressed some doubt as to the desirability of doing anything at Blackton just yet. He said they were at present not taking more than 62 million gallons of water a week to the two towns; and they would thus have a large margin after the Hury reservoir was completed. They would then have a storage of 300 million gallons; and after allowing 22 millions a week for compensation, they would have left 21 million gallons to add to the 60 millions they were pumping at Broken Scar, or a total weekly supply of 81 million gallons, so that in a dry season they could keep a store for 140 to 150 days' supply. He thought, moreover, that they were making a gross mistake in constructing the Blackton reservoir; and he did not see that they were at all justified in spending any more money, because in his opinion there would not be sufficient water to fill the two reservoirs—not more than would keep the Hury reservoir full. They were simply killing the district by the capital they were spending. He thought they might allow the matter to rest for the next ten years; and as soon as the time arrived when their supply was insufficient, they could draw from a mill dam across the Lune at flood time, where they would not be called upon to give compensation. The General Manager (Mr. D. D. Wilson) said the estimated cost of the Blackton reservoir was £75,000. As to the estimated requirements of the district in the near future, Mr. Wilson stated that during the last 18 weeks the pumping varied from 48 million to 65 million gallons weekly; the average being 59½ million gallons. In 1868 the weekly supply of water for manufacturing purposes was 12,443,000 gallons, whereas in 1878 it was upwards of 28,261,000 gallons; being an increase in the ten years of 15,000,000 gallons. During the present year he estimated that the average weekly consumption of water for manufacturing purposes would be about 43 million gallons. The completion of the Hury reservoir would give an increased supply of about 15 million gallons per week; but when the Sadberge reservoir was finished, the districts at present insufficiently supplied would absorb 3 million gallons per week, and reduce the available margin to 12 millions. So that if the demand for manufacturing purposes increased at the rate of 1,500,000 gallons a year, and for domestic purposes at the rate of 500,000 gallons, the whole of the extra supply provided by the Hury reservoir would be exhausted in six years; and during the latter part of this time, the Board would be in the same position with regard to penalties that it was in before. The Chairman pointed out that the increase during the ten years between 1868 and 1878—a period of great development—was no greater than the increase in the ten succeeding years, which was a period of depression. So that, in spite of the depression in trade, there had been a great increase in the water consumption of the district; and thus, even if trade were as bad in the future as it had been in the past, they would have to expect an increase during ten years of between 14 and 15 million gallons. Alderman Fidler asked if there was anything in what Alderman Bulmer had said about the Hury reservoir absorbing the water from the whole of the watershed of the district. The Chairman replied that the question had been put on many occasions, and had been answered by Mr. Mansergh and others. There would come down the valley in one night as much water as would fill the reservoir three or four times over. Mr. Wilson said four inches of rainfall would suffice to fill it. The Chairman then asked whether the Board intended to go on with the Blackton reservoir or not. If they decided upon going on, they could either commence in such a way as would only commit them to the expenditure of £10,000, or they could resolve at once to proceed with the expenditure of the whole amount. He moved—"That Mr. Mansergh be instructed to prepare plans and specifications for the construction of the Blackton reservoir and the low dam, and to make any investigations, either by trial-holes, bore-holes, or otherwise, which he may think advisable to enable him to do so." Alderman Bulmer moved, as an amendment, that they should first instruct Mr. Mansergh to report as to what loss of water there would be in the Blackton reservoir if they moved the bank to the high-water mark of the Hury reservoir. He thought that if the loss was only small, it would be policy to allow four or five years to elapse before they spent any more money. They were killing the district with the capital account; and if they went on as they had been doing, there would never be a dividend from the water undertaking, but the ratepayers would always be called upon to subsidize the works to meet the payments for interest and redemption. After some discussion, the motion was carried Alderman Bulmer being the only dissident.

THE WINDSOR AND ETON WATER-WORKS.—The Town Clerk of Windsor (Mr. G. H. Long) has lately received the award of Mr. R. C. Driver, the Umpire appointed to adjudicate in an arbitration between the Corporation of Windsor and the Trustees under the marriage settlement of Mr. W. H. Cutler, the previous owner of the water-works, as to the sum to be paid by the former for the Tangier mill, house, stores, and land, with bridges and roads, appurtenant to the works they have lately acquired, and a necessary portion of them. The amount claimed by the Trustees was £9000; one item being £350 for compulsory sale. The Umpire has awarded £3200—a difference of £5800; and as there can be no appeal, this sum will have to be accepted.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday*.

The work of transferring the Edinburgh and Leith gas undertakings to the Corporations has, in the matter of details, proved to be a more onerous task than anyone unacquainted with the business could ever have dreamt it would be. Some of the officials have been toiling in the preparation of statements for the Commissioners, or arranging under their different heads the funds of their old employers, the Companies, to the extent of twelve, and sometimes even sixteen hours a day—a wearisome task, for the performance of which it is to be hoped both the Companies and the Commissioners will remember their hard-worked servants. While this is true of the officials, it is also the case that the Commissioners have not been idle. Besides frequent Committee meetings, there have been many public meetings, at which an astonishing number of items of business have cropped up. A meeting of this nature was held on Monday last; and another is to be held on Monday next. At Monday's meeting (as will be seen by the report given elsewhere) the subjects dealt with ranged over a wide field. When one considers how often the Commissioners have of late gone through similarly long *agendas*, and how often they will require to struggle through others during the next few months, it will be seen that, in the meantime at least, the lot of the Gas Commissioner here is not a "happy one." It is a satisfaction, however, to be able to state that the business of the Commission is being very efficiently carried on. For this, no doubt, the chief credit lies with the officials, who are an exceedingly painstaking body; but it is also true that the Commissioners are, on the whole, sensible and moderate.

As I mentioned last week, the recent gas transfer in Edinburgh is frequently mentioned at public meetings in connection with the current municipal elections. One of these is worthy of notice. Mr. Pollard, C.A., one of the most active of the Gas Commissioners, informed the electors of the Calton Ward on Monday night that the Commissioners had secured a contract for 120,000 tons of coal for the present year at from 3s. to 3s. 7d. per ton cheaper than last year, by which a saving of £22,000 would be effected. Whether it was judicious to mention this circumstance is open to question, because its effect will probably be to lead to a clamour for a reduction in the price of gas, with which, on account of the heavy charges upon the Commissioners this year, they may be unable to comply.

One of those periodic discoveries of "mares' nests" which are so common in the many-sided questions of gas supply, has taken place at Dundee. Like most other instances, this one takes its rise in "bad gas." The complaint, ventilated by means of newspaper correspondence, is that air is mixed with the gas as it leaves the retort, and that, inferentially, the community are charged at the rate of 8s. 8d. per 1000 cubic feet for atmospheric air. The first writer wanted information on the subject; the second, whether in league with him or not it is impossible to say, was able to give it, stating that the air was "sucked in through a 3-inch pipe, or through a pretty large meter." This writer suggested that the gas should be tested in the interests of the public, and urged a public inquiry into "the whole affairs of these gas-works." The newspapers state in a foot-note to this letter that, on inquiry, they have ascertained it to be the case that air is mixed with the gas, in conformity with the practice of the most eminent gas engineers, and that the effect is not to diminish the lighting power of the gas, but to facilitate its purification. Thereupon the Editor of one paper gives vent to the desire that the process should be fully and frankly explained; and the scientific authority for adopting it stated. With this he couples the sapient remark that "consumers are naturally prejudiced in favour of gas undiluted with air, as they are in favour of milk undiluted with water." The Dundee Gas Acts require the Commissioners to furnish gas of 18-candle power; and the monthly statistics issued show it to be frequently over 27, and never under 26 candle power. With gas of this quality supplied, and no harmful effects averred, it is difficult to see where any ground of complaint comes in.

The village of Cowdenbeath, in Fifeshire, was on Tuesday night lighted for the first time with oil gas. The plant has been fitted up by the Glasgow Patent Paraffin Gaslight Company. In this instance coal gas has not been superseded; the place having formerly been without a gas supply. Two retorts capable of producing 300 cubic feet of gas per hour have been erected; and provision has been made for extending the works. The gas is to be charged for at the rate of 5s. per 1000 cubic feet.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday*.

Gas affairs have been prominently dealt with this week at meetings of the Greenock electors with their representatives in the Town Council. At the meeting of the Fourth Ward ratepayers on Thursday night, Bailie Shearer, Vice-Convenor of the Corporation Gas Committee, remarked that the Gas Trust was in a flourishing condition, and that the revenue from all sources last year amounted to £36,661 4s. 9d.; being an increase on that of the previous year to the extent of £453 17s., and leaving a net profit to the general purposes of the Police Board of £3000, or £500 in excess of the sums set apart for a similar charge for the last two years. The works and all the appliances connected therewith had, he said, been maintained in a very efficient state; and it was gratifying to him to be able to state that the Klönne bench of retorts, erected in 1884, at a cost of £4763, continued to work admirably, and that the debt incurred in its construction had been wiped off from revenue since then, with the exception of £1078 18s. 6d., and which he thought they would be able to pay off this year. The financial position of the Trust at the close of the year appeared so satisfactory that, in view of the increasing consumption of gas, which they wish to develop as far as possible, the Gas Committee considered that there was an opportunity for making a reduction in the price, and accordingly they resolved upon charging 3s. 6½d. per 1000 cubic feet for the current year, or a reduction of 2½d. per 1000 feet. Hitherto the reductions had been made by 5d. at a time; but it was considered safer to adopt the 2½d. reduction on this occasion, and concede a similar amount again next year if the revenue would permit. Mr. Cameron, speaking at the same meeting, said that he could not help thinking that £3000 was too large a sum to take out of the pockets of the gas consumers and pay into the town's coffers. He held it to be not only unfair, but opposed to the interests of the town, to make a profit upon the gas-works. Last year, for instance, the gas consumers paid about 2d. or 3d. per £1 of the town's taxes; and he for one obtained the benefit of this, as, comparatively speaking, he burned little or no gas in Greenock. A great many persons were in the same position as himself, either because they lived out of the town or preferred to burn oil; but he was sure that neither he nor those situated like him wished to keep down the taxes at the expense of the gas consumers.

Ex-Bailie Ure, speaking of the Glasgow gas supply undertaking to his constituents on Thursday night, expressed the hope that the price of Glasgow gas would undergo a further reduction next year. At present, he said, the price was 2s. 8d. per 1000 cubic feet; whereas when he entered the Town Council the price was 5s. per 1000 cubic feet. He also mentioned

that there were now in use in Glasgow 11,000 gas stoves, cookers, and heaters which had been supplied by the Gas Trust; and there were likewise in use 537 gas-engines within the area of the gas supply. He considered these facts to be very important; for when there was little to do, in the way of providing gas for illuminating power in the summer time for the citizens, they had to supply a large quantity for these gas-stoves, &c.

Mr. Mechan, addressing his constituents of the Thirteenth Ward on the same evening, also referred to the business of the Gas Trust. He remarked that the Gas Committee were hopeful that they would be able to reduce the price of gas next year. In regard to the complaints that were made as to the quality of the gas, he thought these arose from the manner in which the gas was consumed; and he suggested that the Gas Committee might supply gas-burners free to the consumers, and that men should go about, and fix burners suitable to the pressure in different localities.

The new gasholder at the Rothesay Gas-Works was put into operation for the first time on Thursday afternoon. Provost Thomson performed the ceremony of turning on the gas; and the holder gradually rose, until it was about half full, when the gas was turned off again. The working capacity of the holder is 72,000 cubic feet; and it has been erected on the site of a smaller one, which was only capable of storing 10,000 feet. The new holder works in a cast-iron tank 51 ft. 6 in. diameter by 20 feet deep, and is in two lifts, the outer one being 50 feet, and the inner one 48 ft. 6 in. in diameter. The contractors were Messrs. Hanna, Donald, and Wilson, of Paisley, who have carried out the work in a most satisfactory manner. The contract price was £1560; and with a few extras the total cost will be about £1500. Rothesay has now a gasholder capacity of about 128,000 feet, which is nearly double what it was before, and is sufficient to meet any increased requirements for years to come.

On Thursday last 396 shares in the Falkirk Joint-Stock Gas Company were sold by auction, and realized from £2 8s. to £2 13s. per share.

The upward movement in the price of sulphate of ammonia continues. A contract has been made this week for 350 tons at £12 per ton, October to April delivery. The spot price is steady at £11 15s.

A certain degree of firmness has been shown in the pig-iron market this week; and the prices are advanced generally about 1s. per ton over the closing prices at the end of last week.

The coal market has shown considerable activity during the week, prices being firmer in almost every instance, and the wages of the miners are being systematically advanced throughout a large portion of Lanarkshire.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Oct. 20.

Sulphate of Ammonia.—The market is undoubtedly stronger; and the unforeseen continuance of the demand, at present extending far beyond the accustomed period, must be as highly gratifying to the producers as it will be discomfiting to such consumers as have been delaying purchases in anticipation of lower values during the slack months—October and November, according to theory, being considered as such. The large French requirements (which do not appear to be yet quite completed) clearly prove that the abstinence of these consumers during the earlier months and the summer of this year was simply a matter of using up every available ounce of stock and home produce, and not, as many would have it, a change of front—i.e., a transfer of favour from sulphate to nitrate. Germany, moreover, seems to recognize the position; but as many consumers there have been earlier in the field, they display less anxiety, and at present buy only parcels as actually required for present and near delivery. What strengthens the market particularly at the moment is that the liquor supply is by no means so prolific as it has been in past years at this particular season. This may be attributed to the generally bright weather experienced during October; and while the production remains behind the spot demand, prices in their natural course are not likely to slacken. Further, there is the tone of the nitrate market, repeatedly referred to, and which indicates a probability of further enhanced prices. To-day's quotations of October-November cargoes are now very close upon 10s. per cwt.; but the actual shipments during October and November will naturally regulate values more than the sentiments expressed by sellers at present. The closing values of sulphate may be called £11 12s. 6d. to £11 15s. at all ports.

LONDON, Oct. 20.

Tar Products.—Benzols continue neglected; and quotations are weaker. There is a little more activity in pitch; and some of the fuel makers are supplying their pressing needs at the advanced prices demanded. Creosote is moving off better; and the prospect for this article is improved. Carbolic acid (crude) is firm; and the same remark applies to anthracene. Prices may be taken as follows:—Tar, according to position, 17s. 6d. to 22s. 6d. per ton. Benzol, 90 per cent., 2s. 11d. per gallon; 50 per cent., 2s. 4d. Toluol, 1s. 6½d. per gallon. Solvent naphtha, 1s. 3d. per gallon. Crude naphtha, 30 per cent., 1s. per gallon. Light oil, 3d. per gallon. Creosote, 2d. per gallon. Pitch, 12s. to 15s. per ton. Carbolic acid (crude), 8s. 5d. per gallon. Cresylic acid, 9d. per gallon. Tar salts, 15s. per ton. Anthracene, 30 per cent., "A" quality, 1s. 6d. per unit; "B" quality, 1s. 3d.

Ammonia Products.—Sulphate is moving off freely, and important shipments are again being made to France. The experience last year evidently satisfied the users there of its superiority to nitrate of soda; the latter article having largely displaced sulphate during the past season. Prices continued firm during the week, at £11 10s. to £11 15s. per ton, less discount. The prices of other products are as follows:—Gas liquor (5° Twaddell), 7s. 6d. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 2d. per lb. Carbonate of ammonia, 3½d. per lb. Muriate of ammonia, brown, £18 per ton; white, £27. Sal-ammoniac, £30 per ton.

[From the *Chemical Trade Journal*, Oct. 20.]

Sulphate of Ammonia.—The market keeps very firm; and we hear that makers are holding out for higher values. Business was done yesterday at £11 15s. Hull; but for next month £12 to £12 2s. 6d. is now being asked. There is a danger in running up the prices too rapidly; but if the consumers act wisely, they will cover their requirements early, as anyone with half an eye can see upon what a delicate balance the supply and demand are hung. Sulphate is scarce; and there is no denying this fact. Beckton stands at £11 15s.; while London outside makes are value for £11 13s. 9d. The Leith market is very firm at £11 13s. 9d.

Tar Products.—Benzols are weaker again; and prices are a penny or three-halfpence below last week's quotations. Solvent naphtha is still in good demand—that is, coal-tar solvent; the coke-oven solvent, which was under trial at several india-rubber works, having now been practically abandoned. Crude carbolic is firmer, though without change in price; and "B" quality of anthracene has advanced another penny, and is now valued at 1s. 3d. Good liquid creosote is moving off freely; and the demand will most assuredly be good throughout the winter. Pitch remains much in the same state as in our last report; and prices are unchanged.

FILEY WATER AND GAS COMPANY.—The annual general meeting of this Company was held on Saturday, the 13th inst.—Captain Unett presiding. The report and balance-sheet for the year ending June 30 last was presented, and showed the receipts for both gas and water to have been considerably in excess of any previous year. The work undertaken by the Directors last year in making a new reservoir at Hunmanby and remodeling the works at Filey have been satisfactorily completed, at a cost of £5130; and the Company are now in a position to supply both gas and water of good quality to any extent which may hereafter be required by the townspeople.

CEARA GAS COMPANY, LIMITED.—From the report of the Directors of this Company for the year ended June 30 last, we learn that the rental, both public and private, shows a satisfactory increase. The expenditure on capital account—£2741 6s.—includes 300 additional public lamps, condensers, coal-stores, mains, &c. The accounts show a profit of £4476 13s., which, added to the balance of £675 4s. brought forward, makes £5151 17s. Deducting the interim dividend paid in April, there remains £1001 3s. available for division. The Directors recommend that £1000 be added to the reserve fund, and the declaration of dividends for the six months ended June 30 last at the rate of 10 per cent. per annum on the preference shares (less income-tax), and at the rate of 11 per cent. per annum on the ordinary shares (free of income-tax); making, with the interim dividend already paid, 8 per cent. for the year. The balance carried forward will be £949 12s. 6d.

FEATHERSTONE WATER SUPPLY.—The difficulties which arose some time ago at Featherstone in respect of the water supply of the township have at last ended; an agreement having been come to between the Featherstone Local Board and the Wakefield Corporation for a supply from the reservoirs of the latter authority. It has received the common seal of the Board, as well as that of the Corporation. On the sealing of the document, the Mayor gave expression to the general feeling when he referred to the pleasure it gave him to find that the two authorities had at last come to terms. The hitch in the negotiations, and which so long retarded a final settlement, was the demand on the part of the Board to be guaranteed a supply whether or not Wakefield had sufficient for its domestic and manufacturing purposes. But this demand was withdrawn; and the Corporation also made a concession, whereby the agreement is to remain in force for the term of 30 instead of 20 years. Both sides are to be congratulated upon the compromise.

THE PROFIT OF THE OLDHAM GAS-WORKS.—Mr. H. Andrew, the Superintendent of the Oldham Corporation Gas-Works, writing to a local paper, says: "The sums paid directly by the Gas Committee in aid of the borough rates, during the year ended March 25, 1888, amounted to £13,809 2s. 11d. The entry in the borough fund revenue account would have been correctly stated if it had been given thus:—Interest on the gas-works capitalized profits during the year ended March 25, 1887, £75,438 6s. 11d., at 4 per cent., £3017 9s.; net profits from gas-works for year ended March 25, 1887, £10,791 18s. 11d.—total, £13,809 2s. 11d. The £3017 1s. is included in the amount charged for annuities and interest (viz., £11,844 7s. 6d.) in the gas-works profit and loss account, and also in the item of £4812 17s. 11d. for annuities, interest, &c., accrued to and unpaid on March 25, 1887. The sum of £7973 16s. 4d., being the amount available to be used in aid of the borough rates from the gas profits for the year ended March 25, 1888, has been paid into the borough fund since the 25th of March last, and will therefore be dealt with in its revenue account for the year ending March 25, 1889."

DAMAGING A GAS-LAMP AT BRISTOL.—At the Bristol Police Court last Friday, John Golding and William Burgess were summoned for damaging a gas-lamp belonging to the Bristol Gas Company. The circumstances of the case were very peculiar. On Aug. 13 last, Mr. Golding left his horse and trap unattended in Victoria Street, Temple. The animal started off and came into collision with a horse and trolley belonging to Mr. Burgess, standing by the side of the pavement without anyone being in charge. The two horses ran away; and eventually Mr. Burgess's trolley came in contact with a lamp-post, knocking it down, and doing damage to the extent of £1 16s. 3d. Mr. Carter, who appeared for Mr. Burgess, submitted that he was not liable, and that his driver ought to be summoned, as he was responsible. Witnesses having been called in support of the summons, Mr. Carter contended that there was no default on the part of his client. The Magistrates were of this opinion, and ruled that he was not liable, and dismissed the summons against him. They held that Mr. Golding's horse was the cause of the damage by running away. They expressed sympathy with Mr. Golding, but said he must pay the amount of the damage.

SALES OF SHARES.—On Wednesday last, Messrs. Edwin Fox and Bousfield disposed of a number of miscellaneous shares at the Mart, Tokenhouse Yard, E.C.; among them being 20 £10 fully-paid shares in the *West Kent Gas Company*, on which the maximum dividend of 10 per cent. is being paid. These realized £20 per share; and a parcel of 30 £10 shares (£4 paid) in the same Company, on which the maximum dividend of 7 per cent. is being paid, sold at £6 10s. each. Sixty £5 shares (£4 paid) in the *Bombay Gas Company, Limited*, fetched an average price of £5 15s. The last dividend paid on these shares was 7½ per cent.—On the previous day, Messrs. Nicholson, Greaves, and Barber sold some of the new shares recently issued by the *Sheffield Gas Company*, which are of the nominal value of £6 each, and the first call (£1 4s. each) on which will be made next month. They fetched £4 5s. and £4 6s. 3d. per share.—Last Wednesday, Messrs. Edwards and Sons sold by auction at Stoke-upon-Trent, £20,000 new consolidated stock in the *Staffordshire Potteries Water Company*; being a portion of the £30,000 lately authorized by Parliament. The stock was put up in £100 lots, which realized prices ranging from £140 to £147 each.

SERIOUS EXPLOSION OF GAS AT THE LEEDS MIDLAND STATION.—Between three and four o'clock last Tuesday afternoon, an explosion of gas in a disused kitchen, almost immediately underneath the first-class refreshment room at the Midland Railway Station, Leeds, resulted in serious injury; Richard Collier, a gas-fitter, and William Regan, a labourer (both employed by the Company), being rather badly burnt. An escape of gas had been discovered in the cellars under the refreshment department on the platform on the south side of the station; and the men went to search for the leakage. They disconnected the mains in two or three places, in order to satisfy themselves as to the direction in which the gas travelled. Having completed this operation, they joined up the mains again excepting at one point. In the brief period during which the pipes were disconnected a considerable quantity of gas accumulated in an old empty kitchen. When Collier and Regan were finishing their work, the latter struck a light, which ignited the escaped gas. Collier's clothing took fire; and he was very seriously burned from head to foot. Regan's hands and a portion of his head suffered, though much less severely. Collier was carried to the Infirmary, to which institution his fellow-workman was able to walk. The more seriously injured man lay unconscious all Tuesday evening; and his condition was considered somewhat dangerous. His companion, however, after receiving medical attention, was able to go home.

REDUCTION IN PRICE.—The *Heckmondwike Gas Company* have reduced the price charged for gas supplied to the public lamps to 2s. 6d. per 1000 feet.

PROPOSED ADOPTION OF THE SLIDING SCALE BY THE BRISTOL GAS COMPANY.—At the meeting of the Bristol Sanitary Authority last Thursday, a discussion took place upon a communication received from the Secretary of the Bristol Gas Company (Mr. Jas. V. Green), to the effect that the Directors contemplate applying to Parliament for power to adopt the sliding-scale principle, and asking whether, in the event of such permission being applied for (which it was considered would be advantageous to the consumers as well as to the Company), the Sanitary Authority would concur in the application. Mr. Green pointed out that the Company may now charge 4s. 6d. per 1000 cubic feet; but that the Directors propose to fix the initial price at 2s. 9d., from which figure the sliding scale will operate. He added: "I may say that ½ per cent. on the capital of the Company amounts to £1095, whilst 1d. per 1000 cubic feet amounts to £5084; so that practically out of every saving of £6000 our proprietors would receive an additional dividend of £1000, and the consumers of Bristol would receive £5000." It was decided to inform the Company that the Authority had not had sufficient time to consider the matter to enable them to advise the Town Council thereon, with a view to an application by the Company next session.

THE NORTHERN COAL TRADE.—The northern coal trade is now experiencing increased activity through the apprehension of a strike of some importance in the Yorkshire district. Already some of the southern railways which derive their supplies usually from Yorkshire and the Midlands are negotiating for contracts in the Durham and Northumbrian coal-fields; and hence the price of steam coals is stiffer. Some of the best collieries are now asking 8s. per ton for best steam coal—an advance of 6d. Gas coal is also in brisker demand; and, all round, the users of coal appear to desire to stock more rapidly. Some Italian contracts for gas coal are now being negotiated; but the uncertainty as to the rate of steamship freights affects business. It may be added, too, that in all the coal contracts now the question of the supply of tonnage for carriage is important; and 5s. per ton has had to be paid for freight on coal by steamer to London this week—a rate which is very considerably above that of a year ago, but which is fully justified by the advance which has taken place in other freights. The household coal trade is much more active; but there is no change in prices. The general appearance of the coal trade of the North, however, seems to point to a further advance in rates; whilst the opening of the strike campaign would certainly bring about a rise. Gascoal is now much more abundant; but the cement-works are taking large quantities. Still for three months there will of necessity be increasing supplies.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST. (For Stock Market Intelligence, see ante, p. 713.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.					£ s. d.
GAS COMPANIES.								
590,000	10	12 Oct.	10½	Alliance & Dublin 10 p. c.	10	18-19*	..	5 10 6
100,000	10	"	7½	Do.	10	12½-13½	..	5 11 1
800,000	100	2 July	5	Australian (Sydney) 5½ p. c. Deb.	100	110-112	..	1 9 3
100,000	20	30 May	10	Bahia, Limited.	20	23-25	..	9 0 0
200,000	5	11 May	7½	Bombay, Limited.	5	7½-7¾	..	4 16 8
40,000	5	"	7	Do. New.	4	54-55	..	5 4 2
380,000	Stock	29 Aug.	11	Brentford Consolidated.	100	221-227	..	5 3 6
125,000	"	"	8	Do. New.	100	161-166	..	5 5 5
220,000	20	13 Sept.	10	Brighton & Hove, Original.	20	43-45	..	4 13 4
320,000	20	28 Sept.	11	British.	20	45-47	..	4 15 9
50,000	10	13 Sept.	11	Bromley, Ordinary 10 p. c.	10	19-21	..	5 4 9
39,000	10	"	8	Do.	10	13-14	..	5 14 3
328,750	10	30 May	8	Buenos Ayres (New) Limited.	10	143-151	..	5 3 2
200,000	100	2 July	6	Do.	100	110-112	..	5 7 1
150,000	20	10 Aug.	7	Cagliari, Limited.	20	25-27	..	5 3 8
550,000	Stock	12 Oct.	13½	Commercial, Old Stock.	100	260-265*	-3	5 3 9
190,000	"	"	10	Do. New, do.	100	209-214*	..	5 0 5
121,334	"	28 June	4½	Do.	100	123-128	..	9 10 3
557,320	20	14 June	12	Continental Union, Limited.	20	45-46	..	5 4 4
242,680	20	"	12	Do.	14	30-31	..	5 8 1
200,000	20	"	9	Do.	20	36-38	..	4 14 8
75,000	Stock	28 Sept.	10	Crystal Palace District.	100	205-215	..	4 13 0
234,060	10	27 July	13	European, Limited.	10	254-264	..	4 18 1
120,000	10	"	13	Do.	10	254-264	..	5 0 0
354,000	10	"	13	Do.	10	184-194	..	4 16 3
5,468,600	Stock	29 Aug.	13	Gaslight & Coke, A. Ordinary.	100	249-253	+1	5 2 9
100,000	"	"	4	Do.	100	100-105	..	3 16 3
665,000	"	"	10	Do. C, D, & E, 10 p. c. Pf.	100	260-265	..	3 15 6
30,000	"	"	5	Do. F, 5 p. c. Pf.	100	125-130	..	3 16 11
60,000	"	"	7½	Do. G, 7½ p. c. do.	100	182-187	..	4 0 2
1,800,000	"	"	7	Do. H, 7 p. c. max.	100	167-172	-1	4 1 4
463,000	"	"	10	Do. J, 10 p. c. Pf.	100	258-263	..	3 16 1
1,061,150	"	14 June	4	Do.	100	120-123	..	3 5 0
234,850	"	"	4	Do.	100	125-130	..	3 9 3
650,000	"	"	4	Do.	100	175-178	..	3 7 5
3,600,000	Stock	11 May.	10	Imperial Continental.	100	210-213	..	4 13 10
75,000	5	14 June	6	Malta & Mediterranean, Ltd.	5	5-54	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne 5 p. c. Deb.	100	113-114	..	1 7 9
541,920	20	14 June	6	Monte Video, Limited.	20	20-21	..	5 14 3
150,000	5	30 May	-0	Oriental, Limited.	5	9-9½	..	5 5 3
60,000	5	23 Sept.	-7	Ottoman, Limited.	5	6-7	..	5 0 0
166,870	10	27 July	4	Pará, Limited.	10	5-6	..	6 13 4
420,000	100	2 May	6	People's Gas of Chicago—	100	107-110	..	5 9 1
500,000	100	1 June	6	1st Mtg. Bds.	100	95-100	..	6 0 0
100,000	10	12 Oct.	10	2nd Do.	10	16-17*	..	5 17 8
500,000	Stock	29 Aug.	15½	San Paulo, Limited.	100	306-311	..	4 19 2
1,350,000	"	"	12	South Metropolitan, A Stock	100	238-242	-3	4 19 2
141,500	"	"	13	Do.	100	245-255	..	5 1 1
550,000	"	28 June	5	Do.	100	135-140	..	3 11 5
60,000	5	29 Aug.	11	Tottenham & Edm'ton, Orig.	5	11-13	..	4 4 0
WATER COMPANIES.								
717,467	Stock	28 June	9	Chelsea, Ordinary.	100	260-265	..	3 7 11
1,720,560	Stock	12 Oct.	7	East London, Ordinary.	100	193-198*	..	3 10 8
700,000	50	11 June	9	Grand Junction.	50	123-127	..	3 10 10
708,000	Stock	10 Aug.	10½	Kent.	100	270-275	..	3 16 4
1,043,800	100	28 June	9	Lambeth, 10 p. c. max.	100	255-260	..	3 9 3
406,200	100	"	7½	Do.	100	197-202	..	3 14 3
200,000	Stock	28 Sept.	4	Do.	100	117-120	+½	3 6 8
500,000	100	27 July	12½	New River, New Shares.	100	340-350	..	3 9 3
1,000,000	Stock	"	4	Do.	100	123-127	-1	3 3 0
902,300	Stock	14 June	6	S'hwk & V'hall, 10 p. c. max.	100	166-171	..	3 10 2
126,500	100	"	6	Do.	100	157-162	..	3 14 1
1,135,966	Stock	11 June	10	West Middlesex.	100	265-270	..	3 11 1

* Ex div.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 30, 1888.

THE LONDON COUNTY COUNCIL—A PROSPECT.

THE announcement as to the appointment of the Duke of Westminster to be Lord Lieutenant of the new County of London, which was published last week, has served the newspapers for a peg whereon to hang some rather idle speculation as to the future administration of the huge Metropolitan province now about to assume organized entity. Some highly complimentary things have been said respecting His Grace of Westminster, most of which, it is only just to admit, have been fairly earned. The Duke is a Londoner in his sympathies as well as by choice of residence; and there cannot be two opinions about his fitness in every sense for the most honourable and exalted employment in connection with the government of the great capital in which he has probably the largest individual territorial interest. It is a sound instinct that sees in a member of the highest order of the nobility of the land the right person to be first named as an officer of the new Metropolitan executive, and witnesses to the awakening of a sense that what may be called Absenteeism has been, and still is, as great a hindrance to

healthiness of London government as in the familiar example of Ireland. Wherever there exist different grades and classes in a society—that is to say, all over the civilized world—the perfect working of that society can only be ensured by every class and degree performing those functions of the whole organism for which it is best fitted. It is to be hoped that few intelligent students of sociology now retain the exploded opinion that any good can be expected from those violent reclassifications of the members of a community that were so favoured by the revolutionaries who made their last experiments in '48. The time may come when the best of the ideas which are commonly recognized as Socialism will be carried into effect; but if so, it can only be through the working out to their natural result of those processes which in their present stage present to us the spectacle of a society arranged in more or less perfect and separate strata. In a healthy community, whatever may be the diversity of the classes composing it, all are cemented together by common recognition and discharge of public duty, as well as interpenetrated by sympathies arising from unity of race, community of opinions, and multitudes of other similarities and agreements. No layer can be forcibly withdrawn without injury to the rest, although it may be as apparently useless in itself as a vein of quicksand in a sub-soil. Readers of that splendid work of Henri Taine's, "The Ancient Régime," will remember how strikingly the author makes out the connection of the horrors and blunders of the Revolution with the withdrawal of the old nobility of France from the spheres for which they were originally created, and in which they were useful in order to ornament a frivolous Court. The nobles of the Ancient Régime became useless when taken out of the places in which they could have served the commonwealth. Unused members, physiologists tell us, are liable to decay, and even to poison the organism to which they belong. So it was with the France of the old Monarchy; and so it has been, in a very much smaller way, with the London of the Metropolitan Board of Works. Whole classes of the Metropolitan community have abstained from act or part in the administration of the centre of population and influence of which they constituted a portion, to their own loss as well as that of the public. There has been an excuse for them in the muddled and imperfect scheme of London government under the Vestry system; but with the gift of a County Council, this excuse disappears. The question is, Will the new tools of government be taken up by the right hands?

It is a good beginning to select for the Lord Lieutenant of the new Metropolitan county a great nobleman who has earned such respect for himself as even to reflect additional lustre upon his rank; but the Lord Lieutenant is, after all, very much of an Olympian god in the scheme of county self-government; and the question of the acceptability of a county administration will depend upon the elective members, and especially upon the new popular leaders who will be developed under the yet untried scheme. Of what sorts and conditions of men will the London County Council be composed? It is not too soon to ask the question now, when the subject of who are likely to come forward as candidates for election into these bodies is interesting the country generally, albeit in a quiet way. Some people protest against the introduction of party politics into these elections; others assert that unless politics are followed, it will be impossible to procure good men for the Councils. In a recent leading article, *The Times* remarked that "it would be a great and irretrievable misfortune for London if the County Council should prove to be nothing better than an agglomeration of Vestrydom" or a reproduction of the Metropolitan Board of Works." Yet it is tolerably certain that most of the old parochial personages who have so long worked the machine of London Local Government, are quietly preparing to put themselves forward at the proper time for election into the new organization; and it would not be surprising if there should be a good deal of hand-shaking among old cronies, as well as some lobbying in the regular old style, when the Council meets for the first time, and proceeds to the nomination of its different Committees.

The remedy for this possibility of the near future lies in the selection of new and good men for the Council, and in the regular publication of their doings when in harness. Perhaps one or another of the London newspapers that obliges its readers with a daily column of Turf news will condescend to throw about half as much light upon the policy of a Chairman of a Finance Committee of the Council disposing of about a million sterling out of the rates, as upon

the public performances of the wretched "platers" which are religiously recorded in its columns for the edification of its sporting readers. We confess candidly, however, that we scarcely hope for as much. The first selection of councillors for London must be largely hap-hazard, seeing how little the people know of each other, and how divided are their interests between city and suburb. But this drawback can be easily made up if there is only sufficient publicity thrown upon the after-proceedings of the representatives to be chosen so much at random. It is precisely this desideratum, however, which is likely to be lacking. The London daily newspapers might as well be printed in the moon for all the care they usually bestow upon the municipal affairs of the capital; and the various district and weekly publications that profess to keep record of Metropolitan municipal affairs are generally of a quality beneath contempt. If this is amended with the new dispensation, it will go further towards ensuring the good working of the fresh system of local government than anything else that could be named. At present it is a deplorable fact that habitual readers of the principal London daily newspapers are kept better acquainted with the development of the town affairs of Paris, and even of New York, than of the city in which they earn their bread, and in the suburbs of which they have their domiciles.

While it will be of the first importance to get good men and able administrators for the County Council of London, if such can be obtained, it will be almost equally important that the mistake perpetrated in the case of the London School Board should not be repeated. For the first School Board, all the celebrities of the day were candidates. Lord Lawrence was the first Chairman, and Professor Huxley was an ordinary member. Now the Chairman is—the Rev. Mr. Diggle, and the members are nobody knows who. It is possible that Mr. Diggle may be a better Chairman, in his way, than was his Lordship of the Punjab; but the two names cannot be spoken without arousing a sense of that kind of comparison which rightly deserves to be regarded as odious. The fact of the matter is that the first members of the Board were too big or too eminent for the work that was really required; but they did an amount of good in their day by strongly grasping the unknown responsibilities of their new position, and interpreting their duties in a spirit widely different from that in which they would have been understood by (say) a Select Committee of different Boards of Guardians of the Poor. When these eminent personages gave up the work, they were followed by mediocrities who could copy them in nothing but extravagant expenditure; and these naturally gave place to the existing race of economists. This history teaches us to deprecate the choice of too lofty or celebrated individuals for the first London County Council. London wants neither the seasoned vessels of the Metropolitan Board of Works, nor a cluster of ex-Governors, Generals and Bishops out of engagements. A few smart young lawyers would not be amiss; and the same may be said of moneyed scions of good old business firms in want of something to do. If we once embark upon descriptions of eligible candidates, however, it will be impossible to stop. The great thing is that the body, however composed, should be truly representative of all classes of Londoners, from Whitechapel to Belgravia. There is a great deal for the London County Council to do. Even with regard to gas supply and water distribution, it will have a long leeway to make up, without rushing full tilt upon the question of the purchase of the undertakings of the Companies. Yet we must not expect too much at first. "Who goes softly," says the Italian proverb, "goes safely; who goes safely, goes far." The new body will have to feel its way with particular care, having before its eyes the fate of its unhonoured predecessor, and knowing that pitfalls will await it at every step in its advance. If properly constituted, however, of men who for the most part are neither needy adventurers nor senile men who have prospered in trade because they never had an idea out of their business of money-making, the Council may have an honourable and protracted career.

THE COAL QUESTION.

Much attention has been directed during the past week to the question of coal. The owners have conceded the required advance of wages in several districts; the situation in Yorkshire, Derbyshire, and North Nottinghamshire up to the end of the week being stated as follows:—Nineteen collieries, with an output of 10,000 tons per day, were working at the advanced rate; while sixty-nine collieries, with a daily output of 80,000 tons, had refused the advance, and accordingly

the men, with few exceptions, were out on strike. The strike was vigorously kept up in Derbyshire; about 20,000 men being out until last Saturday. On the other hand, the owners in the mining districts of Oldham and Ashton have granted the advance, and all fear of the strike extending to this district is therefore at an end for the time. Although 8000 men are reported as being out in the Leeds district, the miners' agents are confident that the advance will soon be generally obtained. It was announced yesterday that the chief Derbyshire collieries had resumed work at the advanced rate. A great deal of solemn nonsense on the subject of the strike is addressed to the men in some newspapers. They are adjured to think of the interests of the trade of the country, the manifest improvement in which, that has been recognized of late, is said to be imperilled by their action; but bearing in mind how little regard is had to such considerations by the great men who form syndicates and "rings" for their own profit, it is the rankest hypocrisy to tell working men that they should not look after themselves. If mere self-interest is not to rule the men at the bottom of the industrial system, those at the top should not be so prone to act upon the same motive whenever they see the chance. Of course, a strike is a deplorable device for procuring a resettlement of a wages question; but it is evident that workmen are less prone to fly to this their last weapon than formerly. Sorry as we naturally feel to see this interruption of the trade of the country, we do not deny or conceal our opinion that, at least in the gas coal branch of the trade, the men can very well be paid the additional wages; and that if for this purpose the cost of coal should require to be raised by a few pence per ton, Gas Companies and Corporations can easily afford to pay the difference. Several subsidiary questions arise out of this subject of miners' wages and strikes. It may be remembered that a few years ago Mr. C. E. Jones read a very useful paper before the Manchester District Institution of Gas Engineers, in which he argued that if gas coal were ordered to be delivered in equal monthly quantities instead of as wanted for instant carbonization, the strain upon colliery management would be materially reduced, and strikes, which usually come just at the commencement of the winter season, would be largely prevented. We supported this appeal to Gas Companies at the time; but it is to be feared that the objectionable system condemned with so much reason by Mr. Jones is still too general, although at least 3d. per ton can be saved by purchasers who are willing to receive their consignments of coal in regular quantities throughout the year.

Before leaving this subject, it may just be noticed that the irrepressible Mr. Ellis Lever has written to *The Times*, advertising himself, as usual. He says: "I am, as you are aware, a large gas coal and cannel contractor, besides having an interest in colliery companies;" and, apparently out of respect for this claim, the Editor of *The Times* allows him to make some very peculiar statements regarding the gas coal trade. Strangely enough, Mr. Lever then supports what was remarked in the *Journal* last week upon the result of competition and low prices in fostering dishonest practices for the purpose of obtaining orders for coal. He declares—and there is no better authority upon the point—that to secure gas and other coal contracts, commissions of "from 6d. to 2s. 6d. a ton" are paid to those who have the giving or influencing of "orders." When, however, he goes on to state that "it is computed that £800,000 a year is paid in this way in connection with the gas industry of the United Kingdom," one may be permitted to think that he speaks less from personal experience than from a much too exuberant imagination. Mr. Lever next regales the readers of *The Times* with the repetition of the story of his own criminal prosecution for exposing the Hunter frauds at Salford; and continues: "I have lately exposed similar doings at the Halifax Gas-Works"—asserting, moreover, that he "could name scores of towns where the same practices obtain, to the complete demoralization of all concerned." The obvious rejoinder to this boast is, why does he not carry it out, and at once earn his statue as the great and presumably only honest coal dealer of his age? With a fine display of indignation, Mr. Lever concludes this truly remarkable, not to say audacious, letter. He protests, of course in the name of the public interest, against the formation of anything like a Coal Syndicate. The only good we can see in such a project is that it would render middlemen, like Mr. Lever himself, superfluous, which is "a consummation devoutly to be wished;" for it is open to be argued that, whatever evils

might be expected from the working of a Coal Syndicate, they could not possibly surpass the mischief that has been wrought by middlemen. We are ready to admit that all middlemen are not like Mr. Lever; but he belongs to the class, and cannot dissociate himself from it. In connection with this aspect of the question, the letter addressed by Mr. Henry Woodall to the Manchester daily newspapers, and reproduced in another column, will be read with some amount of interest.

THE HALIFAX GAS SCANDAL.

THE Halifax gas affair has entered upon a further stage of its development. We had gathered from the statements of the local press that the immediate result of Mr. T. K. Fox's published libels upon the three persons whose names were mentioned therein would be the commencement of proceedings against the author by Mr. Alderman Riley, and against the Mayor by Mr. E. G. Wrigley. Time has passed on without any such action having been taken. Mr. Riley seemed to be ready for the attack; but he required an indemnity in terms which the Town Council have declined to give; and in default of this he has made no sign of any intention to begin hostilities on his own account. It is useless to deny that this apparent repugnance to avail themselves of their remedy on the part of the libelled persons has made an unpleasant impression even upon that section of the public which was at first disposed to suspend judgment in the matter. It is reasonable that a suspension of judgment should be demanded and obtained when allegations of this order are flying about; but the suspension can only be for such time as may be reasonably allowed for the incriminated persons to act in their own defence. We have all along been disposed to make special allowance for Mr. W. Carr, knowing that his state of health is such that the excitement and strain of an action-at-law might be too much for him. In the case of Mr. Wrigley, we understand that, by the advice of his Solicitor, he is awaiting the commencement of a civil action by the Halifax Corporation, the writ in which he is daily expecting, upon the line of the claims indicated in the now notorious speech of the Mayor. This action will clear the way for subsequent proceedings to be instituted by Mr. Wrigley for the defence of his personal character; but it is considered best, under the circumstances, that the commercial side of the question, as between the coal contractor and the Corporation, should be first dealt with. We are not aware of the nature of the steps, if any, that Mr. Riley will take. If Mr. Riley and Mr. Wrigley could clear themselves of blame, the deliverance would in all probability serve for Mr. Carr also, who is apparently not charged with anything other than what he must have shared with one or both of these his associates. With Mr. Wrigley particularly it is a question of life and death. He has poured contempt upon Mr. Fox; and as Mr. Fox is notoriously only a stalking-horse for Mr. Lever, the treatment is not unmerited. Whether or not the accused persons take action, the matter is to be probed to the bottom. They have had offered to them the opportunity for acting on their own behalf; and the Corporation have declared that, whatever steps are found to be necessary for thoroughly sifting the affair, shall be undertaken in the public interest. If it is of moment to the accused to clear their characters; and it is also of the highest importance to the Corporation of Halifax that the circumstances attending the administration of their gas undertaking should be elucidated. We can only hope that success the most complete and satisfying will attend the efforts of the Town Council in this direction.

THE BRISTOL GAS COMPANY AND THE SLIDING SCALE.

As announced in last week's issue, the Bristol Gas Company contemplated applying to Parliament next session for the sliding scale. The Company have at present a maximum price of 4s. 6d. per 1000 cubic feet, but are actually selling gas at 2s. 4d. They intended to ask for an initial price of 2s. 9d., and notified the fact to the Bristol Sanitary Authority, whom they asked to consent to the figure and the application. This the Authority refused to do, upon the rather transparent excuse that there had not been sufficient time to examine the proposal, and advise the Town Council respecting its desirability or the reverse. The Directors of the Company seem to have been only half-hearted in the matter; for, after making this announcement of their views, they have dropped the idea of going to Parliament, with the Corporation possibly in opposition. This looks, on the face of it, a rather weak style of proceeding. If the Board had really made up their mind that the sliding scale would be a good

thing for the Company, they should certainly have persevered, with or without the countenance of the Local Authority; knowing that if the first House of Parliament put the initial price below the limit which they were prepared to accept, they need not proceed with their Bill in the second House. It seems a pity that, having shown their hand to this extent, they did not decide to make a dash for what they wanted. The incident shows how difficult it would be now for any Company really working honestly under the old legislation to better themselves by adopting the sliding scale. It is not to be expected that the Bristol Company, selling gas at 2s. 4d., would be allowed a sliding scale of 2s. 9d. per 1000 cubic feet. Perhaps they thought of asking for 2s. 9d., with the idea of falling back upon 2s. 6d. as a last resource; but even then it would be very questionable whether there would be any advantage in giving up the safeguard of a 4s. 6d. maximum for an extra 10s. per cent. in the present. And supposing that the initial price had been made equal to the current selling price, would the Company be right in accepting it? "Certainly not," would be the probable answer of the majority of the shareholders, if the position were explained to them. Altogether, it looks very much as though the existing maximum-dividend Companies are likely to continue as such from the lack of means of escape.

THE LATE SIR W. SIEMENS.—The biography of the late Sir W. Siemens, which, as stated in the JOURNAL last week, has been prepared (under the direction of the Executors) by Dr. W. Pole, F.R.S., was issued last week by Mr. Murray. Pending the fuller notice of the book which will appear in an early issue, we may say that Dr. Pole has produced an exceedingly interesting account of the career of one of the most conspicuous of the engineers of the present generation. The late Sir W. Siemens possessed in a high degree the inventive faculty; and the use to which this great talent was put is well shown by his biographer. The volume contains portraits of Sir William and his three brothers, as well as other illustrations.

DEATH OF MR. T. ROWLAND HILL.—We much regret to have to record the sudden death, last Tuesday, of Mr. Thomas Rowland Hill, in his 56th year. The deceased gentleman was formerly the head of the firm of Hill, Higgs, and Hill, Builders and Government Contractors, of Kennington. He retired from the firm, however, some years ago—partly on account of ill-health; relief from business being considered desirable. We believe that members of the Hill family have been shareholders of the South Metropolitan Gas Company for the last 30 years or more; while Mr. Hill himself was elected a Director immediately antecedent to the amalgamation effected in 1879 with the Surrey Consumers' Company. He was regarded by his colleagues as a man of good sound sense and business ability; and during the nine years he was on the Board, he won the esteem of both the officers and his co-Directors. In his private life he was also much respected.

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—The next meeting of this Association, which will be held on the 8th prox., promises to be an exceedingly interesting one. In the first place the members will have submitted to them, in a paper by Mr. George Livesey, the important question of the day, from a gas-works constructor's point of view—viz., "How and how far the guide-framing of gasholders may be dispensed with." Next, Mr. W. E. Price, of Hampton Wick, will call attention to some of the hindrances to the sale of gas. The rest of the business will consist, as usual at the November meeting, of the election of President and office-bearers for the ensuing year, and the admission of new members. In view of the dissatisfaction which has from time to time been expressed with the old meeting-place, we are pleased to notice that the Honorary Secretary (Mr. J. W. Helps, of Croydon) has secured the Whitehall Rooms of the Hôtel Métropole for the future gatherings of the Association—an arrangement which will, we are sure, be much appreciated by the members.

MR. ELLIS LEVER AND THE LEEDS GAS COAL CONTRACTS.—Our readers will remember that at the meeting of the Leeds Town Council on the 11th inst. (see *ante*, p. 686) certain communications which had been received from Mr. Ellis Lever in reference to the gas coal contracts were under consideration. No action was taken upon the matter as far as the Council were concerned; but the Gas Committee decided to entertain Mr. Lever's proposal. Accordingly, he had an interview last Saturday week with the Mayor (Mr. Alderman Scarr), the Chairman of the Gas Committee (Mr. Gilston), and the Town Clerk (Sir G. W. Morrison), when the subject of his letters was discussed at some length. The result was that he was invited to test various consignments of coal on their way to the gas-works. On this he was engaged for several days last week; and presented his report to the Committee on Friday. He states that the coal examined was from 6 to 15 per cent. inferior in quality to that submitted when the Committee accepted the tenders; and some tests are reported to have revealed a deficiency of from 20 to 30 per cent. He also condemns the existing system of checking and weighing the coal. After considering the report, a Sub-Committee was appointed to further investigate the matters referred to therein, in conjunction with Mr. Lever.

Water and Sanitary Affairs.

A NEW grievance has been found out by Mr. Archibald E. Dobbs; and he is in ecstasies accordingly. He accuses the New River Company of "inexpressible meanness," "paltry robbery," and "pettifogging extortion," over a matter of 3s.; being the charge in respect to a particular water-closet, which he alleges takes no water from the Company's main, but derives an exceptional supply from an old well. On this phase of the "The Water Question" Mr. Dobbs expatiates in language of the most impassioned character; the world being made acquainted with the momentous topic by means of a letter to *The Times*. Mr. Dobbs is aghast at the audacity of the Company. "Do they think that I am 'dead or dumb, or that my hand is paralyzed so that I cannot write?' Intoxicated with past victories, Mr. Dobbs cannot bear to be ignored. It is true he is not the party who is required to pay the 3s. It is not even clear that the gentleman on whom the demand is made is either friend or neighbour to Mr. Dobbs. But somebody, it matters not who, is called upon to pay; and Mr. Dobbs, as the sworn adversary of the Water Companies, considers his personal dignity compromised. The Companies have ceased to be afraid of him (if ever they were afraid at all); and Mr. Dobbs warns them of the tremendous consequences of their temerity. What is going to happen, we do not know. But Mr. Dobbs is very irate, and New River shares may be expected to fall. Let it be understood, however, that the Company are acting within their rights, though Mr. Dobbs says that, in his opinion, they are altogether wrong. It may be urged that, as a matter of policy, the Company ought not to enforce their claim. But the Directors have a heavy responsibility resting upon them. This is not a mere question of 3s., or they might spare themselves any further trouble. They probably see in this matter, as in other questions that have arisen, that if they surrender their rights in one instance, they may have to do so in all other cases of a similar character. Water Companies have learned by this time the danger of making concessions. If they yield a point, the act of grace is quickly perverted into an abandonment of all such rights for the future. Once gone, they cannot be revived. We must also remember Mr. Dobbs has stated the case in his own way; and perhaps there is another way of telling the same story. An additional bone of contention on which Mr. Dobbs is now "sharpening his teeth," consists in the basis adopted by the New River Company for the water-rate outside the Metropolitan area. It appears that the Company take 10 per cent. off the assessment for the inhabited house duty, and make the remainder the basis for their water-rate. This is much too simple and understandable for the subtle genius of Mr. Dobbs, who desires a troublesome calculation to be entered into for the purpose of ascertaining the "net annual value." Possibly some consumers would gain a trifle by the change; but it is quite likely others would lose, and, on the whole, nobody would be any the better for all the disturbance, except that Mr. Dobbs might plume himself on the ability with which he sets people by the ears. He says it would be a "joy" to him to pursue the matter further by a long disquisition in the columns of *The Times*; but he fears lest the patience of the Editor and his readers should fail. Yet it might be well for all the rigmarole to come out, that the public might see how small a residuum of fact has served as the basis of such an iridescent bubble.

THE Directors of the Commercial Gas Company have elected Mr. W. G. Bradshaw as a member of the Board.

It is reported that Mr. Archibald Dobbs has consented to become a candidate for one of the South Paddington seats on the new London County Council.

THE Liverpool Engineering Society are to-morrow (Wednesday) evening to have read to them, by Mr. R. S. Wyld, jun., M.Inst.C.E., a paper entitled "The Laying of Large Mains."

WE have received from the Secretary of the Institution of Civil Engineers (Mr. J. Forrest) a copy of the new list of members, which has just been issued. In point of numbers, the Institution is probably the largest voluntary association in existence; the roll of members, associate members, associates, and students now reaching 5529.

THE many professional friends of Mr. Alfred Penny, whose relinquishment of his engagements, owing to impaired health, was announced in the JOURNAL some months ago, will be pleased to learn that he is now fairly well. As communications are still occasionally sent to him on gas matters, we may mention that Mr. Penny has removed from Beckenham to Queenwood, Gipsy Hill, Upper Norwood.

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET. (FOR STOCK AND SHARE LIST, see p. 772.)

DURING the past week the Stock Exchange markets have, on the whole, been firmer than they were the week before. Still they have fluctuated to some extent, almost from day to day; and they showed no very pronounced change at the close. The Money Market has been easy; and the Funds have fractionally risen. The Gas market was rather quiet until towards the end of the week, when there was a disposition to run against the Metropolitan Companies. This movement had an electric origin; and was aided by the very liberal notice accorded by a portion of the daily press to the preparations being made by an electric lighting undertaking upon a very ambitious scale. One is nothing now-a-days if not sensational; and accordingly this adventure (at least, so it is reported) aims at supplanting gas for a fifth of its cost. Truly a large stride from the three times its cost, which is about the best performance of electricity at present! However, in result, the Metropolitan gas stocks were put down a little; the fall ranging from 1 in South Metropolitan "A" to 2 in Gaslight "A" and Commercial old. Alliance and Dublin was depressed to a slight extent, from a similar cause—an electric project being revived in the Irish capital. Among Suburban Companies, the only noticeable feature is the further rise in Brentfords. The Company will reduce their price by 2d. per 1000 cubic feet from Christmas; thus entitling them to declare an extra $\frac{1}{2}$ per cent. dividend next August. But that is some time to look forward to. The Foreign Companies have been steady; and most of them are particularly firm. Bahia and Metropolitan of Melbourne have slightly advanced. The Bombay Company will meet on the 7th prox.; and the interim dividend of $3\frac{1}{2}$ per cent. will be paid on the 1st of December. The Water department has been exceedingly quiet. Chelsea and Lambeth have been done at low figures; but East London is the better. New River is recovering. The movements in this stock are always interesting. A few days ago business was marked as low as 340; but at the Mart last Wednesday some shares realized as high as 357—with a minimum of 353.

The daily operations were: Very quiet business on Monday in the Gas market; consisting only of three or four transactions in Gaslight and Imperial Continental. One deal in East London was all the business in Water. Tuesday was more animated; but not much. Prices in Gas were only moderate; and Gaslight "A," receded 1. South Metropolitan debentures rose 2. Water was still very quiet, and prices were low. Gas was again inactive on Wednesday, and tending to flatness. South Metropolitan "A" fell 1; and the "B," $1\frac{1}{2}$. But the debentures rose 1 higher. Water was quiet and unchanged. There was more activity in Gas on Thursday, with a tendency to weakness among the Metropolitan issues. Commercial old fell 2; but Brentfords old and new improved 1 and $2\frac{1}{2}$ respectively. Water was as before. Friday was the busiest day of the week for Gas—especially Gaslight "A" and all three issues of South Metropolitan. Prices were run down rather low; but the only change in quotation was a relapse of 1 in Gaslight "A." Bahia buyers were 1 higher. Nothing at all was done in Water; but New River buyers advanced 5. There was the usual quietude on Saturday; and Gaslight "A" was not even touched. Alliance and Dublin fell $\frac{1}{2}$; and Metropolitan of Melbourne rose 1. Nothing was marked in Water; but East London advanced 1.

ELECTRIC LIGHTING MEMORANDA.

GAS AND ELECTRIC LIGHT IN DUBLIN—A DISAPPOINTMENT AT EXETER—THE PROGRESS OF THE DEPTFORD ELECTRICAL SUPPLY WORKS—THE BUSINESS OF THE EDISON AND SWAN COMPANY.

THERE is another "difficulty" between the Corporation of Dublin and the Alliance and Dublin Consumers' Gas Company; this time in respect of electric lighting. The Company have a passage in their Act of Parliament which authorizes them to supply "artificial light;" and for some years past they have persisted in attaching to these words the signification that they cover the supply of electric light. The Electric Lighting Act takes no cognizance of the position of the Dublin Gas Company, but demands that they should proceed by Provisional Order, like any other speculators in this line. This the Company have given notice of their intention to do; and, naturally, the Corporation have formed a similar resolve. Consequently, the Company and the Corporation are placed in direct competition with each other—a situation which the national mind, as represented in the *Freeman's Journal*, finds exactly suited to its taste. Now that Donnybrook Fair has become a mere memory, the gentlemen of Dublin must have their bit of excitement somehow; and, to the credit of the Gas Company be it spoken, they are always ready and willing to oblige by treading on the tail of the Corporation gowu. *Arcades ambo!* As to the merits of the question, that is a minor consideration; but there will be a rattling good fight, anyhow. We are loth to quit the subject without expressing the opinion that the Gas Company had far better leave the electric light alone, and cultivate their own proper business. They cannot expect to make any money out of it; and from their point of view, it will be better for the Corporation to throw away money upon electricians rather than that the shareholders' cash should be squandered in the way proposed.

Exeter is one of the places chosen by the West of England champion of electric lighting, Mr. Massingham, for carrying on the

campaign which he began at Taunton. A local Company was formed some time ago; and, by dint of a good deal of agitation, the Corporation were persuaded to institute inquiries as to the possibility of lighting the streets by arc lamps. Of course, before the figures were forthcoming, the ratepayers were assured that electricity could afford them a better light at a less cost than gas. Tenders for the street lighting were accordingly invited; and the result is to frighten the Local Authority as well as the people. Taking the basis of a seven years' contract, the offers for supplying 65 arc lamps ranged from the Brush Company's tender of £43 down to the Exeter Electric Light Company's quotation of £22 17s. 6d. per lamp per annum. As the lowest offer is very much dearer than the cost of gas, however artfully the comparison may be made, the idea of adopting electric lights, never very warmly taken up by anybody outside Mr. Massingham's own party, has been abandoned. It is hard to see what the Exeter Electric Light Company can do now, except quietly retire from public view. As we ventured to predict some time ago, at this rate the enterprising promoter of these West of England electric lighting companies, which do not light, must be quickly nearing the critical period when he will be fain to confess that it was an evil day for him when he gave up selling boots and shoes and devoted himself to electricity.

Progress is being made at the Deptford station of the London Electric Supply Corporation, the outcome of the Grosvenor Gallery experiment. Great things are prophesied of this undertaking, which is to be the largest electrical generating factory in the world, and to exhibit the most powerful steam-motor plant ever collected upon one site. We are not disposed to say much about this venture until it arrives nearer completion. A noteworthy feature of the Deptford scheme is the clever idea for running the main conductors from the station into London by obtaining wayleave of the Southern railway companies. The works have a river frontage for convenience of coaling, and bringing materials by water carriage; and only about half a mile of underground piping will be needed to connect them with the South-Eastern Railway Station. Thence it will simply be a matter of running a half-inch copper rod along the various railway lines terminating at different points in town from London Bridge to Victoria, with the District Railway to give access to Kensington and Westminster. So far the scheme is very well thought out. One cannot help respecting the Grosvenor Gallery electricians for the quietness and business-like way in which they have gone about their work, building up a connection piece by piece like any other commercial interest. In this respect they compare most favourably with that other school of projectors, whose public appearances and pretensions have been in inverse ratio with the amount of work they have done, and who are so much better at lecturing and talking to newspaper reporters than at real business.

The fifth annual report of the Edison and Swan United Electric Light Company, referring to the accounts of the concern for the year ending June 30 last, states that the sale of lamps progressed in a satisfactory manner during the year, and the volume of the Company's general business likewise increased; the result being a credit balance of £25,123. This is a very bold statement; and it will be advisable to wait for the shareholders' meeting, and what is said thereat, before forming any opinion upon this figure. The Company wisely restrict themselves to the manufacture and sale of lamps and plant, and do some ship lighting, but eschew lighting contracts. In this respect they differ from the American Edison Company, who, as is well known, have a lighting business in New York which they claim to be very profitable, although the plant was laid down at a time when every electrical fitting cost twice as much as it would at present. The New York Company also claim that, although they have been lighting their district direct from steam-engines and dynamos for over five years, there has never during all this time been the slightest interruption of the supply. Security is obtained by dividing the work of generating the current among a number of engines and dynamos, so connected that if any one or two of them should break down the others would instantly make up the deficiency of current. After their abortive Holborn Viaduct experiment, the English Edison Company quietly withdrew from the attempt, if they ever intended such a thing, to rival their American prototype in the work of lighting; and confined their energies to lamp making, which, diversified by litigation, has fully occupied them ever since.

GAS ACTS FOR 1888.

The timely communication from Mr. William Livesey upon the subject of parliamentary regulations respecting Gas Companies applying for statutory powers, will serve as a preface for our customary summary of the results of the gas legislation of the past session. In stating the amounts of authorized capital and borrowing powers, it must be understood that these are subject to the considerations set out by Mr. Livesey. As he has pointed out, gas legislation is at present conducted upon a very confused system, if system it may be called. The sliding scale and auction clauses have been enforced upon, and adopted by companies for many years; and nobody has paused to inquire how the principles of these modern importations into gas legislation agree, or are in conflict with, the General Acts in conjunction with which they are applied. There are questions affecting the reserve and insurance funds of gas undertakings which have never yet been authoritatively settled. Under the old legislation the reserve fund was taken out of revenue, and therefore belonged to the undertaking as a whole—we will not say, belonged to the consumers, because

any such general statement might be open to misunderstanding. Under the new dispensation, the reserve belongs to the shareholders; being composed of money applicable to dividends, but which they have denied themselves from providential motives. Many Gas Companies, however, have reserve funds made up in both ways; and nobody can say, in all strictness, what might be the result of a judicial examination in such cases. Mr. Livesey's remarks upon the incidence of the ordinary terms of the sliding scale—"a quarter per cent. for a penny"—upon capital issued at different nominal rates of dividend are not new, as he admits; but they are worth repeating until they receive their due consideration. The compulsory issue of new and additional capital as 7 instead of 10 per cent. stock is clearly a survival of the letter of an obsolete law; and Mr. Livesey shows how unfairly it works in practice. Experience shows, however, that legal inconsistencies such as this, and even more serious legal wrongs, are left to linger for a long time, mainly because it is nobody's business to set matters right. We are therefore warranted in predicting that gas legislation will continue for some time to come to be the "thing of shreds and patches" which Mr. Livesey shows it to be. None the less, however, is it incumbent upon Gas Companies seeking fresh or further statutory powers to strive, by carefully drafting their demands, to minimize the effect while recognizing the existence of these parliamentary inequalities. With these preliminary observations, we revert to the actual gas legislation of the year; remarking to begin with that it is small in quantity, and not by any means exceptional in quality.

The Draycott Gas Act dissolves and reincorporates a limited Company formed in 1887 for the purpose of purchasing gas-works then supplying the township of Draycott, in Derbyshire. The capital of the limited Company consisted of £20,000 in £5 shares, of which one-half were fully paid up; and there was no loan. The statutory capital is stated at £20,000, one-half of which (being the amount actually paid up) is the original, and the remainder is to be the additional capital, to be raised, when required, under the auction clauses. Borrowing powers are conferred to the extent of £2500 in respect of the original capital, and of one-fourth of the additional capital actually issued. The sliding scale is imposed, with 4s. 6d. per 1000 cubic feet as the standard price for gas supplied within a radius of 1250 yards from the centre of the existing gas-works, and 5s. beyond. These were the rates asked for in the Bill. Gas of 15-candle power is to be supplied; and it is not, unless in case of unavoidable cause, to contain more than 25 grains of sulphur in 100 cubic feet, as ascertained by the Referees apparatus. The Company may allow not exceeding 10 per cent. discount for prompt payment or in consideration of large consumption, provided that all consumers are treated alike. The Frodsham Gas and Water Act dissolves a limited Company formed in 1856 for supplying gas in the town and parish of Frodsham, Cheshire; the share capital being £5000 fully paid, and £1200 having been borrowed on mortgage. The limits of the statutory Company are enlarged and defined. The gas capital consists of the original £5000 with £15,000 additional under the auction clauses; power being given to raise £1250 by borrowing upon the security of the old capital, and one-fourth of the amount of the new capital as issued. The sliding scale is enacted, with 4s. 7d. and 5s. as the initial prices per 1000 cubic feet for 15-candle gas supplied respectively within and beyond a radius of one mile from the present works. The Henley-on-Thames Gas Act incorporates a limited Company formed in 1834. The share capital consisted £7500 all paid, and there was no mortgage debt. But the works had been extended out of revenue; and at the time of application for statutory powers were valued, with the working capital, at £13,600. The capital of the incorporated Company is to be £24,000, of which £12,000 is regarded as original capital; being made up of the £7500 old share capital of the limited Company, and £4500 to carry 5 per cent. dividend created in respect of moneys expended upon extensions and improvements. In the Bill the Company asked for £33,600 capital, including an allowance of £6100 for improvement capital. Borrowing powers are granted to the extent of £3000 upon the original, and a like amount upon the additional capital. Gas of 15-candle power is to be supplied under the sliding scale, at a standard price of 4s. 4d. per 1000 cubic feet; the illuminating power to be tested upon the works. The Bill asked for an initial price of 5s. per 1000 cubic feet for 14-candle gas. Gas supplied to the public lamps is to be charged for at the lowest price demanded for the time being of any private consumer. Interest at the rate of 5 per cent. is to be paid on consumers' deposits. The Keswick Gas Act reincorporates with further powers a Company formed in 1845. The capital consisted of £9250 all paid up; and there was no loan. The limits of the statutory Company are the boundaries of the parish of Crosthwaite, Cumberland. Their capital is fixed at £20,000, whereof £9250 is the original capital; and there is power to borrow £2300 in respect of the original, and one-fourth of the amount of the additional capital actually paid up. The standard price for 15-candle gas under the sliding scale is 4s. 3d. per 1000 cubic feet within the district of the Local Board, and 6s. beyond. The Bill asked for an initial price of 4s. 6d. per 1000 cubic feet within the Local Board district. Discounts to consumers of 10 per cent. are sanctioned; and 4 per cent. interest is to be allowed on deposits. Where the Company deem it necessary to do so, they may require prepayment for gas supplied for short periods of six months and under, and may refuse to supply unless the estimated cost thereof is so prepaid; allowing 4 per cent. interest on the amount of all such prepayments. For the protection of the

Keswick Local Board, it is enacted that seven public lamps are to be provided and kept lighted by the Company free of charge; and that, if the supply of gas to the other public lamps is by meter, the price to be charged is not to exceed the lowest rate paid by any private consumer. The Riddings District Gas Act incorporates a Company to take over gas-works conducted by the firm of James Oakes and Co. The capital of the Company is fixed at £30,000, with power to borrow £7500. It is enacted that the Company may, if they think fit, undertake electric lighting, under the provisions of a Licence or other sanction issued in accordance with the terms of the Electric Lighting Act. The maximum price of gas is to be 4s. per 1000 cubic feet; and the illuminating power, 14 candles. In the event of any meter used by a consumer being found defective, the error is to be deemed to have arisen only during the current quarter of the year in which the meter is tested, unless the contrary shall be proved to the satisfaction of the Inspector. An agreement between Messrs. Oakes, the owners of the property, and Mr. Charles Horsley, for the Company, providing for the transfer of the gas undertaking for the sum of £18,000 is scheduled in the Act.

There were no Gas Companies in Parliament last session for the extension of statutory powers, with the exception of the Edinburgh and Leith Company, which is represented now by the Edinburgh and Leith Corporations' Gas Act. This Act provides for the incorporation of Commissioners, comprising the Lord Provost of Edinburgh and the Provost of Leith, with fifteen persons to be elected by the Corporation of Edinburgh and six by the Corporation of Leith, to be entitled "The Edinburgh and Leith Corporations' Gas Commissioners." The Act defines the method of election, and describes the procedure of the Commissioners. The agreement dated Nov. 8, 16, and 18, 1887, between the Corporations and the Edinburgh Company is confirmed; and the agreement dated June 29, 1888, between the Corporations and the Leith Company is also confirmed. The particulars attending the transfer to the Commissioners of the two undertakings are stated. On the days of transfer the Commissioners were to pay to the Edinburgh Company the sum of £27,000, and to the Leith Company £11,000, upon which payments the properties were to change hands, subject to the payment of annuities to the shareholders as set forth, and with the exception of cash in hand, book debts, and securities representing cash. The Commissioners also paid for stores and stocks. Sums paid by either Company on account of capital between agreed dates and the dates of transfer are to be repaid by the Commissioners. It is recited that the annuities to the Edinburgh Company's shareholders are at the rate of £10 per cent. upon £200,000; and to the Leith Company's shareholders after the rate of £9 6s. 8d. per cent. per annum upon £150,000. All or any of the annuities are to be redeemable after Nov. 11, 1908, at the price of 28½ years' purchase. Gas of 20-candle power is to be supplied at rates, to be fixed from time to time by the Commissioners, that will bring in sufficient revenue to pay the expenses of the undertaking. Any unforeseen deficiency is to be made good by a Guarantee Fund. Consumers removing are to give written notice to the Commissioners, under risk of remaining liable for gas consumed upon the premises up to the next usual period for ascertaining the register of the meter. The sum of £300,000 may be borrowed on mortgage of the undertaking.

Among minor Acts passed, the Glasgow Corporation Act enables the Corporation to enlarge their gas-works, and to make certain railways and roadway diversions. Land required compulsorily is to be taken within two years. The borrowing powers of the Corporation are extended to £560,000. The Lancaster Corporation Act extends the Corporation gas undertaking. The Nelson Local Board Act confirms an agreement entered into by the Board for the purchase of the Brierfield Gas-Works, and enacts that consumers of more than 200,000 cubic feet of gas per annum in the Brierfield district shall not pay more than consumers of like quantities in the Nelson district; while smaller consumers are only to pay 3d. per 1000 cubic feet more in Brierfield than in Nelson. As between the Local Boards of Nelson and Brierfield, the Nelson Board, as owners of the gas-works, are not to make a higher profit than 10 per cent. upon £65,000, and 7 per cent. upon the remainder of a capital sum of £100,000, not deducting repayments under any sinking fund; and the Brierfield Local Board are to occupy with reference to the Nelson Local Board the privileges of the "gas ratepayers" under the Gas-Works Clauses Act of 1847. The Perth Water and Gas Act provides for additional lands to be taken for gas purposes, and enacts that the illuminating power of the gas supplied by the Perth Commissioners shall be 25 candles, tested at the works.

THE QUALITY OF THE PARTICK, HILLHEAD, AND MARYHILL COMPANY'S GAS.—Our attention has been called to the statement reported, in the JOURNAL last week, to have been made by Bailie McFarlane, in the discussion in the Glasgow Town Council on the proposed purchase of the Partick, Hillhead, and Maryhill Gas Company's works, to the effect that the illuminating power of the Company's gas had been at times as low as 14½ candles, as compared with the Corporation gas at about 23 candles. We are assured that some mistake must have been made by the speaker, inasmuch as the quality of the Company's gas has rarely, if ever, been below 18 candles. We may mention that, in the course of his reply, the Lord Provost remarked that though the gas was not up to the Corporation standard, there was no evidence of any serious complaints having been made in respect to it; and this he regarded as an important consideration.

Notes.

THE SCHÜLKE GAS-LAMP.

In a recent number of the JOURNAL (*ante*, p. 510), we gave a short description of the small type of the above-named lamp, which appeared to us to possess many points of exceptional merit. We have since had a lamp under our immediate notice; and the opinion previously formed of it has been fully confirmed. The makers, however, have determined to make the lamp fitted in every way for domestic use, and have added two slight features which will recommend themselves strongly to practical men. First, by the addition of a small tap, forming part of the lamp itself, the right quantity of gas is admitted to the burners to enable the lamp to be lighted at the top of the chimney by a taper or electric lighter, without moving the recuperator body; and free from any detonation. This tap also affords a ready means of turning the flame down for a small light. The downward radiation of heat from the concentrated light of regenerative lamps is well known; but where the lamp is fixed in close proximity to a person reading, this radiation of heat is admirably checked in the case of the Schülke lamp by a clear glass bowl, which cuts off nearly all the heat, but allows the light to penetrate freely with very slight loss. Both these devices add largely to the practical utility of the lamp, which is rapidly making its way into general use.

AN AMERICAN LOW-POWER GAS-ENGINE.

A new gas-engine, called the "Little Wender," is now being introduced in the States by the Cornell Engine Company, and samples of it are on show at the Chicago Inter-State Exposition. It is claimed that it is the first engine ever made with a rocking-valve that gave satisfactory results in working. In this way much friction is saved over the use of slide-valves; and the power of the engine is correspondingly increased. The gas and air are mixed on the outside of the cylinder, and again inside; the combustion (by a Bunsen burner) being in this way improved, so that the exhaust may be discharged without offence into a room. The valve-box and plate are built square; but all the other parts cylindrical. The engine gets an impulse at every stroke of the piston (like a single-acting steam-engine); and it uses ten parts of air to one part of gas. As to the power developed, 1½-horse power has been indicated on a 1-horse engine running at 180 revolutions of the fly-wheel per minute; and it is said to readily double its power of feeding it up to 600 revolutions per minute—a certain explosion occurring at every turn of the wheel.

A HYDROCARBON VAPOUR GENERATOR.

A new gas-making apparatus, named the "Thermogen," has been patented by Mr. Charles Hearson, and is well spoken of by a writer in *Industries*. It is essentially an apparatus for vaporizing benzine or other volatile hydrocarbons, with the object of afterwards using the vapour in a gas-engine. The vapour is produced in such a manner that it can be made available for supplying a gas-engine without any alteration of the mechanism. A small generator standing 18 inches high, and costing a few pounds, will supply vapour enough for a 2-horse power engine. It gives off the vapour as required; stopping the process of evolution when the engine stops. It is self-contained and self-regulating. In application it consists of a boiler, retort, generator, and mixing chamber. The generator is simply a vertical tube kept red hot by burning round it at the lower end a small portion of the vapour as formed. To start the apparatus, the tube must be first heated from an extraneous source; and this is done by lighting a little methylated spirit in a place provided for the purpose, after which the arrangement is automatic. The oil or spirit is supplied by gravitation under a head of about 8 feet. The vapour as formed escapes into the mixing chamber, which consists of a thin metal cylinder with holes round the circumference at top and bottom. This contains a loosely fitting piston, and is surrounded by a sliding shield, the object of which is to provide means whereby the composition of the vapour may be varied by altering the proportion of air admitted. Any required degree of richness in the "air-gas" delivered to the engine may accordingly be ensured by adjustment of these parts of the apparatus. The description reads rather complicated; but the apparatus is said to be very simple and adapted for ordinary working, being well made and readily cleaned.

FIREPROOFING TEXTILE FABRICS AND TISSUES.

In a recent number of the *Revue Industrielle*, M. Philippe Delahaye made a few remarks respecting the fireproofing of materials placed in proximity to sources of heat, such as gas-flames used for lighting scenery in theatres, &c. Quoting the chief of the Municipal laboratory, who has had this question under examination for a lengthened period, it is made to appear that to render light tissues unflammable is no easy matter. Gay-Lussac laid down the laws of the problem in 1821, by showing that during the action of the heat the tissue must have its filaments protected from contact with air, and also that any combustible gases driven off from a tissue by heat must be mixed with other gases difficult of combustion, so as to be unflammable. The first condition is realized by covering the tissue with some very fusible substance, which upon the first approach of heat will envelop all the surface in a more or less vitreous coating, incapable of evaporating or drying under the prolonged action of a more elevated temperature, and consequently completely isolating the fibre from the air. A great number of earthy and mineral salts proposed for this purpose have given bad results, because under the action of prolonged heat they

leave dusty residues, not capable of sufficiently preventing the access of air; and accordingly combustion has ensued after an exposure more or less prolonged. Substances fusible with difficulty are, on the other hand, unavailing; as they do not melt quickly enough to protect a fabric before it ignites. Further among fusible substances it is necessary to eliminate such as are efflorescent, which after a time fall away in powder; such as are volatile at low temperatures; and those that are too hygroscopic and remain damp. Among the substances which satisfy the first condition without altering by excess of dryness or humidity, are boric acid, alkaline borates, phosphates, and alkaline tungstates. Ammoniacal salts satisfy the second condition of vaporizing with production of unflammable gas. Although less certain in effect than the employment of incombustible materials, rendering tissues inflammable with difficulty is a method calculated to contribute to the public safety. The question of the best process to be adopted with this intent is a very serious one, for upon its satisfactory solution depends the acceptability of gas lighting for theatres in some countries where the Government takes a parental view of its responsibilities for regulating places of amusement.

AMERICAN v. ENGLISH PRACTICE IN ELECTRIC LIGHTING.—Writing on the 13th inst., the New York Correspondent of *Industries* says: "The rough-and-ready manner in which American electric light engineers set to work when erecting distributing plant has been repeatedly criticized in England; and the opinion seems to prevail with you that while our stations and machinery are extremely good, our line construction is inferior. I regret to say that this opinion is perfectly correct. The experience gained in the construction of telegraph and telephone lines has not been utilized as it should have been by electric light engineers; and this has brought about the present agitation against overhead lines. The leniency of the public in permitting electric light companies to erect distributing plant in a most temporary manner, is one of the reasons why the development of electric lighting as a business investment has been more rapid in this country than in England. I think Professor Forbes is in error when he attributes this development to the greater technical knowledge of our capitalists. I do not deny that certain capitalists have been aided by their own technical knowledge; but the main reason of our commercial success in electric lighting is that the principle of *laissez faire* has been allowed to rule to an extent which, from the point of view of public safety, is almost reprehensible."

AN ELECTRIC LIGHTING STATION AT DEPTFORD.—Last week, at the invitation of the Directors of the London Electric Supply Corporation, a large party of gentlemen connected with the Press paid a visit to Deptford, for the purpose of inspecting the buildings and other works which are in course of construction there with the object of forming a central station for the supply of electricity to all parts of London. The buildings consist of one boiler-house and two engine-houses, occupying a space of 210 feet by 195 feet, and having a height of nearly 100 feet. The boiler-house is constructed to contain boilers of 65,000-horse power; and of these a number are being erected to provide steam for engines of 13,000-horse power. In one engine-house a pair of small engines of 300-horse power will be erected in the course of a few weeks for the purpose of actuating two Ferranti dynamos, each of which is capable of supplying a current for 25,000 lights; while in the other will be placed two engines with dynamos, each capable of providing for 200,000 lights. The lines laid down are for the eventual supply of 2,000,000 lights—a maximum which it is expected will be eventually reached. The Corporation already supply electricity to a large number of public and private establishments; and they aim at providing all comers with what they require for lighting or motive purposes. Way-leaves have already been obtained affording entries to the northern part of the Metropolis by several different routes; and the work of main-laying is being pushed forward. The station, both architecturally and mechanically, has been designed by Mr. Ferranti.

DEATH OF MR. JULES PAZZANI.—The Imperial Continental Gas Association have been inopportunistly deprived of one of their ablest Engineers through the sudden death of Mr. Jules Pazzani, M. Inst. C.E., which took place, after an illness of only a few hours' duration, at Amsterdam, on Sunday, the 21st inst., as the result of apoplexy. The deceased gentleman, who was only 47 years of age, had been in the service of the Association for nearly 30 years. During the greater portion of this time, he filled the position of Assistant Engineer at Vienna, of which city he was a native. In 1880 he left Vienna to take charge of the Association's works at Rotterdam. The conclusion of a new contract with the Municipality of Amsterdam, about five years ago, necessitated the erection of new works, and the laying of an entirely new system of mains; and Mr. Pazzani was elected to the important duty of superintending the carrying out of the works. We believe that the Association's Nieuwer-Amstel works (a plan of which was given in the *JOURNAL* for July 6, 1886) were designed by Mr. Pazzani; and they reflect great credit upon him as an Engineer. His demise will be the more keenly felt by the Association, seeing that it followed very closely upon that of his predecessor at Amsterdam, Mr. Miltner. The deceased leaves a widow and rather large family to mourn his loss. His uniform courtesy and kindness gained for him many friends, who will greatly miss him. The funeral took place last Wednesday, and was numerously attended. Several representatives of the Town Authorities and of the Dutch Association of Gas Managers were present; and the coffin was covered with beautiful wreaths.

Technical Record.

THE GASHOLDER GUIDE-FRAMING QUESTION.

AN AMERICAN REVIEW OF THE DISCUSSION.

[The last number of the *American Gaslight Journal* contains the first of a series of articles by Mr. W. Mooney, C.E., dealing with the question of the possibility of dispensing, wholly or partially, with the guide-framing of gasholders. As from a constructional standpoint, this is the most important matter now engaging the attention of gas engineers, we reproduce the communication, which, as it brings under review, in a concise form, the main points in the discussion which has for some time been going on in our columns, will doubtless be acceptable to our readers, seeing that it will enable them the better to approach the consideration of the further developments of the subject which will from time to time come before them.—ED. J. G. L.]

An article with the title "Is Lofty Guide-Framing Necessary for Large Gasholders?" which appeared in the *JOURNAL OF GAS LIGHTING* for March 29, 1887, has brought out various conflicting opinions from several engineers; and as the article seems to have awakened renewed interest in a popular subject, the controversy has probably not yet ended. In fact, it is probable that the author little knew what interest would be aroused by its publication, and what actual results were to arise from it. At a period in the history of gas lighting when holders were being made larger than before, it only needed someone to start the subject to arouse the latent interest which has shown itself in the pages of the *JOURNAL* for nearly a year. It is proposed in the present article to review the arguments upon the subject, as briefly as possible; and, as they all sprang from the publication of the first article above mentioned, a short statement of the position taken by the author will be given.

At the beginning of the article, some hints are thrown out which lead to the belief that Mr. Livesey had already taken some steps toward dispensing with the guide-framing in some three-lift holders lately built, but to what extent the writer is silent. Then follows the statement that "during the coming summer (1887) a gasholder at the Rotherhithe works of the South Metropolitan Company will be altered by the addition of a third lift, *without raising the guide-framing to the additional height.*" The writer further adds: "The saving by dispensing with the framing for the additional lift will not, in this instance, be great; but behind it lies the whole problem of the utility and office of guide-framing in general." He then briefly explains the objects and requirements of guide-framing, as follows:—"It is primarily to provide a means of guiding the moveable vessel along its vertical path. . . . The first conditions of such an arrangement are rigidity and truth of line. Both ends of the line of railway must be as steady as they can possibly be made. . . . In order to be of any service at all, this guiding structure must not only be rigid, but must preserve its rigidity under the greatest stress that can be brought upon it. . . . According to this theory, every gasholder in England ought to be a wreck before the week is out."

After this startling statement, the writer puts forth the following, in all the added weight of italics:—"It is impossible to construct a framework strong enough to uphold a gasholder of any considerable size, without depending upon the inherent stability of the holder itself." He then continues: "There is in the construction of gasholders a point, depending entirely upon their bulk, beyond which these structures are wholly independent of the exterior framing with which it is at present thought necessary to provide them. If this were not true, the erection in the open air of holders surpassing 40 to 50 feet in diameter, and 30 to 40 feet high, would have been impossible. As soon as this limit had been passed, every gale would have swept the land clear of gasholders, and the larger ones would all have been enclosed in storm-proof buildings." This statement is really saying, in other words, that large holders hold themselves up without aid; or no large holder exists in which the guide-framing is strong enough to resist the pressure of the wind without the aid of the holder itself.

The writer then goes on to say, in effect, that he believes the only framing necessary for guiding large holders is a framework standing a few feet above the water-level in the tank, or, at most, to the height of the inner lift. As the difference between these two points in a three-lift holder would be great, it is probable that the writer meant to say to the height of the outer lift. Continuing, he says: "The only good effect of all devices of columns, girders, diagonal ties, and the rest of the usual elaborate guiding structure, is to transmit the strain to the ground as directly as possible. There is no strength in the members up in the air. All they are good for is to preserve a rigidity of form, and to send their burdens down to earth without getting forced out of shape in so doing." The writer, after asking the question, "Why employ elaborate and costly independent framing to transmit to earth the sideways pressures of a gasholder, when you have the holder itself to do it?" answers it thus: "In every large holder yet extant, stability has proceeded from two factors—dead weight and tight bottom rollers. Without these, no outside framing that was ever erected could save a holder from wreck by the first sou'-wester; with them, the outer guiding structure becomes of minor importance." Concluding, he says: "At its base, not at the top, is the place whence the stability of a gasholder must be provided for, if at all."

The very first notice of, or reply to, this article comes from

Mr. V. Wyatt.* After disagreeing with the previous writer in some things, he finally agrees with him to this extent: "Gasholders can be constructed to work well with the external framework carried up only a short distance—say, about 10 feet above the wall coping of the tank; and *perhaps* without any external framing at all. Modification of the lower curb and the cup-and-grip junctions of telescopic gasholders properly spliced may effect this; but the present form of construction, *minus* the external framing, will not be enough. I quite anticipate the production of a self-sustaining gasholder in the future."

Mr. H. E. Jones, in a short letter commenting on the above ideas,† thinks that the drawback of any device dispensing with the guide-framing would be to increase the weight of the floating part of the structure, which is heavy enough already.

Mr. G. Livesey, who would naturally be in the foreground in such a controversy as this, is the next to write on the subject.‡ He thinks the writer of the original article goes too far, and proves too much—that, in fact, he has got slightly beyond his depth, and that much stronger proof than the writer gives is needed to show that large gasholders can work wholly independent of exterior framing. He says: "If some *practicable* means could be devised whereby all the bottom rollers might be made to rise or fall equally . . . the holder would then, to all intents and purposes, have a solid foundation, and no columns or guide-framing of any kind would be necessary. As, however, there are no known means for keeping the bottom rollers in the same level plane, we must, until a better way has been shown, prevent tilting by means of tiers of rollers placed a certain vertical distance apart on the sides, working against guide-framing . . . I am not prepared to say that, if only two tiers of rollers are used, they should be placed at a less vertical distance apart than one-fourth of the diameter of the holder at the top and bottom of the outer lift. This will necessitate external guide-framing to a corresponding height; and such guide-framing is also essential for guiding the inner lift until it is cupped . . . To expect the inner lift to rise and fall satisfactorily when guided only by the rollers on the cup is out of the question; it must have rollers on the crown curb, working in the external framing, to guide it until it is cupped, when a two-lift holder would no doubt work with perfect safety without further support from the guide-framing . . . I should with a three or four lift holder consider it necessary to carry the guide-framing to the height of two lifts; so that the second might be cupped before the rollers on the crown curb left the guides. In short, a holder cannot be considered safe unless it has at least two sets of rollers, at a considerable vertical distance apart, working against perfectly firm guides." In concluding, he sums up by saying: "The utmost I expect to see is, for a double holder, guide-framing not less than one lift high, and for a three or four lift holder, guide-framing not less than two lifts high; and I much doubt whether anyone will attempt to go beyond this."

The next article—from Mr. Hunt, of Birmingham§—contains nothing of importance, and concludes by saying: "If I ventured to express a definite opinion upon so speculative a subject, it would, as regards telescopic holders, be adverse to the proposal of the writer, mainly because it seems to make no adequate provision for the safe working of the inner lift, when this happens to be uncupped. In the absence of any simple and efficient substitute, we have to fall back upon external guide-framing, at least equal in height to the depth of the lift, for effecting this object." In the same number of the JOURNAL, Mr. W. Mann states that a three-lift holder was erected in London, several years ago, by the Phoenix Gas Company, having guide-framing only two lifts high. He, however, says he never knew how it worked, or what became of it. Mr. John Somerville, in the JOURNAL for May 26, 1887, supplies the missing facts; stating that he has ascertained that the holder above mentioned was a failure. It was never cupped, and was changed to a double-lift; and, after a few years' use, was finally taken down (in 1882) with other holders, presumably to make room for other structures.

The next writer on the subject is Mr. W. H. Y. Webber, whose paper was read at the twenty-fourth annual meeting of The Gas Institute, held at Glasgow in June, 1887.¶ The writer states that the purpose of his paper is to show "that the ordinary lofty guide-framing of gasholders may be safely dispensed with, and its place supplied by a system of *guiding from the base*, which may be shortly described as a development by a duplication of the bottom curb and rollers." It is also the writer's idea that the sole provision for guiding and maintaining the stability of a holder will be the rollers on the outer lift working against guides in the tank, and only carried by short pieces or brackets to the height of 5 or 6 feet above the water-line.

In writing of the uncertainty respecting the value and effect of the stresses to be provided for, Mr. Webber says: "I have seen holders wrecked that should have been standing to this hour; and I know of holders still standing and doing service that ought, according to rule, to have been blown down fifty times over. They stand simply because they cannot help it, or because they have never been subjected to such destructive stresses as are supposed to be inevitable for such structures."

The writer then enters into an elaborate calculation in regard to the actual force of the wind on gasholders; prefacing his remarks by stating that, in view of experiments and observations by many celebrated engineers on this subject, "it will be fair to assume

that a pressure of 20 lbs. to the square foot is the greatest actual force that wind is likely to exert over the whole exposed side of a gasholder erected anywhere in the United Kingdom." As regards the difference in pressure in favour of a cylindrical surface over a vertical plane surface, he takes 50 per cent. of the area of vertical cross section as representing the actual equivalent plane exposed to the wind. Upon the question as to the manner in which the wind pressure is exerted, and how it is divided between the columns, &c., composing the guide-framing, Mr. Webber joins issue with the writer preceding him [M. Arson*]; claiming that there is no justification whatever for the assumption that wind pressure tends to push a gasholder *bodily along a horizontal plane*, as it is not a stable bulk, but an unstable body, and when pushed against will *capsize before it will slide*—that is to say, "the wind pressure on a gasholder is an overturning force." The reason of this is on account of the centre of gravity being so much above the centre of the figure. A gasholder is a cylindrical iron-covered vessel, without a bottom, required to float in water, the vessel being in unstable equilibrium; hence it tends to topple over as soon as the two centres cease to be maintained in a vertical line. Every holder must be so guided at all possible altitudes that the centre of gravity and the axis or centre of figure shall be always in a vertical line. If this condition is seriously disturbed, swift destruction of holder and framing must ensue.

Continuing, the writer says: "The steadiness of a gasholder depends far more upon the tightness of the bottom rollers than upon any other condition. It is the practice of good gasholder erectors to make the bottom rollers fit the tank-guides as tightly as they can be dropped into place. When this is done, the proper adjustment of the upper rollers will enable a holder to work without a tremor, however gusty the weather. . . . When the bottom rollers bear tightly all round, the overturning leverage of the top-heavy holder is constantly opposed by the leverage between the *leeward* top roller and the *windward* bottom roller; and as the distance from the latter to the centre of gravity is very much greater than the distance from the same centre to the top roller, its controlling effect is correspondingly greater. This demonstration of the part played by leverage, as distinguished from horizontal equable thrust, in the conditions of a holder's stability, concludes the part of this paper which deals with established principles."

In conclusion, and practically suggesting his ideas of improved construction in the matter under consideration, the writer says he would build on the tank wall a series of concrete or brick piers, about 6 feet above the water-line, 6 feet by 2 ft. 3 in. at the base, and tapering to smaller dimensions above. The strain of the holder is first taken by the tank guides, which are cast-iron boxes, 6 in. by 6 in., filled with concrete, and, of course, rigidly secured to the tank walls and piers.

Briefly stated, the plan of Mr. Webber is to secure the holder firmly at the bottom with radial and tangential rollers, placed in two rows, one row secured to the bottom curb, and the other to a secondary curb placed about 5 feet above the bottom curb—both curbs to be extra stiff and strong; the idea being that the holder shall be considered as "stepped" into a socket, and that socket holding the vessel with a grip strong enough to withstand the pressure of the wind, and yet loose enough to allow it to rise and fall freely.

Mr. Webber says: "It may be asked if the holder is strong enough to transmit all these strains to the point of support without taking some of the pressure off by means of external framing. To this it may be replied that if the holder is strong enough to withstand the strain at the top of the socket [that is, at the top of the short piers], where it is most severe, it must necessarily be able to carry them at other points, where they are less. So long as the holder preserves its true figure, it will transmit exterior strains to the ground as perfectly as would a surrounding framework; and it must always preserve its figure while the pressure of gas from within is in excess of that of the wind outside, even without the help of the vertical stays and the curbs. A wind pressure of 20 lbs. per square foot is only equal to a gas pressure of 38-10ths; so that most holders have an ample margin of internal force."

In the discussion on the paper Mr. Corbet Woodall said that, although they might not be disposed to adopt Mr. Webber's theories, they would all thank him for having given an admirable paper, and a healthy shock to anything that might be called stereotyped ideas on gasholder guiding and constructing generally. Gasholders must, it seemed to him, become different, more costly, and elaborate structures altogether if the scheme were to be adopted with a chance of success. He thought the cost of a holder built on Mr. Webber's plan (that is, stiff enough to stand the strains of wind pressure, with only short columns about 6 feet high, on the principle of a post "stepped" in a socket) would be very heavy—probably as great as one provided with external framing. In order to make the bottom rings of the rollers so rigid as to keep their form and resist the tendency to crush in (on the leeward side), so much metal must be used, in external curbs and otherwise, as would go far to dissipate the outside saving. Mr. George Livesey said that he was about to try trebling a double-lift holder without continuing the framing up to the third lift, and considered there was no danger in doing so if tangential and radial rollers were used for the two lower lifts. The upper lift would

See JOURNAL, Vol. XLIX., p. 631. | *Ibid.*, p. 722. ; *Ibid.*, p. 761.
§ *Ibid.*, p. 806. || *Ibid.*, Vol. L., p. 171.

* A translation of M. Arson's well-known *mémoire*, by Dr. Pole, F.R.S., will be found in the JOURNAL, Vol. XXIX., and in "King's Treatise on Coal Gas," Vol. II.

have its radial roller to guide it until the second lift was cupped; then it would go clear of the framing. He could not agree with Mr. Webber's plan, and did not think it safe. He had a feeling that there was some uncertain element in the question, which would bring a gasholder to grief if guided in that way. He did not see how the inner lift was to be guided until it was cupped. He believed that a three-lift holder could be safely guided by framing reaching only to the top of the outer lift; so that when fully inflated the stability of the holder would be dependent upon the top and bottom rollers of the third lift, which he really believed would be sufficient to safely support a gasholder properly constructed. It would certainly not be wise for any engineer to make an experiment of this kind unless perfectly certain it would be safe. After the discussion, Mr. Webber stated that he simply put forward a suggestion which had to be proved. This would dispose of a great deal of the criticism which had been offered. He further said that "the difference between Mr. Livesey and himself was only one of degree." He fully admitted that in this matter they must "proceed by steps."

The next article is by Mr. W. Gadd, C.E., of Manchester.* Speaking of wind pressure on holders, he says that investigations and experiments have led him to the conclusion that "average wind pressures are about the most misleading facts possible for the guidance of the constructive engineer, as it is the momentary or sudden gusts or pressures which really do damage to structures, and not the steady winds, even when these are of a very violent character." Mr. Gadd then suggests a method of guide-framing which he calls "opposite leverage carried below ground." This idea, not very clearly described, is an absurdity not worthy to be mentioned. In the following issue of the JOURNAL, Mr. Webber returns to the controversy, and becomes somewhat personal in his remarks concerning Mr. Gadd, whom he accuses of never having seen a gasholder built. Mr. Gadd, in his article, having spoken of "counterbalancing," Mr. Webber states that "counterbalancing went out when exhausters came in"—a rather wild statement for him to make. In reply to Mr. Webber, Mr. Gadd [in the following number] admits that he has never been engaged in gasholder building, but states that, "nevertheless, he has seen a goodly number, and finds that there are still in use a number of counterbalanced holders."

A new, and very sharp writer, under the *nom de plume* of "Theory and Practice," also enters the lists in the same issue, and criticizes Mr. Webber for his opinions in regard to tight-bottom rollers, which would be absolutely necessary to carry out Mr. W.'s ideas. He insists that gasholder work cannot be so nicely adjusted as to ensure perfect fitting contact between rollers and guides, to say nothing of their becoming loose by wear. On the subject of counterbalancing, he also takes Mr. Webber to task. "Scores of gasholders exist," he says, "with counterbalance-weights where exhausters are in use." Continuing, he says: "To my mind you do not want to force gas against a much heavier gasholder than is necessary to give the requisite pressure in the service-mains; otherwise you are wasting engine and exhauster power, and therefore increasing wear and tear and expense." And he adds: "If gasholders are constructed to stand the strains his [Mr. Webber's] mode of guiding would put upon them, the gas company's account for steam power will be nearly doubled, unless he employs counterbalance weights to his holders. . . . Mr. Webber's 6 feet guide-framing is a monstrosity." In the JOURNAL for Sept. 6, 1887, Mr. Webber answers his unknown critic; maintaining his opinion that holders can be, and are made with the bottom rollers nicely adjusted, and with steel pins working in good bearings, preventing wear and capable of adjustment. He also insists that counterbalanced holders, although still in use, are obsolete. "Theory and Practice," as the champion of Mr. Gadd, returns to the charge in the JOURNAL for Sept. 13. He reviews Mr. Webber's opinions on subjects that have been gone over before, but adds nothing of importance to the subject under discussion. Mr. Gadd also criticizes Mr. Webber in a letter in this number of the JOURNAL. Referring to Mr. W.'s remark that the bottom curb of a gasholder is perfectly rigid, he says: "Nothing is perfectly rigid, not even the great earth itself, which bends and bulges under the varying strains of the moon's attraction and its action on the mobile ocean." Continuing, he says: "At the present moment I am inclined to think it possible to devise a holder not only possessing no external guide-framing, but dispensing with any piers whatsoever, and having only one row of rollers at the bottom of the ring, yet forming a structure more stable than the one at present in use, although the rollers may be far from tight in practice." (This no doubt refers to Mr. Gadd's system of spiral guide-framing, an account of which was given in the *American Gaslight Journal* for Sept. 17, 1888.†) In regard to Mr. Webber's statement that counterbalancing is obsolete, Mr. G. D. Malam writes [in the same issue]: "An 80-feet three-lift holder which I designed two years ago has two of its lifts counterbalanced. The exhauster has thereby been relieved of 20 per cent. of unnecessary work."

The next two articles‡ are evidently from the pen of the writer of the original article. From his very lengthy demonstrations on the subject of centre of gravity, with pressure, &c., he draws the following conclusions:—(1) That gasholders cannot work at all without at least two tiers of rollers to each lift, thereby necessitating guide-framing. (2) That single-lift holders cannot work safely without sufficient depth of guide-framing. (3) That

unless the depth exceeds one-seventh of the diameter, much weight of material is necessitated. (4) That a telescopic gas-holder is even worse, unless the guide-framing exceeds one-seventh of the depth, owing to lever power. (5) Even without wind pressure, or weight of snow, the above is true, and much more so, with short guide-framing. (6) Under certain conditions, gasholders can be constructed without guide-framing reaching higher than the height of the outer lift; the conditions being that each lift must be rigid in itself, and unable to distort under the strains induced, that the guide-framing must also be rigid and unyielding, and that the holder must be free to rise and fall perfectly level. (7) The inner lift would not rack out of shape when the vertical stays are strong and well attached to strong curbs and sheeting; but, as an additional safeguard, diagonal ties may be introduced between the vertical stays, and so relieve the side sheeting from diagonal strain. (8) Gasholders can be constructed safely with the inner lift unsupported by external guide-framing after it has cupped, providing the guide-framing is carried to the height of the two outer lifts. (9) That it is neither safe nor advisable to make treble-lift holders with guide-framing to the outer lift only.

In the JOURNAL for July 31, 1888, is given an account of the completion of the gasholder at the Rotherhithe station of the South Metropolitan Gas Company; this holder having been changed from a two-lift to a three-lift, and erected without guide-framing beyond the height of the second section. Early in the discussion on this subject, Mr. Livesey stated his intention of making this experiment. Of course, this practical example and bold innovation on the old time methods is still in the experimental stage, and has yet to stand the test of the elements. The holder is 150 feet in diameter, with 25-feet lifts, standing in an iron tank only half sunk in the ground. It will thus be seen that the conditions were not favourable; and if the holder stands and works to the satisfaction of its builder, it will be all the more a success for its projector. The crown of the upper section was heavily trussed; the JOURNAL stating that the superfluous metal amounted to 80 tons. The paper also states that the columns were connected at the top and middle by lattice girders; and no mention is made of any change in this respect. This portion of the guide-framing it seems to the writer, will be the first to be dispensed with in the future. The JOURNAL further states that Mr. Livesey expressed himself as perfectly satisfied with the result, which practically marks a new era in gasholder construction. The article concludes as follows:—"It shows that monumental structures are not necessarily strong, and that massive Doric columns and heavy crown trussing are not enough, by themselves, to constitute a trustworthy holder. Regard for right principles is the only fountain of security in gasholder construction; and the most important principle of the art may be briefly summarized in the aphorism: 'Take care of the bottom, and the top will take care of itself.'"

The person writing under the *nom de plume* of "Theory and Practice," in the controversy, again comes to the front, in a very clear and concise letter to the JOURNAL for Aug. 21 last. Referring to the article on the successful issue of the Rotherhithe experiment, he says: "The writer of the article also infers that, because the top lift does not blow over when the top part of the guide-framing is done away with (as at Rotherhithe), it does not push at the top guides when the framing is carried to the full height, as usual; or, in other words, that the top roller-carriages never have any work to do. This clearly shows what false conclusions may be drawn from an experiment improperly understood. In the Rotherhithe gasholder, the total horizontal push of the wind, the resultant horizontal shear, the bending strain at the foot of the guide-framing are all the same, as if the framing reached the full height. The crippling or buckling strains are increased because the cups are not so well suited to resist distortion as the strutted top curb is, and therefore render but little assistance to the guide-framing. The great difference in the conditions is this: The bell of the gasholder itself is now called upon to act as a cantilever in its upper lift, which it is not required to do in the ordinary construction. It would undoubtedly push against the top of the guide-framing if there were any to push against; but as there is not, it has to take all the bending strains in itself, caused and created by abolishing the top framing."

[Here the article closes; the writer doubtless intending to devote his next communication to a consideration of Mr. Gadd's "spiral" system, as laid before the Manchester District Institution of Gas Engineers in August last, and to the enunciation of his own views on the subject under discussion—Ed. J. G. L.]

THE BRISTOL GAS COMPANY AND THE SLIDING SCALE.—As the result, doubtless, of the unsatisfactory answer received by the Bristol Gas Company to their application to the Sanitary Authority on the subject of the proposed adoption of the sliding scale by the Company, as recorded in the JOURNAL last week, the Directors have decided not to proceed any further in the matter.

THE REPORTED DISCOVERY OF PETROLEUM IN CHESHIRE.—According to statements which have lately been circulated, there is good reason for believing that no importance need be attached to the recent discovery of petroleum in a well at Anderton. The pump over the well, taken down when the petroleum was found, has now been put up again, and the well covered in. Any petroleum there was in the well has almost entirely disappeared,

* See JOURNAL, Vol. L., p. 331.

† See ante, p. 373.

‡ See JOURNAL, Vol. L., pp. 792, 963.

AMERICAN GASLIGHT ASSOCIATION.

THE ANNUAL MEETING AT TORONTO.

As intimated in the JOURNAL a fortnight ago, the sixteenth annual meeting of this Association was held at Toronto on the 17th, 18th, and 19th inst.; and we understand that it was highly successful. From the programme of business we learn that the proceedings were formally opened on the first-named day by the President (Mr. T. Turner, of the Charleston Gas-Works); and after the minutes of the previous meeting and the applications for membership had been read, reports were presented from the Executive and Finance Committees, the Treasurer and Secretary (Mr. C. J. Russell Humphreys), and the Committees on Standard Meter Couplings and Badges. The President then delivered his Inaugural Address, which was well received. The election of officers and members and the reception of the report of the Executive Committee on Amendments to the Constitution completed the morning's work. In the afternoon, the reading of papers was commenced. The first was a communication from Mr. James Somerville, of Indianapolis, dealing with the "Daily Experience of a Gas Manager." Mr. Fred. Mayer, of Baltimore, followed, with a paper on the "Construction of Gasholders and Wrought-Iron or Steel Tanks above Ground;" and this was succeeded by one in which Mr. D. H. Geggie, of Quebec, related his experience in the distribution of gas under extremely low temperatures. On the 18th, the two papers down for reading were: "Coals for Gas Making, with Special Reference to Provincial Coals," by Mr. J. D. Perkins, of New York; and "Enriching Gas with Naphthalene," by Mr. A. Kitson, of Philadelphia. The remainder of the morning was occupied with the transaction of miscellaneous business, and the reception of reports of Committees. In the afternoon, papers by Mr. J. R. Smedberg, of Baltimore, and Mr. A. Q. Ross, of Cincinnati—on "Observations during Many Years' Experience in the Gas Business," and on "The Steam Stoker and Improved Charger"—were taken, and the contents of the "question-box" disposed of; after which the meeting adjourned. In the evening the usual banquet took place. On the following day, the Toronto Gas-Works were inspected in the morning; the afternoon being pleasantly occupied in driving round the city and suburbs. We hope to give some of the above-named papers next week.

ECONOMY OF ORDINARY COAL GAS AS A MOTIVE POWER.

In the recently issued volume of the Transactions of the Institution of Civil Engineers, there is a paper on "The Distribution of Hydraulic Power in London," by Mr. E. B. Ellington. The charge per horse power per hour by the London Hydraulic Power Supply Company was taken by the author at 4d.; and he thought that it would hardly be a profitable operation to supply public power under conditions similar to those which exist in London at less than 2d. per indicated horse power per hour, and that any idea of supplying it from a central source at rates much below this was chimerical. In the course of the discussion on the paper, the economy of the gas-engine as a motive power was alluded to. Mr. H. Davey said that some time ago he had mooted the question of supplying cheap illuminating gas for the distribution of power in Leeds. He was convinced that it would be almost, if not quite, the most economical system, if, as might be expected, a further development of the gas-engine was attainable. But taking this engine as it stood, he found that an ordinary gas-main would convey, in the form of common 18-candle gas, ten times the amount of power that would be transmitted by compressed air at 40 lbs. pressure. Messrs. Crossley stated that their engines gave about 1-horse power for 20 cubic feet of gas consumed per hour. In Leeds the cost of gas was 1s. 9d. per 1000 cubic feet; so that they could get 50 indicated horse power for 1s. 9d. This is equivalent to 0.42d. per indicated horse power per hour; or about one-fifth of the lowest practical charge as fixed by the author of the paper. Mr. Davey added that as compared with coal, and assuming a consumption of 8lbs. per indicated horse power per hour, the cost per ton, in order to furnish power at a similar rate, would have to be 8s. Mr. Dugald Clerk gave some figures showing the practical results of working an 8-horse power engine of his make in Birmingham, as follows:—

Engine Working at Full Power, and developing 10 brake horse power per week of 54 hours.

Gas, 13,200 cubic feet, at 2s. 6d. per 1000 . . .	£1 13 0
Water and oil	0 5 6
Attendance	0 3 0

Total £2 1 6

Engine Working at Half Nominal Power for a Similar Time.

Gas, 6300 cubic feet, at 2s. 6d. per 1000 . . .	£0 19 6
Water and oil	0 4 6
Attendance	0 3 0

Total £1 7 0

In the first case the engine required 240 cubic feet of gas per hour, and in the second 138 cubic feet; and it will be seen that the cost per brake horse power per hour was 0.92d. at full, and 1.5d. at half power. Mr. Clerk thought there was no chance of the hydraulic system approaching in economy anything like these figures. Mr. B. E. Thorpe referred to a gas-engine used for working an elevator at Mansion House Buildings, London. The cost of gas, at 2s. 9d. per 1000 cubic feet, was found to be 1s. 10.1d. per day; and the elevator made 385 trips per day. Allowing 1s. 5d. per day, or

about £20 per annum, for depreciation, &c., the cost would be 0.1d. per trip. With water power (water at 4s. per 1000 gallons), the cost would be 0.14d. per trip. The man who had to be on the premises looked after the engine; if he had to be employed for the elevator service only, it would be a question at once of using water power. These figures are sufficient to show that, wherever there is facility for fixing a gas-engine, and a workman can be spared to look after it, ordinary coal gas is a much cheaper source of power than any system worked from a central station. Of course there may be cases where the supply of power is only needed at rare intervals, or the demand is very small, where the fixing of a gas-engine would be objected to, or where the first cost of the engine would be an obstacle to its adoption.

INVERTED V. ORDINARY GAS-BURNERS.

With reference to the improved illuminating power and the economy in the consumption of gas ensured by the use of inverted gas-burners, Dr. Bunte, in the *Journal für Gasbeleuchtung*, has made a few observations. His experiments were conducted with the Weber photometer, which instrument not only measures the illuminating power of particular sources of light, but also the light produced by this source in different parts of a room or workshop. The decision upon the light obtained is so much the more important, as regards an appreciation of the illuminating power and the value of the burners employed, when it is borne in mind that the distribution of the light greatly depends upon the question of the employment of inverted burners or the ordinary Argand or batwing burners. Whilst with the former the light is chiefly thrown downwards, with the others there is a greater evenness in the distribution of the light upon all parts of the space illuminated. It is therefore necessary to establish by experiment the relation existing between the consumption of gas and the light obtained in the same place according to the type of burner employed. Although these observations cannot be applied except to each particular case (inasmuch as the reflection of the walls, the decorations, &c., produce considerable effect), still it is of very great importance to make these inquiries, and determine the relation existing between the quantity of gas consumed and the light obtained. As an instance of this, in the amphitheatre of the Higher Technical School of Carlsruhe, until the commencement of the last winter quarter, the lighting was arranged in such a manner that 21 Argand burners were employed; whilst behind a reflector there was a row of seven "slit" burners specially prepared for lighting a board at the lower end of the room. This light was found insufficient, especially for the purpose of distinguishing with precision objects placed upon the board for the illustration of lectures, &c. With the view of remedying this inconvenience, the authorities wished to adopt electricity; but this project had to be abandoned, and they were forced to employ gas lighting—using the Siemens regenerative lamps for the purpose. Six burners were fixed, with the old Argand burners remaining; four of the former being placed in a row above the stalls, while two with reflectors served to increase the lighting of the board. Since the place had previously been lighted by means of the old form of burner, and now with the Siemens system, it was easy to make a comparison between the quantity of gas consumed and the respective lighting power obtained. To measure the quantity of the gas employed in the amphitheatre, a meter was fixed on the supply-pipe of each of the two systems. On the 28th and 30th of January of the present year, parallel tests were made, so that the room was lighted for one hour by the old, and another hour by the new arrangement, when the following results were obtained:—With the Argand or batwing burners, the consumption of gas was 5.018 cubic metres per hour, and that with the Siemens burner 2.633 cubic metres; whilst the illuminating power was observed in twelve different directions in the case of the Siemens, and in ten with the old burners. The result obtained by the employment of the Siemens burner was a great increase of light; being nearly double that previously produced. With regard to economy in the consumption, the Siemens burners consumed upwards of 52 per cent. less gas, and yielded double the illumination of the others. It will thus be seen that the inverted flame burners approach as near perfection as possible, and that gas lighting can still compete with all other methods of illumination.

THE VENTILATION OF GAS-LIGHTED BUILDINGS.

In a recent number of the *Journal für Gasbeleuchtung*, a communication appeared by Herr S. Elster, of Berlin, in which he stated that the question of the ventilation of places lighted by gas had been a subject of consideration for three or four years by the Berlin Society of Gas Engineers, and that he had requested Herr Oechelhaeuser to make the necessary experiments, and to indicate the best means of realizing this much-desired object. He added that they had obtained outside assistance; and their researches upon the question had produced more than they had anticipated, for they did not expect to include in them so difficult a question as the radiation and conductivity of heat—their only wish being, as far as possible, to solve the great problem of effecting ventilation by means of gas illumination. Herr Elster's remarks were as follows:—

Last year I went to London, furnished with a recommendation from several architects of our city, in order to personally inspect the installations which had been made for obtaining ventilation by gas lighting. The best building fitted up at present, as far as regards ventilation by gas lighting, is the Examination Hall of

the College of Physicians, situated on the Victoria Embankment. This building includes a central hall, measuring 100 feet long by 16 feet wide. It has two storeys; and on the right and left there are two cross-wings, each measuring 60 feet by 24 feet—the one on the right being intended for anatomy and physiology, and the one on the left for chemistry. These wings are connected to the main building by means of lifts; and everything has been so arranged as to allow the work carried on to be done in the very best possible way so far as regards health—especially having in view the nature of the substances, subjected to dangerous fermentation, there exposed. On examination, it was found that the central building is lighted by twelve No. 2 Wenham lamps, and each of the side-wings by three No. 3 lamps. A certain number of chimneys are necessary, in order that the products of combustion of each burner may be conveyed outside the building. For this purpose earthenware pipes are employed, of 4 and 6 inches diameter, which are not laid in the ordinary way, but are placed in the walls constructed to receive them. It is said that the expense of laying the 60 pipes is no more than 1 per cent. of the cost of the building, which is about £5000. I have again to point out to our German architects, who state that the pipes for taking away the hot air should be at a distance of 18 inches from all woodwork, that this figure is admitted as correct—that the pipe is always placed at this distance from the floor. Upon examination, it is found that the windows are grouped in pairs, and that underneath two iron girders are placed, between which pass the pipes for conducting the air for combustion and for carrying away the vitiated air. These girders or joists are covered underneath, and form a kind of ceiling case. In this way it is possible to obtain a space of 18 inches between the pipes and the woodwork. The vertical earthenware pipes are connected by means of bends to the horizontal pipes, and are fitted to the walls in such a way that it is possible that the movement of the ordinary air in a pipe 6 inches in diameter may be produced by the displacement of the gas in two pipes 4 inches in diameter placed on either side, which convey the products of combustion beyond the roof. Above this may be seen, emerging one after another, the covered pipes, which are for driving the air upwards, and for actuating the ascending current. Inside this building, on the ground floor, the Steward's offices, &c., are situated; and nothing appertaining to either the ventilation or the heating of the place is allowed to go on without the authority of Drs. Stone and Percy. In Germany, we have comptrollers of gymnasiums, &c.; but we have no inspectors or comptrollers of private dwellings. There is an example for us to follow in this Institution; for it is on this that the satisfactory condition of the inside of the building rests with regard to health.

Herr Elster concluded by saying that what interferes with the development of ventilation in Germany at present is the obligation of always having the pipes for conducting away the hot air fixed at a distance of 18 inches from woodwork; whereas in England they are often satisfied with packing the pipes in silicate cotton, which is found to be quite sufficient protection.

Register of Patents.

AUTOMATICALLY LIGHTING AND EXTINGUISHING GAS-LAMPS.—Schiller, J. R., and Meyer, C., of Zurich. No. 14,808; Oct. 31, 1887. [8d.] This is an improvement on the patentees' previous similar invention—No. 6400 of 1887 (see JOURNAL for June 12 last, p. 1052).

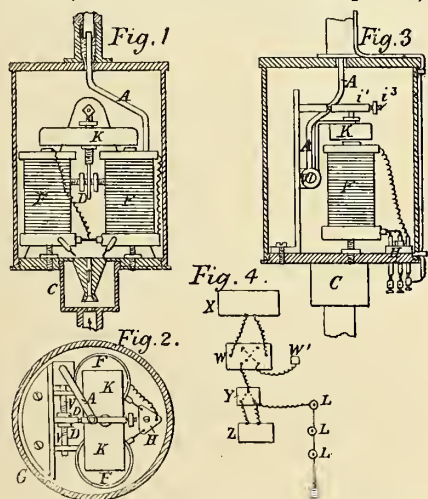


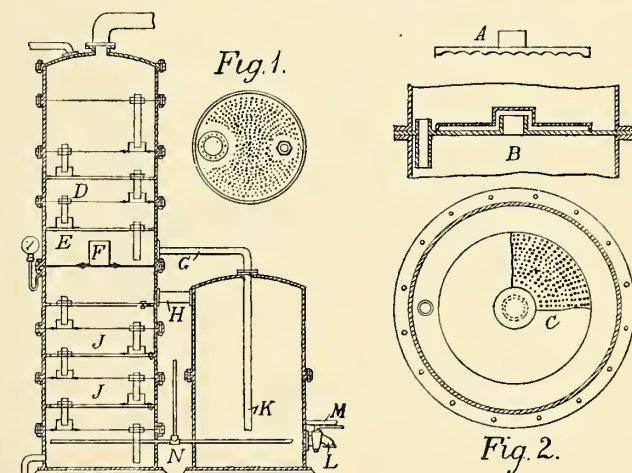
Fig. 1 is a front view of the apparatus; fig. 2, a top view; fig. 3, a side view; and fig. 4, a plan of the connection of the lamps carrying the apparatus with the central station.

The principle of the apparatus is essentially the same as that described in the earlier patent. One, two, or more electro-magnets act upon an oscillating or swinging armature when an electric current is passed, in such manner as to cause the armature to operate a lever, by means of which the gas-cock is either opened or closed. A wire or wires leading to the gas-burner produce sparks as the current passes through them, whereby the gas escaping from the burner, after the cock has been opened as indicated, is ignited. The apparatus for this purpose consists of two electro-magnetic spools F, which, with their armature, are enclosed in a gas-tight box. The bottom of this box carries on its under surface a nipple or sleeve C, by means of which the box is attached to

the gas-pipe. Inside the sleeve is an inverted cone, the hole through which forms a passage for the gas passing into the box. The object of this device is to prevent impurities (such as tar), carried along by the gas, from entering the box and deranging the apparatus. Induction coils, which have cores of thin soft iron wire, are attached to the bottom; these consisting of several layers of thick copper wire, upon which thinner copper wire is wound. One end of the thick wire of one spool is connected to one end of the thick wire of the other spool; the other ends of these thick wires passing through the bottom, from which they are separated by an insulating plate H. One end of the thin copper wire of one spool is secured to one end of the thin wire of the other spool; the third end is soldered to the bottom of one of the spools; while the fourth end passes (well insulated) through the bottom of the box, from whence it runs along the outside to the gas-burner. A permanent magnet K swings in front of the spools. During the passage of an electric current through the primary coils of the spools, the iron bundles will show homonymous poles, in consequence of which one end of the permanent oscillating magnet will be attracted, while the other is repelled. The magnet carries a bent arm, the free end of which hangs between two regulating nuts, collars, or lugs D, which are adjustably fastened upon the stem V. This stem slides in two guides or bearings, and is at one end provided with a cone, which fits into the seat of a valve, from which a pipe A leads through the top of the box to the burner. The main current passes from the battery X, through the commutator W, and then through each of the lamps L—that is through the primary coils of the spools of each apparatus to the electrode W¹; and from here the current passes through the earth to the electrode W², through the commutator W, and back again to its source X. The induction current is generated only in the secondary coils of the spools, and produces the spark for igniting the gas. The commutator Y, inserted in the line, serves for either sending the current uninterrupted direct through the line with the lamps L, or for sending it first through the contact breaker Z, and then through the line, whereby the current is made intermittent. The operation of igniting the gas-flame is performed as follows:—The current when closed passes into the interrupter Z; and from there again through the line. In consequence of the interruption of the current at the central station, the current produces in the spools of each apparatus an induction current, which passes to the burner, where on opposite sides a wire is soldered. The sparks produced between the two wires cause the gas escaping from the burner to be ignited; and the gas having been ignited, the current is not further continued. For extinguishing the flames, the commutator W is reversed, and the current closed. The magnet K is now attracted to the other side; and thus closes the valve in the manner already described.

DISTILLATION OF AMMONIACAL FLUIDS.—Davis, G. E., of Manchester. No. 15,540; Nov. 14, 1887. [8d.]

In stills for the evolution of ammonia gas or of carbonate of or sulphide of ammonium, from any of their solutions, it has (says the patentee) been the custom either (1) to drive off the volatile substances by means of a jet of steam blowing direct into the liquor contained in a boiler of the usual pattern; (2) to heat the liquid by means of direct fire; (3) to pass the steam and vapours up a tower or column filled with bricks or boards, down which the ammoniacal liquid is made



to pass; or (4) to cause the liquid to run down a column containing shelves pierced with large central apertures covered with caps serrated round their lower edges, through which the vapours are made to pass. In all these methods the ammoniacal vapours are not so finely divided as they might be in order to get the utmost possible work out of a given size of still; and the present invention relates to the construction of distilling apparatus whereby a much larger quantity of ammoniacal liquor can be distilled in a given space than heretofore, and with ordinary care can never become choked with tar.

The still is constructed of a metal cylinder with a number of trays. Each tray is fitted with an overflow-pipe D, dipping into a shallow well E; and these trays are perforated with a number of small holes, through which the vapours pass when the still is at work. About one hole, three-sixteenths inch in diameter, in every square inch of tray is the number found to be sufficient. Any volatile ammonia compound present in the solution undergoing distillation is driven off in the upper portion of the still; and the partly freed liquor, passing through the pipe G into the lime vessel K, becomes mixed with the lime or soda introduced through the pipe M. From K the liquor finds its way again into the column through the pipe H; and in passing down the column over the perforated trays, becomes denuded of its fixed ammonia, finding egress from the column at the outlet I, by means of one or more U-tubes, which allow of the escape of liquor and still retain the steam.

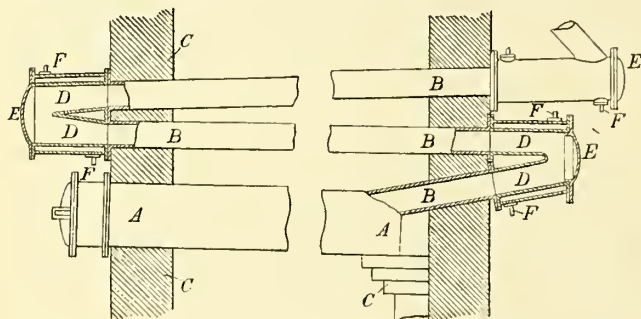
In practice, the liquor to be distilled is run into the still or column

--preferably having first been heated by the waste steam—by means of the smaller pipe on the top of the still; and when steam is admitted by the pipe N, the liquor will form a layer on each tray, of a depth corresponding with the top of the overflow-pipes D, by means of which it runs from tray to tray until it finally reaches the point I, almost entirely freed from its ammonia. The steam and other vapours pass through the holes in the trays, and find their way through the liquor standing on each into the spaces J above; and so on from tray to tray until they finally escape, highly charged with ammonia, by the large pipe upon the top of the column. When the steam is turned off, the liquor will fall from tray to tray; and any tar which may have settled thereon, finds its way by the pipe G into the lime-box K, whence it is removed (together with the refuse lime) by means of the tap L, or by the manhole with which this box is provided.

This form of apparatus answers best when used for the distillation of the quantity of liquor which it is calculated to work. When the quantity of liquor to be distilled is very irregular, it is preferred to make the perforations in the top of a flat cylindrical cap A in fig. 2. At B is shown one of these caps *in situ*; while the plan C exhibits the method of perforation. These perforated caps and trays may then replace the simple perforated trays in fig. 1.

MANUFACTURING ILLUMINATING GAS FROM COAL.—Dinsmore, J. H. R., of Liverpool. No. 15,852; Nov. 18, 1887. [8d.]

This invention relates to the manufacture of illuminating gas from coal in closed vessels or retorts; but more particularly to those processes of manufacturing illuminating gas in which it has been proposed to render permanent practically all the heavy or tarry vapours as well as the light volatile products given off from coal by distillation and useful for the production of light and heat. To obtain this result, double or multiple retorts have been proposed, in which the gas distilled in one retort was to pass through a second or third retort; such retorts being arranged and constructed in various ways and forms. The present invention has for its object chiefly to effect these results, and at the same time to avoid the deposition of carbon or pitch in the ascension-pipes of the retorts, or at any parts of the retorts themselves that cannot be readily removed; and in this way escape the disadvantages attending or incident to the ordinary and other processes of gas manufacture heretofore proposed.



The drawing illustrates a sectional elevation of apparatus according to this invention having a plurality of cooled surfaces.

A is a retort in which the coal is distilled in the usual manner; and B are ducts of any suitable material, arranged at an incline, and through which the gas passes after leaving the retort. D are cooled passages interposed in the ducts B, each having a jacket and a door E. The exit or ascension pipe and the mouth of the duct are also cooled and provided with a jacket. The mouth and the passages D of the ducts B are provided with inlet and outlet pipes F, through which water or cold air is led to and from the space between the jacket and the metal of the mouth or passages. The temperature to which it is preferred to heat the ducts and retorts in all cases is a clear cherry red colour. The example illustrated is suitable for those kinds of coal from which the volume of heavy and tarry vapours is large. The ducts B are smaller than the retort A; the proportion shown being one from which good results may be obtained. The setting or support of the retort A consists of a front wall C and pedestal C'.

When set in a bench in the usual manner, the retorts subject to the greatest heat would be shielded by brickwork or slabs of fire-brick throughout their length, or at intervals, as in ordinary practice. Any required number of retorts may be set in a bench in the usual way; but care must be taken that they are arranged in such a manner that the temperature of all shall be about equal.

It will be observed that each retort with its duct or ducts is an independent complete gas-making apparatus; having no valves, and comprising a plain receptacle and open ducts. Direct access can be had to the retort A and ducts B from the doors; and through these door apertures, the whole of the interior can be scraped and cleaned, and any deposited carbon or other matter adhering to the interior surfaces of them can be removed.

The mode of manufacturing gas is thus described by the patentee: The coal is placed in the retort A, and distilled by heat in the usual way. The gas evolved from the coal leaves the retort and passes through the heated duct B. When the gas comes in contact with, or under the influence of the cooled passages D, that portion of the tar or tarry vapour existing in the gas in a non-permanent state is condensed and arrested; and the tar being in a fluid state will, owing to the inclination of the ducts, flow backwards down them. As soon as the tar comes in contact with the hot surfaces of the ducts B, it is converted into gas; and such gas will, in passing through the successive heated ducts, be rendered permanent. In cases where the coal is being distilled in the retorts shown in the figure, having a plurality of cooled surfaces and heated ducts, an extended and repeated cooling and heating effect is produced—i.e., the gas coming from the retorts A is subjected to heat three times, and a chilling influence three times; hence the gas resulting from the evaporation of the tar condensed in the first cooled passage D flows down the lowest duct B, and is so converted into gas, but instead of going straight to the ascension-pipe, it is subjected to the heat of the

remaining two ducts, and is so rendered permanent. In like manner, the tar in the gas not condensed by the first cooled passage D or still in a non-permanent condition, will be condensed by the following one, and is treated in a like manner.

APPLICATIONS FOR LETTERS PATENT.

15,117.—CROSSLEY, F. W., and ANDERSON, F. H., "Improvements in igniting apparatus for gas motor engines." Oct. 20.

15,128.—HOMBERGEN, J., "Improvements in regenerative gas-lamps." Oct. 20.

15,244.—THOMPSON, W. P., "Improvements in or relating to gas-engines." A communication from Hiram C. Covert. Oct. 23.

15,294.—BAKER, R. L., "A regulating gas-tap." Oct. 24.

15,393.—LAKE, H. H., "Improvements relating to the preparation of tar, chiefly designed for use in the manufacture of artificial fuel." A communication from Madame F. Honnay. Oct. 25.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

GAS LIGHTING AND VENTILATION.

SIR,—I was glad to see the statement in the JOURNAL for the 16th inst., that "at the new establishment of Messrs. W. Sugg and Co., Limited, Westminster, there is now on view an interesting system of lighting combined with ventilation, which should be seen by all who wish to keep abreast of modern progress in the utilization of gas." Well, without troubling myself about any of Mr. Richard Swiveller's notions, I went to the establishment named; and there I was delighted to see a mode of lighting by gas which is as free from the charge of taking oxygen from the air of the room so lighted, or of adding thereto any deleterious gas or vapour, as any electric incandescent system of the same or any other power. Now this, I think, will be a "staggerer" to Mr. Richard Swiveller, if he is an electrician; and if not to him, it will be to many who are always telling the public that gas *cannot* be used as an illuminant without offence. As for me, I have been firmer on my legs ever since I saw it; and hope the same is the case with others.

Oct. 25, 1888.

W. MANN.

PIPE EXTRACTORS.

SIR,—As to Mr. Helps's patent pipe extractor, I should like to ask your numerous readers engaged in main-laying if they ever used any other scheme than the clip and screw, or screws and jacks, for pushing off pipes? Of course, no one would think of breaking out, cutting off, or melting out a large number of pipes; but iron being so cheap at present, a few small-size pipes cut off or broken is not a matter of consequence—although they can be pushed off much quicker with a hydraulic jack. Will your correspondent, Mr. May, explain what size and kind of joint in a gas-main he is unable to push off with two screws, if the joint refuses to give? Of course there is no patent to stop us from lifting the end of the pipe, and dropping or jarring it, as we have done for the last half century. What would Mr. May think of erectors taking down an engine, and breaking or cutting all the steam and feed pipes, instead of using a screw or screws, or jacks?

Oct. 26, 1888.

PIPE LAYER.

WATER BY MEASURE.

SIR,—I shall be glad if you will allow me space for a few remarks on a passage in the article which appeared under the above heading in the last issue of the JOURNAL.

The author, in referring (on p. 717) to my paper, "Notes on Water Supply, with Special Reference to Villages and Country Mansions," read in January last before the Surveyors' Institution, said: "It is stated that less than 3 gallons per head per day is an ample supply for cottages, while most water-works engineers have placed it at 20 gallons and even 30 gallons per head." If the author will kindly refer to my paper, he will find that what I stated was: "The quantity required for cottages has been estimated by various authorities at 2 and 2½ gallons per head per day;" and I quote the source of this information. I did not state, nor did I intend to show, that it was an ample supply. It was simply evidence of the quantity actually used in country cottages; and if the author will also refer to Dr. Pole's lecture on "Water Supply," delivered before the Institution of Civil Engineers in February, 1885 (see JOURNAL, Vol. XLV., p. 440), he will, I think, see that probably it is not far from the truth. Dr. Pole says, in reference to supplies to towns: "The quantity actually required for domestic consumption, including a fair allowance for general household purposes, for water-closets, and for ordinary ablutions, is probably not more than 10 gallons per head per diem." In country cottages there are no water-closets; and in other ways less water is used. So that 10 gallons per head in such cases is very much reduced. At the same time, if water were laid on under pressure to such cottages, I should by no means advocate limiting it to the small quantities now used. I think that, in speaking of 20 and even 30 gallons per head, the author must have meant the average supply of towns. But even then I consider the estimate of 30 gallons too high; for Dr. Pole goes on to say: "But, in addition to domestic consumption, supplies have to be provided for gardens, stables, manufactories, and trade purposes of many kinds, baths, and wash-houses, public fountains, watering streets, flushing sewers, and extinguishing fires. The quantity for these purposes will vary considerably—say, from 5 to 10 gallons per head per diem." Here we have, with the 10 gallons for domestic consumption, from 15 to 20 gallons per head; and it has been shown, in more than one case, that, by a careful system of inspection, these quantities are sufficient—the surplus simply running to waste.

I certainly agree with the author entirely in objecting to a supply of water by meter.

Oct. 24, 1888.

RICHARD F. GRANTHAM.

SIR.—In the article on "Water and Sanitary Affairs" in the JOURNAL for the 9th inst., the following passage appeared as the conclusion of it:—"That houses should be left without proper cisterns to receive and store the water, is certainly a monstrous perversion of what is intended

by the constant supply. If such an arrangement receives the sanction of the law, the consumer had far better revert to a supply on the intermittent system, with its accompanying reserve under his own control. Without this provision, the outbreak of a fire, or the execution of necessary repairs, may occasion serious inconvenience, by the sudden cessation of a supply otherwise constant, and relied upon as such." Your correspondent "Meter," writing in the last number of the JOURNAL, said: "A water-meter working under pressure is a different thing to a gas-meter." The italics are mine, and they are for the purpose of asking whether your correspondent has never heard of water-meters which do not work "under pressure." Cisterns being a necessity, why ought not low pressure water-meters, placed over the cisterns, to be used? Oct. 26, 1888. TRUE MEASURE.

THE EDINBURGH AND LEITH GAS-WORKS PURCHASE.—Our Edinburgh Correspondent, writing last Saturday, says: "With your permission I would like to say a word or two with reference to Mr. Romans's letter which appeared in this week's JOURNAL. I think it bears out my remark of Oct. 16, that he is a little impetuous. I beg to assure him that I made no mistake about his attitude upon the general question of transferring the gas supply to the Corporations. What I said was he 'strongly opposed last year the transfer of the Edinburgh works.' That certainly was Mr. Romans's position. He considered the bargain was bad, and did all he could to get it overthrown. Further down in his letter he speaks of my applauding a 'tinkering method.' Here again I must reproduce my words, which were: 'Meantime I am not convinced that it is not the best policy to expend a moderate sum upon the improvement of the Edinburgh works.' This, I should say, is very faint applause. It is not my object to discuss Mr. Romans's views on the general question; but in one particular I may say I am in thorough accord with him. That is when he speaks of 'the recent schemes.' My opinion all through the negotiation was that, on the part of the Corporations, there was too much scheming; and that, had a more straightforward policy been adopted, the terms of transfer need not have been so high nor so difficult to fix."

ROTHERFIELD AND CROWBOROUGH GAS COMPANY, LIMITED.—This Company was registered last week, with a capital of £6000, in £5 shares, to acquire land at Crowborough, or its vicinity, in the county of Sussex, for the construction of works for supplying Rotherfield, Crowborough, and the neighbourhood with gas, and the carrying on of the usual business of a gas company.

GEORGETOWN (BRITISH GUIANA) GAS COMPANY, LIMITED.—The Directors of this Company, in their report to be presented at the ordinary meeting of the Company next Tuesday, state that the profit for the half year ending June 30 last amounted to £1404 7s., which, added to the balance brought from the previous accounts, makes £3147 16s. After paying the dividends to Dec. 31, 1887, and the interest on debentures to June 30 last, there remains an available balance of £1852 18s., out of which they recommend the declaration of a dividend for the half year on the preference share capital at the rate of 8 per cent. per annum, and on the ordinary share capital at the rate of 7 per cent. per annum, both less income-tax (except upon those dividends payable to the local shareholders), which will leave a sum of £685 10s. to be carried forward to the next half-year's accounts.

THE PRICE OF GAS IN THE MANCHESTER OUT-DISTRICTS.—At the meeting of the Newton Heath Local Board last Thursday, a circular letter was read from the Gorton Local Board with regard to the charges made by the Manchester Corporation for the supply of gas to the out-townships, and the Chairman (Mr. J. M. Elliott) moved a resolution to the effect that, as the Manchester Gas Committee had shown, by their published accounts for the last financial year, that they had made a gross profit of £106,072 9s. 3d., equal to 25.49 per cent. (exclusive of lighting the city lamps), of which amount £26,452 had been contributed by the out-townships, the time had arrived when the price of 3s. 2d. per 1000 cubic feet now charged to consumers beyond the city should be considerably reduced, and that the various urban and rural sanitary authorities should appoint a deputation to wait upon the Committee to urge a reduction of at least 6d. per 1000 cubic feet. The motion was agreed to.

THE NORTHERN COAL TRADE.—There is considerable excitement in the coal trade of the North of England, in consequence of the stoppage of labour in a large proportion of the collieries of Yorkshire; and for several classes of coal there has been an advance of some moment in price. Steam coal has naturally gone up most; and within the past week it may be said that the rise in the general quotations was to the extent of 1s. 6d. per ton, whilst in several instances there have been considerably higher prices paid, and coal is very difficult to get. At present about 10s. per ton is the general quotation for best steam coal. Gas coal is also dearer, but from another cause. It is due rather to the growth in the normal consumption of this class of coal, and to the fact that the summer did not allow such a laying in of stocks as had been anticipated. Many of the gas-coal producing collieries are backward in their contracts; and it is generally stated that one large colliery is 20,000 tons in arrear with its deliveries. This scarcity of gas coal will be probably more felt as the winter advances; and already the price has been further put up for coal sold without contract—7s. 6d. being the current figure now. The general tendency of the coal market is towards increased scarcity and higher prices.

THE GAS QUESTION AT RASTRICK.—Last Wednesday evening a public meeting, called by the Rastrick Property Owners and Gas Consumers' Association, was held at Rastrick, to further consider the question of the gas supply of the district. Mr. H. Sugden presided, and severely criticized the report made to the Wakefield Quarter Sessions by Mr. J. W. Close, of Leeds, the Accountant appointed by the Court to examine the accounts of the Gas Company, as given in the JOURNAL last week. He said, however, that the report had proved every charge the consumers had made against the Company; and he contended that the £223 which Mr. Close stated in his report to have been spent in wines and cigars by the Directors ought to be returned by those who had consumed them in addition to receiving their fees as Directors. He should now be glad for the whole thing to settle down; and he hoped the consumers and the Company would be able to work together in the future, so that gas would be supplied at as cheap a rate as possible. Mr. Storey, the Solicitor for the consumers in the recent legal proceedings, addressed the meeting at great length. He gave an exhaustive *résumé* of the whole of the case, and severely censured several of the actions of the Directors of the Company. The following resolution was unanimously passed:—"After hearing the report of the Accountant, this meeting considers it highly necessary to re-elect the present Committee, and resolves that any balance remaining after all accounts have been paid remain in the bank."

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

THURSDAY, OCT. 26.

(Before Mr. Justice STIRLING.)

LEWIS v. WESTON-SUPER-MARE LOCAL BOARD OF HEALTH.

This case, which was of some importance to local authorities, was heard during the last sittings, when his Lordship reserved his judgment. It was a motion to restrain the defendants, who are the Urban Sanitary Authority for the district of Weston-super-Mare, from carrying a water-main through certain freehold lands belonging to the plaintiff, and forming part of the garden of a house at Weston-super-Mare. The defendants had, under the powers of the Public Health Act, 1875, undertaken to provide their district with a supply of water, and for this purpose had constructed on their lands, adjoining those of the plaintiff, a reservoir, from which they desired to carry a main to a point on the other side of the plaintiff's property. Previously to March, 1888, negotiations had taken place between the plaintiff and the defendants for the purchase by the latter of a strip of the plaintiff's land for the purpose of laying the main in question; but these had not resulted in any binding agreement between the parties. On March 21, 1888, a report was made to the defendants by a Mr. Arthur Powell, a gentleman in their service, to the effect that it was desirable that the main should be laid through Mr. Lewis's land, and recommending that the necessary notice should be given to him forthwith. The report was signed "Your Surveyor, Arthur Powell;" and the question turned upon the right of Mr. Powell to use this title, and consequently upon the value of the report for the defendants' purposes under the Public Health Act. It appeared that Mr. Powell, who is a civil engineer, had been appointed in November, 1887, as assistant to the then Surveyor, on whose death, in the following month, he was promoted to the office, pending the selection of a successor. Mr. Powell's engagement under this resolution was determined on March 25, 1888 (four days after the date of the report), when a Mr. Collins was appointed Surveyor. The report of the 21st of March was taken into consideration by the Board, and adopted on the 11th of April last, after which notices were served on the plaintiff. Some correspondence ensued between the parties; and the defendants threatened to apply for a Magistrate's order under section 305 of the Public Health Act. This, however, was not done; and the plaintiff, finding that the defendants were carrying their pipes up to his land, on the 16th of June applied for and obtained an *ex parte* injunction, which was afterwards continued on notice; and the question now before the Court was whether this injunction ought to be continued to the trial of the action or further order.

Mr. BUCKLEY, Q.C., and Mr. HALDANE appeared for the plaintiff; Mr. GRAHAM HASTINGS, Q.C., and Mr. E. FORD for the defendants.

Justice STIRLING to-day delivered an exhaustive judgment. He said the defendants claimed the power to carry their mains through the plaintiff's land under sections 51, 54, and 16 of the Public Health Act. Section 54 provided that "when a local authority supply water within their district, they shall have the same powers and be subject to the same restrictions for carrying water-mains within or without their district as they have and are subject to for carrying sewers within or without their district respectively by the law for the time being in force;" and section 16 provided that "any local authority may carry any sewer, . . . after giving reasonable notice in writing to the owner or occupier (if on the report of the surveyor it appears necessary) into, through, or under any lands whatsoever within their district." The injunction was claimed on two grounds: (1) It was said that it was not and did not appear by the report of the 21st of March, 1888, to be "necessary" to carry the main through the plaintiff's lands; and (2) it was contended that Mr. Powell, by whom the report was made, was not "the surveyor" within the meaning of section 16 of the Act. Both these points raised questions on the construction of the Act; and his Lordship proceeded to deal with them at length. Having cited a number of authorities bearing upon the case, he considered the scope of the word "necessary" in the above-quoted section. He said it might well mean "necessary for the efficient discharge of the duty in the way which is most for the public interest." It was the duty of the surveyor to take all the circumstances of the case into consideration, and come to a conclusion as to the best course to be pursued, and to report accordingly—saying what was necessary to be done in order to carry into effect the scheme which commended itself to his judgment. If the Court found that the surveyor had exercised his judgment, and come to a conclusion in good faith, his Lordship apprehended that it ought not to interfere, although other courses by which the necessity for entering upon private lands might be avoided might be pointed out, and might be admitted to be practicable; and even although engineers of greater eminence than the surveyor might come forward and say that they would themselves have reported in favour of the adoption of one of the alternative courses. The second objection of the plaintiff had still to be considered. The defendants had power to carry their mains through the plaintiff's land only "if on the report of the surveyor it appears necessary." Who was "the surveyor" referred to? His Lordship then read sections 4, 189, and 190 of the Public Health Act, and said that, in his opinion, "the surveyor" mentioned in section 16 was the fit and proper person duly appointed under section 189, and no other—not even an engineer of the greatest eminence whom the authority might think fit to consult. Was Mr. Powell such a person? In his Lordship's opinion he was not. The Board had never come to the conclusion that he was a fit and proper person to be their surveyor within the meaning of section 189. All that they had determined was that he was competent to be assistant to their surveyor, and to discharge such of the duties as were necessary or proper to be discharged during a vacancy in the office of surveyor. He was, in fact, in the language of the Act, "an officer or servant, necessary or proper for the efficient execution of the Act," but not "the surveyor." It was said that the present surveyor, who was admitted to have been duly elected, and to be "the surveyor," had made an affidavit, in which he took the same view and approved of the report of Mr. Powell. His Lordship thought, however, that this was not material for the present purpose. The defendants were seeking to avail themselves of a power conferred on them by statute in derogation of the plaintiff's rights; and, so doing, they must follow strictly the terms of the power. The existence of a report of "the surveyor" by which the acts contemplated by them appeared to be necessary was, in his Lordship's opinion, a condition precedent to the doing of those acts; and as the report of the 21st of March, on which the whole of their proceedings were founded, was not the report of "the surveyor," he thought the plaintiff was entitled to an injunction until the trial of the action or further order.

THE Local Government Board have sanctioned a loan of £6000 by the Basford Rural Sanitary Authority, for works of water supply for the parish of Kirkby-in-Ashfield.

Miscellaneous News.

MR. ELLIS LEVER AND THE SALFORD CORPORATION GAS UNDERTAKING.

At the Meeting of the Salford Town Council to be held to-morrow, the attention of the members will be again specially directed to matters seriously affecting the gas undertaking of the Corporation. The *agenda* paper sets forth that the Mayor (Mr. Alderman A. L. Dickens) will submit a communication "with reference to the action of the Consulting Committee in a certain matter in the case of Samuel Hunter;" that the Council will also receive correspondence between the Mayor and Mr. Ellis Lever, "in respect of the resolution of the last meeting of the Council [*ante*, p. 645] as to the appointment of a Committee to consider certain statements made by Mr. Lever in the public press on gas matters;" and that Mr. Phillips will move that this resolution be rescinded so far as it relates to the appointment of a Committee, and that in lieu thereof the Council consent to Mr. Lever's proposal "that he shall nominate two members of the Council, who, being so nominated, shall themselves appoint a third, to whom he will disclose evidence of such frauds, and that the said members so selected shall be appointed to form themselves into a Sub-Committee to receive such evidence, and to report thereon to the Council." It may therefore be expected that the proceedings on the occasion will be lively. In view of the great interest, for the gas industry generally, which attaches to the charges made by Mr. Ellis Lever in connection with the Salford gas undertaking, it may not be out of place to reproduce certain portions of some letters which have lately appeared on the subject in the local press.

Mr. Lever's first communication—in which he offered, provided the Corporation would allow him to nominate two persons, with power in them to name a third, for the purpose, to show the Council, within 14 days, how the ratepayers were being "defrauded" in regard to their gas undertaking—was given in the *JOURNAL* for the 9th inst., in conjunction with the proceedings of the Council thereon. The result, it will be remembered, was the appointment of a Committee to hear what Mr. Lever had to say on the matters specially referred to in his letter. This Committee, as stated in the *JOURNAL* last week, Mr. Lever declined to meet, on the ground that they were all either ordinary or *ex-officio* members of the Gas Committee, whose conduct, it was to be presumed, he would impugn. His action called forth a letter from Mr. F. S. Phillips, one of the Committee, expressing regret thereat. He said: "I regret it, because I can see no good in continuing the present state of matters, making allegations and not bringing about an issue. I regret it also because a body of men constituting the present Gas Committee, who have done everything possible for the interests committed to their charge, are branded in the public mind as knowing or taking part in or permitting fraud; and I say that it is unjust to place this imputation upon us and refuse to let the matter be cleared up. I do not hesitate to say that the present Gas Committee has merited very different treatment." He suggested that Mr. Lever and the Corporation should both agree to accept a Committee of the Council to be nominated by an independent person—Mr. Oliver Heywood, the High Sheriff, being mentioned. The next day Mr. Snape followed with a letter, pointing out that the new Gas Committee had not been in office twelve months; and that the new Manager commenced his duties only a little more than six months ago. Since then, he said, the Committee and Manager had been working almost night and day, getting the works into as good condition as possible before the winter came on. Many improvements were in contemplation, but it would take months to execute them; and it would be another two years before a fair estimate of the work of the new Committee could be made. He therefore appealed to Mr. Lever and to the general public to suspend their judgment, and grant the Committee fair play. As to the objection raised to the Sub-Committee, Mr. Snape said: "The Council simply objected to Mr. Lever nominating his own judge and jury. They want an impartial tribunal. Will Mr. Lever accept a Committee composed of two members nominated by himself and two members nominated by the Council, with the Mayor for Chairman? If so, I will help him to get it." Mr. Snape proceeded to defend himself from a charge made against him by Mr. Lever of having "neglected his duty" because he did not act on certain information given to him by Mr. Lever in connection with the history of the Garswood coal contract, which figured so conspicuously in the Hunter trial; claiming that the matter was to be treated as confidential until some further communication was received from Mr. Lever. He concluded by saying that if Mr. Lever would help to send to prison a few of the bribers, who were worse than the bribes, instead of railing at the new Gas Committee, he would be doing good service. Mr. Lever replied to both these letters on the 23rd inst. With regard to that of Mr. Phillips, he indicated Sir James Farmer, the ex-Mayor of Salford, as a member of the Special Sub-Committee to whom he had a "strong and natural objection," inasmuch as Sir James preferred to see him criminally prosecuted rather than afford him the opportunity of stating at a personal interview what he had to say in reference to the frauds being perpetrated upon the ratepayers of Salford. As to the responsibility of the new Gas Committee, in reference to existing coal contracts, to which reference had been made by Mr. Snape, Mr. Lever said he pointed out that many of the contracts of 1886 were corruptly obtained, and would prove a heavy burden upon the people of Salford. He added: "The Council knew that these contracts could be replaced at a saving of £25,000 to the ratepayers, but they deliberately decided to seal these unfavourable contracts in September, 1887—seven months after my prosecution, and nearly twelve months after the old Gas Committee's purchase. But is it not a fact that within the last few weeks the new Gas Committee, for whom Mr. Snape pleads, have entered into a new contract for 25,000 tons of coal without any advertisement or competition?" As to the constitution of the Sub-Committee, he said: "The contention of Mr. Snape that the Corporation wish for an impartial tribunal will hardly hold water in the face of the fact that the Sub-Committee they appoint embraces no member who is not an ordinary or an *ex-officio* member of the Gas Committee. In objecting to my nomination of 'two members of the Council, with power to them to name a third,' the Council in effect say, 'We have in our body at least three men who are untrustworthy.'" With regard to the "neglect of duty" on the part of Mr. Snape, Mr. Lever denied ever having made such a charge. Mr. Snape last Friday replied to this letter. Referring to Mr. Lever's objection to the Sub-Committee, he said "What does Mr. Lever mean or want with regard to the tribunal? I have said that he desires to select his own judge and jury, and that this is a tribunal which is not satisfactory to the Salford Corporation, who offered him one which seemed to them fair. But Mr. Lever will not bring his case before them. Since then Mr. Phillips has suggested a tribunal to be selected by Mr. Oliver Heywood, the High Sheriff. I have suggested another. Will Mr. Lever accept none of these? Why does he ignore Mr. Phillips's suggestion and my own? Will he kindly say if he considers them fair, and if so, why he does not accept one of them? The Council are most anxious that if there are any frauds still going on, as Mr. Lever alleges, they should be stopped at once without a moment's loss of time; and it

certainly does seem surprising that if Mr. Lever has the proofs of these serious allegations in his possession, he is so reluctant to produce them. As I said before, it is nothing less than persecution to keep these charges hanging in the air, and the public mind in a ferment of suspicion, without at once bringing the proofs to the front." On the subject of the coal contracts, Mr. Snape said: "Respecting the contracts Mr. Lever says:—'I know that I pointed out that many of the contracts of 1886 were corruptly obtained.' This is news to me. I know nothing of it. The contracts were accepted by the Corporation on Oct. 6, 1886, three days before my interview with Mr. Lever, when for the first time I heard anything approaching even a credible story with regard to frauds in the gas management; and then, as I have said, no names were given, and certainly nothing was said to me with regard to corruption as to the new contracts, except that both Mr. Lever and I inferred that there was a probability of corruption in regard to them if the story he then told me was true. But he certainly gave me no proof of corruption in regard to them, nor, so far as I am aware, has he given any since to anybody else. I opposed the sealing of the contracts in December, 1886, because, although I had strong suspicion from what Mr. Lever told me, I had no proof; and I was away for my holidays in September, 1887, when the contracts were sealed, or I should have opposed it again. But I never heard that Mr. Lever had produced any proofs. The position of the Council and the Gas Committee was a difficult one. The contracts had been accepted by resolution of the Council, as before stated, and deliveries had begun on Nov. 1, 1886. It is true the actual contracts were not sealed, and one of the first questions that arose at the Investigation Committee was whether, under the circumstances, the whole of these contracts ought not to be cancelled. But on consulting our legal advisers we were told that the contracts having been accepted, and part deliveries having been made thereunder, although the seal had not been attached, they were legally binding unless we could prove fraud with regard to each specific contract. This we were not able to do, nor are we able to do it yet; and therefore the contracts still stand. If Mr. Lever succeeds in enabling us to prove fraud in regard to any one of them, I promise him it will not be very long before that particular contract is cancelled, and an action commenced for the recovery of any money out of which the Corporation has been defrauded. Mr. Lever asks: 'Is it not a fact that within the last few weeks the new Gas Committee, for whom Mr. Snape pleads, have entered into a new contract for 25,000 tons of coal without any advertisement or competition?' Mr. Lever has not the hardihood to say that a new contract has been entered into, but his language certainly suggests it; the fact being that one of the present contracts is for 39,000 tons of coal to be delivered by the end of 1889. The present Gas Committee find they will not want this quantity of coal for a long time, and that if they take it in, they would have to stack it in their yard, where it would deteriorate, and they would lose interest upon it. So they have induced the contractor to cancel a portion of the coal still undelivered, and to deliver in substitution therefor an equal money value of another kind of coal which the Committee actually do want. This variation of the contract, when properly explained, will, I am sure, meet with the approbation of everybody; whereas Mr. Lever tries to bring it up as a charge against the Gas Committee that they are improperly entering into new contracts for coal without advertising for the same." Mr. Snape concluded by again appealing to the public to give the new Gas Committee fair play, and to Mr. Lever to come forward in a manly, straightforward way, and state his case fully if he has any charges to make against anybody. He added that Mr. Lever might depend upon it that, in the spirit at present animating the Salford Council, they would cleanse their various departments from all proved corruptions and irregularities.

As bearing largely on the matters alluded to in the correspondence above summarized, it will be of interest to reproduce a letter, on "Coal Commissions," addressed by the President of The Gas Institute (Mr. H. Woodall, M. Inst. C.E.) to the *Manchester* papers last week. It was as follows:—"This subject is evidently occupying so much of public attention in the neighbourhood of Manchester, that I venture to hope you will afford me space for a few words upon an aspect of the question which hitherto has received too little consideration. It is generally accepted that the commission system is a most reprehensible one, and that the sooner it is abolished the better. But it is not so generally known that, unsuspected by most people, and even by officials themselves, it is being exercised to the prejudice of public interests in ways that would be ludicrous were they not so exasperating. On one occasion I found that an intimate friend had been paying a commission to a casual acquaintance on coals supplied to me, and that, naturally enough, he had given me credit for having shared the plunder. In another case a man whom I know neither by name nor sight went to a colliery with a statement that he had influence with me, and for a consideration could secure an order. A sample was tested and a contract made; and it was not until another year that I learned we had been paying 6d. a ton on 10,000 tons to this very clever fellow, whose acquaintance I had still to make. Now, what I want to ask is, Why should colliery proprietors put their trust in middlemen? And why should companies or corporations buy through them? The credit of a gas concern is practically as good as that of Government itself. There is therefore no need of a negotiator; and manifestly a company is surer of being supplied with what it bargains for when dealing with the colliery direct. Manchester has probably lost more than any other town in Britain by persistent disregard of these self-evident truths; and it will be a happy day for ratepayers, councillors, and officials when the blunder is recognized and corrected."

THE CHARGES IN CONNECTION WITH THE HALIFAX GAS-WORKS.

At the Meeting of the Halifax Town Council last Tuesday—the Mayor (Mr. Alderman J. Booth) in the chair—the question of giving an indemnity to Mr. Alderman Riley with regard to the charges made against him by Mr. T. K. Fox, of being guilty of certain malpractices in connection with the Corporation gas undertaking, was under discussion. It will be remembered that Mr. Riley's Solicitor (Mr. W. H. Boocock) sent to the Town Clerk (Mr. Keighley Walton) a draft form of indemnity which he wished the Mayor to sign prior to any action against Mr. Fox being taken. The Town Clerk objected to certain clauses of the indemnity, and returned it amended to Mr. Boocock. The indemnity is as follows; the words in italics being those struck out by the Town Clerk as objectionable, and the words in brackets those inserted by the Town Clerk, acting on behalf of the Mayor:—

"This Indenture, between James Booth, of Halifax, in the county of York, manufacturer, the Mayor of the said borough of Halifax, of the one part, and James Turner Riley, of the other part.

"Whereas one Thomas King Fox hath, after a certain indemnity had been given to him by the said James Booth, made charges or allegations against the said James T. Riley, imputing to him malpractices in connection with the Halifax Gas-Works, which said charges or allegations were contained in a writing signed by the said Thomas King Fox, and forwarded by his directions to the said James Booth; and whereas it hath been thought desirable that the truth of the said charges

and allegations of malpractices should be investigated in a Court of Law, and that the said James T. Riley should commence forthwith an action for damages for defamation of his character against the said Thomas King Fox; and whereas the said James Booth requested the said James Turner Riley forthwith to commence such action; and whereas the said James Turner Riley hath agreed so to do upon being indemnified as hereinafter set forth:

"Now this indenture witnesseth that, in consideration of the said agreement, the said James Booth doth hereby covenant and agree with the said James Turner Riley, his executors and administrators, that in the event of a verdict being found or judgment given in such action in favour of the said James Turner Riley [for the sum of £10 or upwards, and costs], as also in any event, unless the said James Turner Riley shall in the said action be found or proved guilty of malpractices in connection with the Halifax Gas-Works, in the shape of corruptly receiving money, by way of commission or bribe, on coal or other things purchased by the Corporation, he, the said James Booth, will save harmless and keep fully indemnified the said James Turner Riley, his executors and administrators, from all costs (as well between solicitor and client as between party and party), and as well his and his executors' or administrators' own costs as costs he or they may be liable to pay the opposite side or other parties, and all charges, disbursements, and expenses of what nature or kind soever, which he, the said James T. Riley, his executors or administrators, or his or their duly authorized solicitors or agents, shall properly incur (as well before as after action brought) in, about, or relating to the obtaining information for, or conducting of, such action or of the said action, or in or about the bringing of the same to trial, or the trying of the same; it being the full intention and meaning of these presents that the said James Turner Riley, his executors or administrators, should not be put to or incur any expense personally in the event herein provided for, and that in the events herein provided for, or in any of them, whatever expense the said James Turner Riley, his executors or administrators, may incur or be put to, he and they shall be fully recouped, reimbursed, and indemnified by the said James Booth.

"And the said James Booth, on behalf of the Corporation of Halifax and their officials, doth hereby further covenant and agree with the said James T. Riley, his executors and administrators, that the said Thomas King Fox shall not in such action set up any plea or defence on the ground of privilege, and that every reasonable opportunity and facility shall be given to him, the said James Turner Riley, and his solicitors, for inspecting and taking copies of all the Corporation books relating to the gas-works, and also all tenders, contracts, and papers relating to or affecting the working and management of the said gas-works.

"And the said James Turner Riley doth hereby covenant and agree with the said James Booth that he will, within one week of the execution of these presents by the said James Booth, commence an action for damages for defamation of character against the said Thomas King Fox, and that in such action an opportunity shall be afforded to the said Thomas King Fox, of alleging and substantiating, if he can, that the said James Turner Riley was or had been guilty of malpractices in connection with the Halifax Gas-Works, in the shape of corruptly receiving money, by way of commission or bribe, on coal or other goods purchased by the Halifax Corporation for the said gas-works.

"In witness," &c.

On the minute in the agenda relating to this matter being reached, The Mayor called upon the Town Clerk to read some correspondence he had received on the subject.

The TOWN CLERK read the following letter from Mr. Riley's Solicitor:—"Dear Sir,—I have now seen my client upon your alterations in the draft deed of indemnity, and these alterations raise two important points: (1) The indemnity is limited by making it dependent upon Mr. Riley obtaining a verdict of £10 or upwards and costs against Mr. Fox. You will, of course, see that in certain events Mr. Riley may, with this limitation, have to pay his own costs, whilst Mr. Fox, according to the terms of his indemnity, will not; and this although Mr. Fox may not succeed in proving anything against my client. It is only reasonable to ask that Mr. Riley should be indemnified from all costs in any event save verdict for the defendant. (2) The draft, as altered, gives Mr. Fox unlimited scope to make any charge or allegation against my client in anything he may have done or omitted to do in connection with the gas-works. To this I cannot advise my client to agree. Referring to the indemnity given to Mr. Fox (which I take from the print in the newspapers, as I have no other copy), it is recited that Mr. Fox has 'written certain letters to Keighley Walton, Esq., the Town Clerk to the said borough of Halifax, concerning the supply of coals to the said gas-works; and further, 'that the said Corporation expressed a desire to have the said statements in the letters of the said T. K. Fox fully and thoroughly investigated;' and the first clause of such indemnity provides that, on the signing thereof, Mr. Fox shall state 'in writing the name or names of the person or persons referred to in his letters as the object of the charges therein referred to.' But in the statements made by Mr. Fox in pursuance of his indemnity, these letters are never referred to, and my client is only mentioned in two of the statements. The first of these statements we may pass by for present purposes, as it merely states Mr. Fox's opinion that Mr. Riley is unfit to be Chairman of the Gas Committee; the latter charges my client with malpractices, which may mean a great deal or nothing. Now, taking Mr. Fox's letters, the words of the indemnity, and statements made by the Mayor and others, the public have interpreted them as accusing Mr. Riley of having been guilty of the offence of receiving bribes or commission on coal bought for the gas-works. If Mr. Fox, by charging my client with malpractices, means such practices as these, my client is prepared to proceed against Mr. Fox, and defies him to prove them. The draft indemnity, as submitted to you by me, goes further than this, because it includes not only coal, but any other goods purchased by the Corporation for the gas-works. I must therefore ask that the provision that the indemnity shall be in force unless my client 'be found or proved guilty of malpractices in connection with the Halifax Gas-Works in the shape of corruptly receiving money by way of commission or bribe, on coal or other goods purchased by the Corporation' (and which you have struck out), be allowed to remain. These are the grounds upon which my client is prepared to meet Mr. Fox; and if Mr. Fox's charges mean less than these, he cares not to disprove them further than he has already done by stating that they are not true, and, unless the draft be agreed to as submitted, I cannot advise my client to accept the indemnity." He explained that there were, so far as he could gather, four objections to the alterations. As to the first objection, what the Corporation wanted was precisely on the same lines as the indemnity given to Mr. Fox. Secondly, Alderman Riley declined to face unknown charges; but the fact was that the Corporation did not know what the charges were, but, if action was taken, could call upon Mr. Fox to state the particulars of his charges, and could pin him down to state them. The last objection was the most important one, however. Alderman Riley declined to commence any action unless Mr. Fox would charge him with taking commission or bribes on coal or other goods purchased by the Corporation. It was not yet known whether

Mr. Fox would make such a charge, or could do so; if not, then whatever other charges be made and proved, and however serious they were, Alderman Riley was still to be indemnified. In fact, Mr. Fox might prove twenty charges of malpractices; but unless one of these twenty was a malpractice by taking commission or bribes, Alderman Riley was to be held innocent, and to be indemnified.

The MAYOR: I have to move the following resolution:—"Mr. E. G. Wrigley and Mr. William Carr having declined to commence any action for libel against Mr. T. K. Fox, and Alderman Riley having declined to take proceedings against Mr. Fox except with an indemnity by the Council, in terms which the Council cannot agree to, resolved that the Sub-Committee (the Mayor, Mr. Alderman Ramsden, and the Town Clerk) be authorized and requested to prosecute their inquiries, and institute such proceedings, civil or criminal, as they may be advised."

Alderman POLLARD said he had great pleasure in seconding the motion. The statement made by the Town Clerk had much surprised him. He had been under the impression that the Council agreed at its last meeting to give the same indemnity to Alderman Riley as was given to Mr. Fox, and nothing more. If this was not satisfactory, let the Council take what proceedings they might be advised, whether civil or criminal.

Alderman HOLDSWORTH said he should like to ask the Town Clerk if "bribes" were not mentioned in the indemnity. That was a much broader term than "commission," and meant money received in any way for goods sold to the Corporation.

The TOWN CLERK replied in the affirmative, but pointed out that Alderman Holdsworth did not appear to him to catch the point aimed at by the clauses objected to in the indemnity. It mentioned bribes; but it stipulated, "as also in any event," unless Alderman Riley was found guilty of receiving money by way of commission or bribe, &c. Now they did not know what Mr. Fox intended to prove, or what form of malpractices he alleged; and, therefore, if he proved twenty other charges of malpractices against Alderman Riley, unless he proved a malpractice by way of commission or bribe on coal or other goods purchased by the Corporation, he would fail if the clause in the indemnity stood as submitted.

Alderman MIDGLEY: Am I right in concluding that Alderman Riley is prepared to accept an indemnity, provided it covers any charge of corruption as alleged against him?

The TOWN CLERK: No.

Alderman RILEY said he should like to make a statement.

The Mayor said he could not allow him to speak.

Alderman LONGBOTTOM referred to certain statements which seemed to have gone forth to the public to the effect that the Lord Chancellor was to be asked to appoint a Royal Commission to inquire into the subject of the gas scandal, and also another rumour that the Local Government Board were to be asked to open an inquiry. He did not know, with regard to the first statement, that a Royal Commission could be appointed by any authority but Parliament; and with regard to the second, he did not apprehend that the Local Government Board had authority or control over gas-works owned and managed by a municipal corporation.

The TOWN CLERK said he quite agreed with Alderman Longbottom that neither the Lord Chancellor nor the Local Government Board had anything to do with the matter.

Alderman RILEY: I wish to ask the Town Clerk if I, having received a notice to attend this Council meeting, have not a right to speak.

The TOWN CLERK: No member of the Council can speak on subjects in which he is personally interested.

The resolution was then put, and carried without a dissentient.

MR. ALDERMAN RILEY ON HIS DEFENCE.

Last Friday evening the annual ward meeting of the burgesses of the Market Ward, Halifax, of which Mr. Alderman Riley is the presiding Alderman, was held; and, in view of the recent proceedings in the Council, was well attended. Mr. Riley occupied the chair, and after a few introductory remarks, in the course of which he assured the burgesses that there had been no desire on his part to shirk the meeting, he asked permission to detain them for a short time in reference to the subject which was so prominently before the town—viz., the "gas scandal." He then said: It is now nearly 17 years since you first did me the honour of electing me as one of your representatives, and I have ever since been a member of the Halifax Corporation; and for the last 12 years I have been Chairman of the Gas Committee. During the whole of this period I have always acted as I thought best for the interest of the ratepayers of this town; and I defy the Mayor, or Mr. Fox, or any other person, to point out, in my corporate career, one single instance of dishonourable conduct, or any violation of my duty towards you, my electors, or the ratepayers generally. Mr. Fox has made two so-called charges against me—namely, that I am unfit to occupy the position of Chairman of the Gas Committee; and that I have been guilty of malpractices in connection with the gas-works. Now, what do these allegations amount to? Whether I am or am not fit to be the Chairman of the Gas Committee is merely a matter of opinion; and I ask you to decide this point for yourselves. I think, however, that this charge is sufficiently answered by the fact that the price of gas in this town has dropped from 4s. to 1s. 9d. per 1000 cubic feet during the time I have been Chairman of the Gas Committee; that in 1875, with a capital of £233,523 17s. 5d. invested in the works, the make was 264,038,000 cubic feet, whilst in 1887, with a capital of £290,744 15s. 4d., or about £53,000 more than in 1875, the make was 527,703,000 cubic feet, or practically double that of 1875; that during this period the gas-works have been transferred from a state of chaos to one of first-class order; and that there is scarcely another place in England which has gas at so low a rate as we have here. The latter charge also is equally vague. No particulars are given as to the nature of the malpractices of which Mr. Fox accuses me. The term "malpractice" is of very wide and indefinite import. It sometimes means a great deal, and it sometimes means very little or nothing at all. Literally speaking, negligence, carelessness, or inattention are malpractices. No man, even in his own business, is perfect; and it would have been an impossibility for me to have occupied the position of Chairman of the Gas Committee of this Corporation for upwards of twelve years without having been guilty of one or more of the above malpractices. If this is the sense in which Mr. Fox uses the term "malpractice," then this charge, too, would be of so trivial a nature as probably to be held not to be libellous. In common parlance, however, the term "malpractice" signifies criminal conduct; and, taken in this sense, and in conjunction with what the Mayor has said—viz., that the Corporation has been defrauded out of several thousands of pounds—the public have been given to understand that I have been guilty of receiving commissions and bribes. Gentlemen, I assert most positively that there is not the slightest particle of truth in this base insinuation; and I offered to sue Mr. Fox on this ground. The Mayor and the Town Clerk, however, have advised the Corporation not to accept this offer. This, gentlemen, is tantamount to saying that no such charge can be proved against me. I leave the ruling of the Mayor and Town Clerk, in refusing to hear me speak at the Council meeting on Tuesday last, to speak for itself; and, I am sure, gentlemen,

that you will all agree with me in saying that it was unjust, and that thereby I was placed at a great disadvantage. During the whole of the time that the subject has been before the public, I have never been consulted by the Mayor in reference thereto. Surely he ought to know that one side of a question always seems very plausible until the other side has been heard; and had he spoken to me, I have no doubt that I could have shown him, as far as I am concerned, that there is not the slightest foundation for Mr. Fox's charges. I do not, however, intend to indulge further in crying out against the injustice done to me; and seeing that the Council has passed a resolution to prosecute their inquiries by means of civil or criminal proceedings, I can only add that I am very glad, and that, knowing that I am perfectly innocent, I am prepared to meet whatever legal proceedings, if any, they may adopt. I have been told to-day, on pretty good authority, that the matter is boiled down to this—that the Corporation intend to sue Mr. Wrigley, contractor for cannel coal, for deficiency in the quality of coal. Mr. Wrigley was in the town yesterday, and had an interview with the Mayor and Town Clerk, and that is the result of their deliberations. We shall have to wait our time. I have no fear that anything will be discovered that can incriminate me in the slightest degree. I have an inward consciousness that I have done nothing wrong, and no amount of sifting can prove that I have occupied my position in the Corporation to benefit my pocket in any form; and I defy the Mayor, or any court of inquiry in the world, to prove that. Of course, I know what I have done—I ought to know; and there is nothing that has kept me up through this great trial but the inward consciousness that I have done nothing to betray the confidence that you reposed in me 17 years ago.

There have been further references to the matter at other ward meetings. Mr. Brear, a member of the Gas Committee, was questioned about it at the meeting he addressed last night week, and stated that there was a man employed to weigh the coal, and if the Committee had been deceived, it was nothing they could help. The weighman had told him it was impossible for him to weigh all the coal, owing to the lack of siding accommodation; and he would need a couple of horses or an engine to move the trucks on to the machine. He (Mr. Brear) once asked Mr. Carr if he found the coals came up to contract. He said he did; and when he did not, he would at once speak to the Committee about it. In answer to further questions, Mr. Brear said the weighing-machine was only out of repair four days after the Committee knew about it. All the coals would be weighed by the Railway Company on their own behalf. Alderman Midgley, at a meeting over which he presided on Wednesday night, said the question as to the weighing of the coal should be inquired into further, so as to ascertain whether anybody had given the weighman orders not to weigh the coal. If he had received such orders, then somebody was seriously to blame; and whoever it was—man or master—an example should be made of him. If, as had been expected, there were hindrances in the way of the trucks being weighed, these hindrances should be removed, even if it cost £500 or £600 to do it. He had heard the remark that they should sweep away the whole of the Gas Committee. He did not approve of such a course, for they might depend upon it that the members of the Committee were as honest and straightforward as they themselves were. The Committee had made a mistake; and no doubt every member felt this as acutely as anyone outside.

The *Halifax Courier* states that "on Thursday afternoon the Mayor, Mr. Alderman Ramsden, and the Town Clerk had an interview, at the Town Hall, with Mr. Emor G. Wrigley and his Solicitor (Mr. Cobbett, of Manchester), having reference, no doubt, to the matter alleged against Mr. Wrigley—viz., sending coal of inferior quality to that contracted for. What the result of the inquiry was, of course, kept private. It is not unlikely, however, that proceedings may be commenced against Mr. Wrigley to recover the difference, if any, in the value of the coal supplied and that agreed for. It may interest our readers to know that from 1881 to 1886 hand-picked coal was not contracted for by Mr. Wrigley; but in the latter year, we are informed, the contract was altered, and 5000 tons of hand-picked coal were to be sent. In the following year a similar contract with him was again entered into; and this year—last May, we believe—6000 tons were ordered of him of the same quality. If proceedings be taken, and the coal now supplied be found to be other than that agreed for, it is not unlikely that the contract will be cancelled; and the action would then be to recover the difference in the value of 10,000 tons supplied in 1886 and 1887, and on the quantity delivered so far since the last contract."

THE GAS-WORKS OF THE HUDDERSFIELD CORPORATION.—The new gas-works of the Huddersfield Corporation in the Leeds Road were started on the 27th ult. After an inspection of the new retorts and the other machinery and apparatus, which has been erected under the supervision of the Corporation Gas Engineer (Mr. J. Burgess), the Committee proceeded to the station meter, and afterwards to the new gasholder, where the ceremony of turning the valve was performed by Miss Stocks, the daughter of the Vice-Chairman of the Gas Committee.

THE HENDON LOCAL BOARD AND ELECTRIC LIGHTING.—At the meeting of the Hendon Local Board on Monday last week, Mr. Yule brought forward a motion in reference to the electric lighting of the district, and said his object in doing so was to obtain a more economical system. At present they paid 4s. 6d. per 1000 cubic feet for gas, which, as compared with London, was very high. The following motion was, after a very brief discussion, unanimously agreed to:—"That the Solicitor be instructed to inquire as to the cost of adopting a system of electric lighting as at Barnet; the Surveyor to report as to the estimated relative cost of lighting the more populous parts of the district as against gas."

BOMBAY GAS COMPANY, LIMITED.—The report of the Directors of this Company and the accounts for the half year ending June 30 last, which will be submitted at the meeting of the shareholders on the 7th prox., are satisfactory so far as the receipts are concerned. Compared with the corresponding half of last year, the revenue from the sale of gas and meter-rental displays an increase of £1102 13s. There has also been an improvement in the sale of coke, tar, and fittings. The unsatisfactory feature in the half-year's operations is the serious loss in exchange, which was £14,947 10s., on the £32,000 remitted in the six months; the average rate being 1s. 4½d. per rupee. Of this loss £8474 10s. has been charged to profit and loss, and the balance (£6500) written off exchange equalization account; leaving £1979 5s. 5d. at the credit of the latter account. The amount at the credit of profit and loss is £8859 10s., which, with the balance brought forward (£156 10s.), makes a total of £9016. Out of this sum the Directors have placed £500 to the reserve fund for depreciation of plant, &c., and declared an interim dividend of 3½ per cent., amounting to £8400; leaving £116 to be carried forward. The Directors regret to announce the retirement, through ill-health, of Mr. G. A. Northover from the position of Auditor. Under the Articles of Association, they have appointed Mr. E. A. Pinders to fill the vacancy until the next ordinary meeting of the shareholders.

THE BRITISH GASLIGHT COMPANY AND THEIR ACCOUNTS.

At the Meeting of the Hanley Town Council last Tuesday, the report presented by the General Purposes Committee showed that the following resolution had been adopted by the Gas Sub-Committee:—"That this Sub-Committee, having examined the statement of accounts of the British Gaslight Company, Limited, for the year ended June 30, 1888, hereby expresses its satisfaction that, notwithstanding the correspondence which has taken place between the Company and the Corporation, and the reduction in the price of gas, the Company have omitted the items of depreciation and insurance from such statement, which shows that in addition to paying all dividends and arrears of dividends, together with £973 4s. 8d. balance of costs of the inquiry before the Recorder, they have for the first time a reserve of £717 9s. 11d." In moving the adoption of the report, Alderman Powell said the Company had carried out the promise they made to the Corporation some time ago not to charge in their statement of accounts for depreciation and insurance. All through their dispute with the Company, the Corporation had contended that the Company had no right to do this; and now they had ceased to do it. The result was that, after reducing the price of gas from 3s. 6d. to 3s. per 1000 cubic feet, they had been able to do extraordinary things. For instance, they had paid off a large sum for what in 1884 was a deficiency of dividends; they had paid the full amount of their statutory dividend upon £12,610; they had further paid dividends at the rate of 7½ per cent. upon £30,000, and at the rate of 5 per cent. upon £34,702. They had even done more than this; for somehow or other they had found out that, whereas in 1884 there was owing to the London Board a sum of £3397, the London Board now owed to the Potteries undertaking a sum of £736. The Company had now, for the first time, created a reserve fund of £717 9s. 11d., and had shown, also for the first time, by a fair statement of accounts what an immensely profitable undertaking the gas-works were. They were so profitable, indeed, that he hoped the burgesses of Hanley would not be contented until the undertaking belonged to the Corporation. The report was adopted.

CEARA GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held last Friday, at the London Offices, 9, Queen Street Place—Mr. HORATIO BROTHERS, C.E., in the chair.

The SECRETARY (Mr. T. Guyatt) read the notice convening the meeting; and it was agreed to take as read the Directors' report and accounts for the year ending June 30 last, an epitome of which was given in the JOURNAL last week (p. 734).

The CHAIRMAN, in rising to move—"That the report and accounts be received and adopted," said he had pleasure in remarking that the balance-sheet which they had before them was perhaps the best that had ever been submitted to the shareholders. It was true that the Board did not recommend quite so large a dividend as they had previously declared; but this was a matter of policy. The Directors considered it best to strengthen their position by increasing the reserve fund. The accounts on the present occasion called for very little remark. There was an increase of £356 in the receipts from private consumption, and of £280 in those from the public lamps—making a total increase of £660 in the revenue from gas. There had also been an improvement in residual products to the extent of £428. In other words, the residuals produced £920, against £496. The total increase in the revenue from all sources was £1278. On the expenditure side of the account there was a decrease of £221; but in the balance-sheet of last year there appeared an item of "tax on meters, £590." This tax the Board expected would be abolished. It was part of the arrangement that the Company made with the Provincial Authority, when they entered into an agreement to provide 300 more lamps, that this tax should be no longer levied. It was now awaiting the decision of the Legislative Assembly; and they hoped it would be confirmed. Deducting this £590, the expenditure was practically £369 more than in 1887. Of this increase, £318 fell to coals. He might, however, remark that their Manager (Mr. T. M'Making) was scarcely to be blamed for this, because in regard to the coal there were certain circumstances over which he had no control. They had no doubt that in the future the make of gas would be considerably increased. Although they had not produced so much gas per ton of coal carbonized, they had sold the same quantity of gas per ton. The other items of the account did not show any very remarkable or noteworthy changes. The profit exhibited a gratifying increase—from £2977 in 1887 to £4476 now. To make a fair comparison, however, the tax on meters levied in 1887 amounted to £590, and not being charged in 1888, must be deducted, which would reduce to £986 the increase of profit over 1887. The capital account, the shareholders would see, had been augmented by a sum of £2741 6s. 5d. This was occasioned by the additional lamps and fixing them, and new apparatus and coal stores. In the current year there would also be an increase, as the Board were extending the works to meet the requirements of their customers. He anticipated that this increased demand for gas would continue, as it was now doing; and there was no doubt that in the future they would have to make further provision for it. As to the prospects of the Company, he might say that he looked forward with a great deal of pleasure. It would be observed that, instead of dividing the whole of the amount earned, the Board recommended that £1000 should be put to the reserve fund. By this means they increased the stability of the Company and the certainty of the dividend.

Mr. J. DARELL BLOUNT seconded the resolution, which was at once agreed to.

On the motion of the CHAIRMAN, seconded by Mr. BLOUNT, it was decided to add £1000 to the reserve fund, and to pay dividends at the rate of 10 per cent. per annum on the preference shares (less income-tax), and at the rate of 11 per cent. per annum on the ordinary shares, free of income-tax. This will make, with the interim dividend, 8 per cent. for the year.

Mr. A. J. KINO proposed, and Mr. F. W. BROTHERS seconded, the re-election of the Directors retiring by rotation (Messrs. Horatio Brothers and F. A. Wallroth).

The motion was carried unanimously, and Mr. BROTHERS returned thanks.

On the motion of Mr. WHITE, seconded by Mr. ANDREWS, Mr. Robert King was elected Auditor of the Company, in the place of Mr. R. W. Wilbraham, who retired, and did not seek re-election.

The CHAIRMAN next proposed a vote of thanks to the Manager, the Secretary, and the Officers of the Company. In doing so, he read an extract from the *Libertador*, of Aug. 27 last, giving a report on the popular fêtes promoted by the Town Council of Fortaleza. In the course of the report it said: "A ball in the open air in our picturesque garden was the great attraction of the fêtes. The garden was a gem of elegant and festive ornamentation, presenting an illumination which gained unanimous praise for the zealous and indefatigable Manager of the Ceara Gas Company (Mr. M'Making), to whom the President of the Province expressed the satisfaction which he felt for the way in which that gentleman had discharged his arduous task in a few hours."

The motion was cordially agreed to.

The SECRETARY responded in suitable terms, remarking that Mr. M'Making being abroad, he would very much appreciate the vote, as necessarily he had not too much of the comforts which they had this side. A vote of thanks was always much more pleasing to a Manager abroad than it would be supposing he were in England.

Mr. ANDREWS proposed an acknowledgment of the services of the Directors; eulogizing the manner in which they had conducted the concern. He considered it very politic on the part of the Directors to recommend the substantial addition they had made to the reserve fund.

Mr. R. KING seconded the proposition, which was agreed to *nem. con.*

The CHAIRMAN having briefly acknowledged the vote, the proceedings terminated.

THE DUBLIN CORPORATION AND ELECTRIC LIGHTING.

A Special Meeting of the Dublin Town Council was held on Monday last week—the LORD MAYOR (the Rt. Hon. Thomas Sexton, M.P.) in the chair—to consider a motion to the effect that the Corporation should apply to the Board of Trade for power to supply electricity within the area of the city of Dublin.

Mr. ROBINSON, in moving a resolution embodying the above proposition, said the question had been before the Council for a long time, and so far there had been no practical outcome, owing to the opposition they had received from the Dublin Gas Company. When the Committee of the Whole House had this question under their consideration, they determined to apply to the Board of Trade for a Licence to use electricity for public purposes only—that was to say, that the Corporation should, if they pleased, light the streets of the city with the electric light. They had power, if they desired, to apply for liberty to use electricity for private purposes also; but the Committee decided only to ask for it for public purposes, thinking the Gas Company would not interfere with the Corporation in regard to the manner in which they wished to light the city. But the Company had offered them the most determined opposition. He thought the time had now come when the Corporation should apply also for a Licence for private lighting, in order to break down the monopoly which the Gas Company had succeeded in obtaining over the city—a monopoly which they evidently considered should extend not only to gas but to electricity; for they had served notice that they intended to apply for a Provisional Order to enable them to furnish electric lighting both for private and public purposes. This was a thing against which the Corporation ought to make a determined stand.

Mr. HEALY seconded the motion. He said he was exceedingly pleased at the project to light the city by electricity, and so were a large number of ratepayers with whom he had conversed.

Mr. P. DORAN said he should like to know the probable expense of the scheme. He should much prefer that the Corporation would borrow £9000 to build dwellings for the working classes, and manage with their present light, rather than take up electricity, which had been a failure in other towns.

The HIGH SHERIFF (Mr. Alderman J. Winstanley) said he expected that the mover of the resolution would have shown where the profit would come to the citizens of Dublin, and would have quoted the cases of towns in England, Scotland, or elsewhere, where the light was used, and show what benefit the citizens had derived from it. But the only thing they had heard mentioned was that the Gas Company had gone to the Board of Trade to protect their rights against the inroads of the Corporation; but if the Directors did not do this, they would have been wanting in their duty to their shareholders. He had no objection to certain members of the Corporation sporting with the ratepayers' money; but before a request was made for the subscription of capital to this undertaking, it should be shown that there would not be a considerable loss to the citizens.

Mr. DENNEHY thought the members ought to be careful that, in the proceedings they were taking, they did not bring themselves under a very serious liability as regarded the waste of public money. They were going to deal with a site from which the Corporation derived £200 a year; and he was certain the water power there, though ample for public lighting, would not be sufficient for private lighting. They ought not to forget what happened to the Dublin Electric Lighting Company. He should be surprised if any Committee of the Council or any citizens of Dublin at the present day would be able to realize a profit when the Board of that Company failed ignominiously.

Mr. MAYNE said the gentlemen who opposed the motion appeared to be all influenced by one fear—the loss to the citizens of Dublin. They should remember that the Dublin Electric Light Company was wound up, not because they were not making profits—they were making them—but because they had not sufficient capital, and could not get any more at the time, owing to a panic which had set in in electric lighting shares in England.

Mr. DOHERTY thought they ought to establish a right to light the city, and have control over the lighting of the city, whether by gas, electricity, or anything else.

Mr. ROBINSON having replied,

The LORD MAYOR put the motion. In doing so he said the Directors of the Gas Company were clever business men; and they evidently thought electric lighting was a profitable undertaking, for they wanted a Licence for it. They would not move unless they saw a considerable profit—10 or 20 per cent. If the speculation was good enough for them, it was good enough for the Corporation, who did not wish to pay any dividend.

The motion was carried without a division; and it was subsequently resolved to appoint a Committee of 15 members to take the necessary steps for obtaining the Provisional Order.

AN ELECTRIC LIGHTING SCHEME FOR IPSWICH.—At the meeting of the Ipswich Town Council last Wednesday, sanction was given to Messrs. Paris and Scott, Limited, of Norwich, to lay down cables for electric lighting and power purposes in certain portions of the borough.

ELECTRIC LIGHTING AT BARNET.—At the meeting of the Barnet Local Board on the 9th inst., a Committee presented a report to the effect that as the electric lighting contractor had failed in his contract, and the light was indifferent, he be given 14 days' notice to terminate the contract. At the urgent request of certain members of the Board, it was decided to suspend the notice for a fortnight, to see if the contractor made satisfactory progress. The matter accordingly came before the Board at their meeting last Tuesday, on the question of serving the notice; and Mr. Pooley observed that, the report and recommendation of the Committee having been agreed to at the previous meeting, their duty was clear. They must have some report as to the progress made, and if it was unsatisfactory, all they had to do was to proceed with the resolution. The Surveyor (Mr. W. H. Mansbridge) submitted a report as to the general condition of the lighting from the 3rd to the 22nd inst.; and, in answer to the Chairman (Mr. C. Stephens), said he could not regard it as satisfactory. It was therefore proposed that the notice suggested by the Committee should be served on the contractor. An amendment was, however, brought forward to grant him another week's grace; and if by that time satisfactory progress had not been made, to give him notice to terminate his contract. Eventually this was agreed to.

EDINBURGH AND LEITH GAS COMMISSION.

At a Meeting of the Edinburgh and Leith Gas Commissioners on Monday last week—Lord Provost Clark presiding—the Works Committee recommended that the burgh of Leith should be placed on the same footing as Edinburgh in regard to the lighting of the public lamps. Attention was directed to the lighting of the suburbs. Mr. Kinloch Anderson doubted whether the burners used were of sufficient size. There was, he said, a great deal of grumbling about the matter. He had had a conversation on the subject with the Engineer, who informed him that formerly the city allowed the Gas Company 2 cubic feet of gas per lamp per hour; but this amount had frequently extended to 4 feet. Now, however, the Engineer was restricted to 1½ feet per hour. In reply to the Provost, it was stated that this change was made last year by the Gas Company. A brief discussion ensued on the subject, and subsequently the matter was remitted to the Works Committee. In regard to the application of the retort-house men at the Leith Gas-Works to have their wages restored to the same figure as before May, 1886, the Finance Committee reported that they were of opinion that the wages and hours of work should be left entirely with the Engineers. Bailie Archibald moved that Mr. Linton pay the men the same as before May, 1886. The Lord Provost said that if they took this power from the Managers, it would put them in an inferior position. Surely it was right that the men should deal with the Manager, and not with the Commissioners; otherwise they would individually have constant complaints from workmen. On a division, the report of the Committee was adopted by a majority. It was stated that the Inland Revenue Commissioners had fixed the stamp duty upon the Gas Commissioners' Act of Parliament at £3973; and instructions were given to pay it. Messrs. Davidson and Syme wrote enclosing a summons of declarator and interdict and damages at the instance of Messrs. G. Mackay and Co., Brewers, of Canongate, against the Edinburgh Gaslight Company for fouling a well. The Lord Provost remarked that he thought this was a claim against the old Company; but eventually the subject was sent to the Law Committee with powers.

THE GAS AND WATER UNDERTAKINGS OF THE NOTTINGHAM CORPORATION.

At a Meeting recently held at Nottingham under the auspices of a local Liberal Association, Mr. Alderman Goldschmidt delivered an address on the finances of the Corporation. He quoted statistics showing that the rateable value of the borough has increased from £297,660 in 1871-2, to £914,520 at the present time; the rates being respectively 4s. 6d. and 5s. in the pound. The last-named figure is a reduction of 2d. on the amount levied in 1886-7. Speaking on the subject of the productive debt of the Corporation, he said it comprised the money raised on the security of the gas and water undertakings. "For these," he said, "we had to pay a heavy price, but made a good bargain nevertheless. We owe for gas £873,113, less sinking fund, £12,770; leaving £860,343. Not one penny of this, however, will fall on the rates. The gas undertaking pays its own interest, provides a sinking fund, and has already a reserve fund of £100,000. This sum, if invested at 3½ per cent. compound interest, would produce £800,000 in 60 years, and thus pay off the whole of the gas debt; but as we are, in addition, providing a sinking fund on so much of the gas debt as is represented by consolidated stock, I shall not be going too far in saying that in about half the time allowed by our Act this splendid property will belong to the town, free from all incumbrance. More than that, the gas undertaking contributes large amounts to the support of institutions which cannot legally be maintained out of the rates, and in relief of rates. Thus we received in 1876-7, £5000; 1879-80, £6000; 1880-1, £12,500; 1881-2, £10,000; 1882-3, £12,000; 1883-4, £15,000; 1884-5, £21,983; 1885-6, £22,000; 1886-7, £12,500; 1887-8, £16,000; 1888-9, £16,000—total, £148,983; and our gas consumers had better and cheaper gas than almost any consumers in the kingdom. We owe for our water-works £654,796, less sinking fund, £12,779; leaving £642,017. Like the gas, this concern pays its own interest, provides a sinking fund, and contributes small sums in relief of rates—£6200 in six years; but it cannot make (it is not desirable that it should) large profits. Water being an indispensable necessary of life, as much as the air we breathe, and a powerful agent in securing and preserving the health of the town, it is not desirable to restrict proper use by high prices. The gas and water undertakings are thus shown to be profitable concerns, and could be sold any day for more than the debt we owe on them. There is, therefore, not the slightest chance of a call ever being made upon the town for any liability on their behalf; and it would consequently be absurd to class the amounts I have given of their debt with our ordinary debt as a burden upon the town."

BRADFORD CORPORATION GAS AND WATER SUPPLY.

THE WORK OF THE PAST YEAR.

At the Meeting of the Bradford Town Council last Tuesday, the reports of the several Committees of the Council on the work of the past municipal year were presented. The following are abstracts of those of the Gas and Water Committees:—

The Gas Committee reported that during the year 14,378 yards of mains and 1070 new service-pipes were laid. At the Mill Street works, 120 retorts were taken down and replaced with new ones; and the remaining 80 were repaired. At the Thornton Road works, 40 retorts were taken down and replaced with new ones; and the remaining 280 were repaired. At the Valley Road works, 220 retorts were taken down and new ones erected; and the remaining 380 were repaired. The telescoping of all the gasholders at this station has been completed; thus affording a considerable increase in the amount of storage room. At the Birkshall works, 250 retorts were taken down and new ones erected; the remaining 150 having been repaired. The whole of the foregoing were reported to be in good condition. Contracts had been entered into for the supply of 101,000 tons of coal and 20,000 tons of cannel on satisfactory terms. With respect to the gas-stove department, the Committee reported that the number of cooking-stoves sent out on hire from the opening of the department in April, 1884, to the close of the financial year was 504. The number of cooking and heating stoves sold in this period was 3592. At the chemical works at Frizinghall, 1722 tons of sulphate of ammonia were manufactured during the year, against 1753 tons made in the preceding year; the average price obtained being £11 15s. 6d., against £11 9s. 2d. for the previous year. This showed an advance of 6s. 4d. per ton, or £545 6s. on the quantity sold during the year. Of sulphuric acid, 1292 tons were produced from the spent oxide of iron, of which 1237 tons were used in the manufacture of sulphate of ammonia. The chief repairs of the works were the taking down of the largest acid chamber, and erecting a new one in its stead. The former had been in use upwards of six years; but the new chamber, being made of thicker plates, is expected to last eight or ten years. With respect to electric lighting, the Committee reported that they had adopted Mr. Shoolbred's scheme for laying down a first installation of electricity supply works on land belonging to the Corporation. It will be remembered that power has been obtained from the Local Government Board to

borrow £20,000 under the Bradford Corporation Electricity Order of 1883, in order to carry out the work. The works are now in progress; and it is hoped that they will be completed early in the ensuing municipal year. The Committee reported that during the year the lighting of the town had been efficiently kept up. All new roads and streets were lighted as soon as opened. The whole of the three-light lamps were converted into two-light lamps, of which 674 are now erected; being 74 more than last year. The number of ordinary lamps in the out-districts is 450; and the number within the district of the gas supply of the Corporation is 5283—making the total number of lamps in the borough 6407, as against 6205 last year.

The Water Committee in their report stated that the past year had been remarkable for the very exceptional distribution of the rainfall; that of the winter months being much below the average, while the fall during the early spring and summer had proved greatly in excess. On Oct. 14, 1887, the date of the previous report, the supply to both the high and low levels was restricted to 12 hours a day. This state of things continued until the 7th of November, with the exception that the supply was extended to from six a.m. to eight p.m., or 14 hours a day. After the latter date, a full supply was resumed on both levels. Owing to the dry winter months, the supply was again restricted—on the low level from Feb. 24 to March 6, 1888, to 14 hours a day; and on the high level from Feb. 24 to March 17, 1888, to the same extent. The Committee pointed out that on the 6th of March last, at a period of the year when the reservoirs are generally full, the total storage of all the works only amounted to half their full capacity. Had it not been for the unusually wet months which followed, a most serious state of affairs would have occurred. But although the storage is now in very good condition, a period of 21 months has elapsed since the reservoirs were full; and this notwithstanding the past wet summer. The connection of the high and low levels, decided upon by the Council in September, 1885, is practically complete. It may be remembered that this connection was undertaken mainly with the object of affording a better supply of water by gravitation to certain of the higher parts of the borough. The filters at Gilstead, which were brought into use in January, 1887, have remained in work continuously since that date, and have produced a marked improvement in the purity of the low-level supply. The system adopted in 1885 for the prevention of waste, and which, in conjunction with the connection of the high and low levels, was undertaken for the purpose of economizing the existing sources of supply to the greatest possible extent, so as to tide over the period which must elapse before some new scheme of extension can be brought into use, was continued with good effect during the past year. Some interesting particulars in regard to the work of the Engineer (Mr. A. R. Binnie, M. Inst. C.E.) in connection with the adoption of this system were given in the JOURNAL for Nov. 9, 1886 (p. 846). In November last, the Committee having agreed with the Corporation of Leeds to abandon the Masham source of supply, a Sub-Committee was appointed to inquire into the subject. The Sub-Committee have gone in great detail into the question submitted to them. They have inquired into two proposed schemes, have visited and inspected proposed sites, and have endeavoured to see what arrangements could be made with mill, land, and mineral owners; but questions as to the quality of the water having been raised, this portion of the inquiry has been submitted, as already mentioned in our columns, for the opinion of Dr. C. Meymott Tidy. With regard to the works, speaking generally, they have been found to continue in a satisfactory condition, and, with certain exceptions, to afford a full supply. The revenue from the sale of water during 1887 was £101,528, as compared with £97,057 in 1886, £92,153 in 1885, £91,625 in 1884, and £85,227 in 1883.

SOUTHWOLD WATER SUPPLY.—The Secretary and Solicitor of the Southwold Water Company, Limited (Mr. W. C. Tuck), has lately received from the Company's Engineers (Messrs. Smith and Pain) a report on the well which has been sunk for the supply of Southwold. They state that the supply of water therefrom is ample, and the quality good. They advise the Directors to proceed with the construction of the necessary works, which, if commenced shortly, would be ready before next summer. The Directors have held a meeting, and resolved to advertise for tenders for the erection of the works.

THE BRADFORD CORPORATION ELECTRIC LIGHTING SCHEME.—Last Friday, the foundation stone of the generating station now in course of construction for the supply of electric light to the central portion of Bradford was laid by Mr. Alderman F. Priestman, Chairman of the Electric Lighting and Gas Supply Committees of the Corporation. The object of the scheme, it may be remarked, is to supply the electric current to consumers occupying premises in Market Street, Kirkgate, and other streets in the vicinity, by means of a system of underground wires. The generating plant which is to be used for the present consists of three complete sets of boilers, engines, and dynamo machines, each equal to 150 indicated horse power, together with the other necessary apparatus for regulating the current prior to its transmission. The current will be carried from the dynamo-house by two main cables in brick or composition trenches—one along Market Street as far as the Town Hall, and the other through Kirkgate and Darley Street to the Markets and Free Library; the arrangement being such that a service can be attached at any particular point. The buildings are being arranged so that, if necessary, a rapid extension may be made, so as to meet any sudden demand. The works have been designed and are being carried out under the direction of Mr. J. N. Shoolbred, M. Inst. C.E. It is expected that they will be ready for starting early next year.

GAS v. ELECTRIC LIGHTING AT SWANSEA.—At the meeting of the Swansea Town Council last Wednesday, the minutes presented by the Special Gas Committee stated that at a meeting held on the 2nd inst. reports from the Town Clerk as to the powers of the Corporation with regard to the erection of new gas-works and the lighting of the borough by electricity were received. The Surveyor was directed to obtain such information as would enable him to fully report on the extent of works for public lighting which could be erected by the Corporation for an annual expenditure of £4060, and also as to the cost of such further works as would admit of a supply to private consumers. He was likewise instructed to report as to the desirability of adopting oil-lamps. It was resolved that, in the opinion of the Committee, it was desirable to light the borough by electricity, and that the Town Clerk be instructed to apply to the Board of Trade for a Provisional Order accordingly. At the meeting of the Committee on the 12th inst., they decided which streets in the borough should be lighted by electricity; and it was resolved that the Council be asked to invest the Committee with full powers to conclude a contract with some substantial company for the lighting by electricity of the area in question. A letter was read from the Swansea Gas Company, asking the Corporation to enter into a contract with them for the supply of gas to the public lamps for one, two, or three years at 2s. 10d. per 1000 cubic feet; and the Town Clerk was directed to reply that the Corporation were not at present prepared to enter into any contract. The minutes were adopted.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

The extraordinarily fortunate position of the shareholders of the Edinburgh Gas Company, which was foreshadowed in the JOURNAL for July 3 last, has all but been realized. On Monday the shareholders met, and authorized the final distribution of the funds of the Company, in the terms of which the Directors are awarded a sum for their services, certain *employés* of the Company who have not been placed on the Corporation's pension list are provided for (not very handsomely, I am told), and the shareholders divide £100,000 among themselves. The distribution is made in the form of a bonus of £12 10s. upon each paid-up share of £25. Mr. J. K. Watson, the late Manager of the Company, was awarded a special vote of thanks for his services, which extended to over half a century. Mr. Watson has retired upon a pension of £1300 a year. The full amount allowed by the Corporations in name of pensions is £1750; so that the other pensions must be of small amount. Mr. Watson and his father were the only Managers the Edinburgh Company ever had. He deserved a vote of thanks, and the shareholders acted wisely in seeing that liberal provision was made for him in his old age; for it was owing to his energetic management that the Company was so eminently successful.

It is rather disappointing, after the Arbroath Gas Corporation had resolved to extend their gas-works, that the scheme should be placed in danger of not being carried out through the vacillation of the Corporation themselves. A fortnight ago I recorded a resolution of the Corporation not to go on with the improvements until they obtained further scientific advice. It is easy to alarm the public on questions of expenditure; and this has apparently been done in Arbroath, for on Thursday evening, at a meeting of electors, after some talk about the great cost which improving the works was likely to lead to, and the giving of advice to the Corporation as to what they should do by people who know little of the subject and have no responsibility, the electors unanimously adopted a resolution which stated that they were "opposed to the proposed extension of the gas-works, and are of opinion that any expenditure beyond what is actually imperative for the maintenance of the works is highly imprudent." Had the Commissioners either gone on with their scheme, when adopted, or had they delayed adopting it until after the elections, there is every probability that the "imprudence" which the electors now deprecate would not have come within their vision.

The inhabitants of Portsoy, in Banffshire, find themselves in embarrassment on account of the position of the gas-works. The works are nearly 50 years old; but the business is in a healthy condition. For many years it was conducted according to the wishes of Colonel Moir, who owned a great part of the undertaking. On his death, things did not go satisfactorily, through lack of a guiding hand; and his Trustees have obtained the appointment of a judicial factor, who has powers to wind up the concern. In fear of being left in darkness, a public meeting of the townspeople was held on Monday night, to consider how they could get out of the difficulty. It was reported that the output of gas had risen from 451,000 cubic feet in 1880 to in the present year—not yet completed—626,000 cubic feet. Several proposals were made, such as the formation of a limited liability Company, the adoption of the Police Acts, and then the acquisition of the Company's undertaking. Two attempts have been made to sell the concern by public auction, first at £700, and then at £500; but the only offer made was £350. At the meeting no person seemed to be inclined to become the purchaser; and a Committee was proposed to try what could be done with a limited liability Company. Nearly all the gentlemen proposed, however, declined to act; and the meeting closed without any progress having been effected.

An attempt has been made to get the Edinburgh Water Trustees to adopt the Deacon Waste-Water Meter, with a view to saving the water supply, and probably of obviating the necessity for introducing an additional supply. The proprietors of the meter offered to put down six meters as a trial; but the gentleman who was sent to make the offer I fear overshot the mark when he assured the Works Committee that, by these appliances between 7 and 8 million gallons per day would be saved. As this is nearly half the Moorfoot supply, the Trustees were incredulous; and they desired more information on the subject. A meeting of the Works Committee was held the other day, at which they had before them information from Glasgow to the effect that there the consumption had been reduced by means of these meters from 51 to 38 gallons per head per day; and the Committee, considering that the cost of fitting them on to the Edinburgh mains would be about £24,000, and also that the consumption is only 41 gallons per head per day, did not look favourably on the proposal, but delayed coming to a decision until the Engineers have reported upon the matter.

Two new reservoirs in connection with the water supply of Aberdeen were formally taken over by the Town Council on Thursday. Both are situated about two miles from the city. One at Manuofield, 160 feet above sea level, for the low district service, has a capacity of 12 million gallons; the other, at Slopefield, 300 feet above the sea level, for the middle service, holds 6 million gallons. The cost of constructing them and extending the intake in the River Dee has been £46,900. The walls of the reservoirs are built of heavy granite ashlar 16 inches thick, backed with 4 feet of rubble in cement mortar and clay puddle 1 foot thick. The bottom has been put down in three layers of concrete—the first, 6 inches thick, consisting of six of sand to one of concrete; the second, also 6 inches thick, composed of five of sand to one of concrete; and the upper layer, a thin coating in equal parts of cement and sand. The reservoirs now in operation provide about five days' supply of water for the city. At the opening ceremony, Mr. Rust advocated the extension of the storage power where the water is taken from the river. At present they cannot afford to shut off the river for much more than 24 hours at a time. Mr. Rust suggested they should have a fortnight's supply, which would enable them to take water from the river only when it was clean.

Last Saturday an additional water supply for the burgh of Jedburgh was introduced. The new supply has been obtained from several springs on one farm; the only work necessary being simply to lead the water into the existing reservoir. The cost has only been about £2300.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

By way of supplement to last week's "Note" referring to the completion of the new holder at the Rothesay Gas-Works, I may mention that Treasurer Brown has this week reported to the Town Council that their expectations regarding the past year's working of the gas undertaking had been far exceeded, as they had made a profit of £525; while at the same time placing £100 more to depreciation of works than in the preceding year. They had reduced the price of gas during the year; and the question of granting a discount to large consumers had been left over for consideration. Mr. Mackinnon objected to the system of handing over the gas profits for the benefit of other trusts; and he held that instead of doing this they should further reduce the price of gas. He gave notice of

motion to that effect. Provost Thomson said they hoped very soon to be able to announce a reduction in the price.

The past week has brought forth quite a flood of "deliverances" on gas affairs at the municipal election meetings held in various towns throughout the province over which I have to maintain a watchful surveillance. They have been so numerous that it is absolutely impossible to overtake them all on this occasion. Hamilton is the first place that I shall deal with. At the meeting of the Fourth Ward electors on Monday evening, Mr. Rankin, while discussing gas matters, pointed out that the profits of the burgh gas undertaking for the past year amounted to £1732, being £661 more than in the preceding year. This increase arose very much from the large amount derived from residual products, which was £300 in excess of the revenue from that source in the preceding year. The coal had cost something like £100 less; while from $\frac{3}{4}$ to 5 per cent. more gas had been consumed during the year. The same meeting was addressed by Bailie Archibald, Convener of the Gas Committee, who said that he did not recollect, during all the years he had been in the town, seeing the streets better lighted than they were at present. He had obtained information as to the price charged for gas in other places; and there was none where they could say that the price at all approached theirs—that was to say, in circumstances similar to those of Hamilton. In Glasgow the price was less; but there they had a larger consumption within narrow limits. In Hamilton their district was a scattered one; and they had greater expense, besides losses from the mineral workings. He pointed out that, while they were making large profits at the gas-works, they were yearly setting aside £1000 towards the reduction of the debt. He thought they would be enabled this year again to have a satisfactory surplus; and hoped there would not be any further subsidence of the large gas-holder from mineral workings.

Gas affairs were touched upon last night by some of the Gourrock Burgh Commissioners at a meeting of the ratepayers. Provost Binnie said he was glad to inform them that the price of gas had been reduced from 4s. 7d. to 4s. 4 $\frac{1}{2}$ d. per 1000 cubic feet; and he was of opinion that when the Greenock and Gourrock Railway was opened into the town, there would be an increased consumption of gas, when they would be able to make a further reduction in the price. Bailie Lang reported that the Gas Trust was in a very satisfactory condition. The gas sold during the year ending May 15 last was 8,528,643 cubic feet; being an increase for the year of 227,610 feet. The total number of gas cookers and fires in use was 70; the quantity of gas used by them being estimated at 250,000 cubic feet with a revenue (at 4s. 7d. per 1000 feet) of about £57. On being asked if the Commissioners could not see their way to do away with the meter-rents, Bailie Lang replied that they could not both reduce the price of the gas and do away with the rent of the meters. The meters cost about £50 per year for upkeep, &c.; and he submitted a number of statistics to show that it would be better to continue reducing the price of gas than to take off the meter-rents, one of which was that there were 152 consumers of less than 4s. 7d. worth of gas per annum.

At a meeting of the ratepayers of Renfrew on Wednesday, Mr. Irving, as Convener of the Corporation Gas Committee, confined his remarks wholly to gas affairs. He said that he was not placed in a very enviable position when he became Convener of the Committee, as there was a debt of £210 to be cleared off; but being well backed up by the Council, the Committee had done a considerable amount of work during the year. New gas-pipes had been laid in various parts of the town, and the leakage of gas, which was about 22 per cent., had now been reduced to 9 per cent. (Provost Wright had previously remarked that most of the pipes had been laid so far back as 1842, and that some of them were quite honeycombed.) Mr. Irving then touched upon the new addition made to the gas-works, which, he remarked, were about 40 years old. They were almost entirely in disrepair. The retorts were all in a tumble-down state; and the gable of the retort-house was projecting in some parts about nine inches. There was another serious matter worthy of consideration. They had two gasholders, one of which was in full working order, while the other had had no gas in it for over two years. If anything went wrong with the former, the town would be left in total darkness; and it would perhaps take a month or two before the damage could be repaired. Treasurer Anderson was of opinion that they should not spend money in remodelling the old gas-works on their present site; for if they looked into the matter seriously, they would find that the removal of them to some other site out of the town would be a benefit to the community.

On the Glasgow Stock Exchange on Wednesday, the shares of the Partick, Hillhead, and Maryhill Gas Company were offered at 85s. per share; being a reduction of 3s. 6d. from the last price at which business was done. The preference shares were disposed of at 45 13s. 9d. per share—no change. On Thursday, the Glasgow 9 per cent. gas annuities changed hands at £277.

The Glasgow pig-iron warrant market has had an unsatisfactory course this week. At the close yesterday, Scotch iron was quoted at 41s. 7 $\frac{1}{2}$ d. cash buyers.

A considerable amount of activity has shown itself in the coal trade during the week; a large business having been done. Prices continue to firm up; and a general increase of wages amongst the miners seems to be almost certain.

BURY CORPORATION WATER SUPPLY.—The Bury Corporation decided last Thursday to promote a Bill in the next session of Parliament to authorize the construction of new and additional water-works, and works connected therewith; to vary, amend, or increase the rates for the supply of water within the water limits of the Corporation; to borrow additional moneys, and for this purpose to extend the borrowing powers; and to vary, alter, amend, or repeal the provisions contained in the Bury Improvement Act, 1885, for the redemption of the water-works annuities and the paying off of moneys borrowed, and to make further and other provisions with respect thereto.

THE DRAINAGE OF MARGATE.—Mr. Baldwin Latham, M. Inst. C.E., has lately reported to the Corporation of Margate on the subject of the drainage of the town. He estimates the area to be drained as 759 acres, with a population of 29,943 exclusive of visitors; increasing probably to 35,940 by the middle of August. The average rainfall amounts to about 24 inches; and more than an inch occasionally falls in one day. A separate system is not required for the high-level district. It is contemplated that the rainfall of all the high-level or gravitation district shall pass into the sewers; that of the low-level district to be carried away from the streets by the existing and improved surface-water drains. He proposes a continuous discharge, so that there shall be no stagnation either in the outfall or in the sewers of the district. The sewage is to be conveyed by direct gravitation from 629 acres and from 130 acres by pumping. He estimates the total cost at £48,000, which borrowed for 30 years (as most of it will be) can be met by a rate of not more than 9d. in the pound per annum on the district; and he reckons the cost of making the house connections at about 45s. each. Sir F. Bramwell and Sir Douglas Galton have reported upon the scheme, the general design of which, they say, appears to be satisfactory.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Oct. 27.

Sulphate of Ammonia.—A further advance in nitrate, and a continuous good prompt demand, have caused the market to harden further; and £12 is now the nearest value of prompt parcels at the various ports. There is no appreciable increase in the available supplies; and prompt lots therefore find ready buyers as they come on the market. If Germany and France are to-day less eager for near parcels, other buyers seem to be turning up; and there can be no doubt that, while the future register of nitrate prices hangs in the balance, consumers will feel more or less scared, and will endeavour to cover their sulphate requirements without waiting events. The large inquiries for spring are, therefore, not surprising. But there is a good deal of variation in the prices quoted and the business done; and it is apparently not easy to sift the actual truth of the statements made in this respect. It may be taken that to-day's approximate value for spring deliveries is £12 5s.; but while on the one hand it seems to be a fair price to be accepted, it depends on the other hand upon the nitrate movements whether still higher prices for sulphate may supervene—although, as before, beyond a certain point nitrate may cease to influence the range of sulphate values. To-day's nitrate market appears in a somewhat quieter mood; and there is rather less excitement in the sulphate trade.

LONDON, Oct. 27.

Tar Products.—This market has been somewhat languid during the past week. Benzols have not recovered the weak tendency noted for some time past. Pitch is a little more inquired for; but the price does not improve. Carbolic acid is the only product which can be said to have made any advance during the week. Prices may be taken as follows:—Tar, according to position, 17s. 6d. to 22s. 6d. per ton. Benzol, 90 per cent., 2s. 10 $\frac{1}{2}$ d. per gallon; 50 per cent., 2s. 4d. Toluol, 1s. 6 $\frac{1}{2}$ d. per gallon. Solvent naphtha, 1s. 3d. per gallon. Crude naphtha, 30 per cent., 1s. per gallon. Light oil, 3d. per gallon. Creosote, 2d. per gallon. Pitch, 12s. to 15s. per ton. Carbolic acid (crude), 3s. 6d. per gallon. Cresylic acid, 9d. per gallon. Tar salts, 15s. per ton. Anthracene, 30 per cent., "A" quality, 1s. 6d. per unit; "B" quality, 1s. 3d.

Ammonia Products.—Sulphate is undoubtedly better; and the demand is excellent. Considerable orders have been going out during the week; and the price may be taken at £11 15s. to £12 per ton, less discount. The prices of other products are as follows:—Gas liquor (5° Twaddell), 7s. 6d. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 2d. per lb. Carbonate of ammonia, 3 $\frac{1}{2}$ d. per lb. Muriate of ammonia, brown, £18 per ton; white, £27. Sal-ammoniac, £30 per ton.

[From the *Chemical Trade Journal*, Oct. 27.]

Sulphate of Ammonia.—The sulphate of ammonia market is very firm, both for prompt and forward delivery. There is no abatement in the demand; and though the inquiry hitherto has been for French accounts, the Germans are now coming forward, finding that waiting tactics are likely to avail them nothing. Pressure of inquiries has resulted in Beckton raising its price to £12; and this figure is now being asked for outside makes in London. Hull values are now £11 17s. 6d.; and Leith, £11 16s. 3d. The whole position seems to hang upon the price of nitrate; and as that commodity is slowly but surely advancing, the outlook for sulphate is extremely favourable.

Tar Products.—The weakness in the benzol market noticed in last week's report still continues, but prices have not further receded; 90's stand at 2s. 10 $\frac{1}{2}$ d., and 50'90's at 2s. 4d. Solvent naphtha continues firm; and creosote is also in good demand. Crude carbolic acid (60's) remains in much the same condition as reported in our last number; and anthracene is still firm at 1s. 6d. for "A" quality and 1s. 3d. for "B." Pitch is in fair demand, but is not yet answering the expectations of sellers.

SALE OF THE LEIGH (ESSEX) GAS-WORKS.—On Wednesday last, Messrs. Edwin Fox and Bousfield sold, at the Mart, Tokenhouse Yard, E.C., the Leigh (Essex) Gas-Works. The works are very small—comprising a retort-house and coal-store combined, fitted with one single and one bench of three retorts; a purifier-shed, containing two 6-feet purifiers; and a station meter and governor house. There is a gasholder 28 feet in diameter, and a scrubber and condensers. The mains, which extend for about a mile, are of 3 and 4 inches diameter. The price of gas (which has recently been reduced) is 5s. per 1000 cubic feet. The consumers number only 35; and there are 22 public lamps, which produce nearly £50 per annum. The property was purchased by Mr. W. C. Parkinson, of Cottage Lane Works, City Road, for £720.

SUGGESTED PURCHASE OF THE KETTERING WATER-WORKS BY THE LOCAL BOARD.—At the last meeting of the Kettering Local Board, attention was called to the scarcity of water in certain parts of the town; and in the course of the discussion, the Chairman (Mr. J. Wallis) mentioned that the Directors of the Water Company were contemplating the adoption of a scheme for the improvement of the supply, recommended by Mr. T. Hawksley, under which, at an expenditure of £32,000, a reservoir of 52 acres in area would be constructed and new pumping machinery erected. Some of the members expressed the opinion that the present was an opportune time, before such a heavy expenditure as that mentioned by the Chairman was incurred, to consider the question of acquiring the Company's property; and subsequently a Committee was appointed to confer with the Directors on the subject.

THE OLDHAM CORPORATION COAL CONTRACTS AND THE ADVANCE OF COLLIERIES' WAGES.—The Oldham Gas Committee, at their meeting last Wednesday, over which the Mayor (Mr. Alderman Platt) presided, had before them a singular application from one of the colliery firms who are under contract to supply coal to the Committee. Before the letter was read the Committee were informed by the Superintendent's report that several communications had been received from Yorkshire collieries which supply coal to the Corporation, stating that it was probable they could not continue delivery in the event of a strike. The Superintendent (Mr. H. Andrew) and Mr. Alderman Hall went to Wigan to ascertain whether the Committee could be supplied from that district should such a contingency occur. The result of their inquiries was that they learned that the Wigan coal-masters would be able to deliver, having given to the men the advance applied for. The application in question was from Messrs. Pope and Pearson, Limited, of Normanton, who wrote to say that they had decided to grant the 10 per cent. advance to the men, although they were of opinion that it was totally unwarranted by the present state of the trade. They thought, however, that it was "the lesser evil of the two;" for had it been refused, a strike would have ensued, and their deliveries to the Corporation and to a few other large consumers consequently stopped. Under these circumstances, they asked the Committee for 2d. or 3d. per ton more than the contract price for their coal. The Mayor explained that the contract price was 9s. 7d. per ton, and that if they acceded to this application, and any other firms made a similar request, they would have to do the same all round. After some conversation, it was decided that the request be not acceded to.

THE RETFORD CORPORATION GAS-WORKS LOAN.—At the meeting of the Retford Town Council last Friday, the Town Clerk brought forward a scheme for saving 1½ per cent. on a loan of £30,000 for gas purposes. The Corporation have been paying 4½ per cent. His suggestions were unanimously adopted.

REDUCTIONS IN PRICE.—The *Grange Gas Company* have determined to reduce the price of gas from 6s. to 5s. 3d. per 1000 cubic feet from the 1st of January next.—The Directors of the *Accrington Gas and Water Company* have decided to make a material reduction in the price of gas, to take effect at the beginning of the new year.

THE PROPOSED WINDING UP OF THE MAXIM-WESTON ELECTRIC LIGHT COMPANY.—In the matter of a petition presented by Mr. Hugh Watt, M.P., for the winding up of the Maxim-Weston Electric Company, Limited, Mr. Justice Chitty last Saturday made an order, by arrangement between the parties, that the petition should be dismissed upon £500 being deposited by the Company in the joint names of the Solicitors for the petitioner and those of the Company, to abide the result of legal proceedings to be taken by the petitioner to establish his claim.

THE NEW WORKS OF THE CAMBRIDGE WATER COMPANY.—Last Tuesday afternoon, the ceremony of laying the memorial stone of the new works which the Cambridge Water Company are constructing at Fulbourn, as an auxiliary of those at Cherry Hinton, was performed by the Rev. Dr. Perowne, Master of Corpus Christi College, the Chairman of the Company. The works, which have been necessitated by the increasing population of the district, were commenced last November. The buildings comprise an engine-house, 42 feet long by 30 feet wide, in which are two engines, each of 40-horse power, with three boilers of the newest construction, as well as coal-stores, smith's shop, &c. The wells, at the present time, are capable of delivering 2 million gallons of water a day. It is expected that the buildings will be completed and all the necessary engines laid down in about twelve months' time. The works have been designed by the Company's Engineer (Mr. T. Hawksley), and carried out under the supervision of the Manager (Mr. W. W. Gray).

PROPOSED CONSTANT WATER SUPPLY FOR WIMBLEDON.—At the meeting of the Wimbledon Local Board on the 17th inst., the Clerk (Mr. W. H. Whitfield) reported that a deputation appointed by the Board waited upon the Engineer of the Lambeth Water Company (Mr. J. Taylor, M. Inst. C.E.) with reference to the question of a constant water supply in South Wimbledon. The Company proposed to introduce a constant supply experimentally in certain parts of the parish within their district. They would then see how far they were able to deal with the difficulties that arose under their existing statutory powers. There seemed to be every ground for supposing that the Company would be able fully to deal with the difficulties, and prevent the misuse and waste of water. If this was done, he believed there would be no impediment to their supplying the whole of the lower part of the parish constantly. The Chairman (Mr. J. Townsend) thought the Company had met the Board very satisfactorily. They offered to make the necessary experiments with a view to ascertaining their position; and if they found there was not much waste from the constant supply, they would be prepared to adopt it generally.

LEEDS CORPORATION WATER SUPPLY.—On Monday last week the Water Committee of the Leeds Corporation visited the Blackmoor Tunnel works, which are being carried out by the Borough and Water Engineer (Mr. T. Hewson, M. Inst. C.E.). It is now six months since the works were commenced; and although it will take close upon two years to complete the scheme, satisfactory progress has so far been made. The laying of the new line of 42-inch pipes from the mouth of the old tunnel at the Seven Arches to the filter-beds at Weetwood has been completed; and water is now being carried between these points by this line. The line of 42-inch pipes and the old line of 40-inch pipes are capable together of conveying all the water that it is possible to collect from the Washburn; so that this section of the water-works may be said to be complete. The laying of the additional pipe-line, by increasing the means by which the water can flow to the filter-beds, has reduced the quantity passing through the old tunnel; the depth at the point of discharge being about 15 inches instead of 5 ft. 3 in., as was formerly the case. The effect of this reduction of the depth of water in the old tunnel has been to do away altogether with the leakage of the water through it into the new tunnel; thus saving the water, and enabling the new work to be carried on under more favourable conditions.

THE WORCESTER CORPORATION AND THE GAS COMPANY'S ACCOUNTS.—On Friday last, at the meeting of the Worcester Watch Committee, the accounts of the Gas Company for the half year ending June 30 last were produced. Mr. Corbett said he had gone through them, and the result of his investigations was to show that the Council had been justified in the policy which they had pressed upon the Gas Company, and which the Company had adopted. The increase in the quantity of gas consumed in 1888 was 7 million cubic feet, or 5 per cent. on the total consumption; showing that there was a steady progressive increase, to which attention had been called on former occasions. The result had been that although during the last two years the discounts allowed by the Company had been much increased, the net income had not appreciably diminished. The net sales in 1886, before the increase of these grants, was £20,100, and in 1888 they amounted to £20,000; so that, although there had been an increase of discounts, which had given the public an advantage of £1600, the net income of the Company from the sale of gas had only dropped £100. There had been, as anticipated, some slight falling off in the profit from residuals; but this had not been so much as the Company at the time thought likely. The net result of all the figures had been that the income, in spite of increased discounts and the diminution in the value of residuals, only showed a falling off of £400.

SALES OF SHARES.—A part of a King's share and 21 £100 new fully paid-up shares (returning a dividend of over 12 per cent.) in the *New River Company* were sold by Messrs. Edwin Fox and Bousfield, at the Mart, Tokenhouse Yard, last Wednesday. The first eleven lots disposed of each consisted of a 96th part of a King's share, and produced the following prices:—1½ lots, £880 each; one, £885; three, £890; two, £900. The next lot—a 100th part of a share—realized £900. The succeeding three lots each comprised a 120th part of a share; and fetched £700 each. Seven lots, consisting each of a 130th part of a share, were sold as follows:—One lot, £620; four, at £625; one, at £630; and one, at £635. The 21 new shares were disposed of at almost uniform figures—Eight realizing £353 each; three, £354; one, £355; four, £356; five, £357.—On the previous day, Messrs. Nicholson, Greaves, and Barber sold a number of the newly-issued shares of the *Sheffield Gas Company* at premiums ranging from £4 2s. 6d. to £4 10s. each.—On the same day, six £10 shares in the *Brechin Gas Company* were sold by public auction; and the prices realized ranged from £35 to £35 2s. 6d. per share.—Last Wednesday, Messrs. Boulter and Cooper sold by auction, at Malton, 41 fully paid £10 shares, and 20 shares on which £6 had been paid, in the *Malton Gas Company*. The former realized £25 to £25 2s. 6d. each; the latter, £15 10s. to £16 10s. each.—Last Friday, £144 "A" stock in the *Farnworth and Kearsley Gas Company* was sold for £365.

GUERNSEY WATER-WORKS COMPANY, LIMITED.—This Company was registered last week with a capital of £40,000, in £5 shares, to carry on in the island of Guernsey the business of a water company in all its branches, and also the manufacture and sale of ice and aerated waters; and to acquire a concession granted by an Act of the States of the island, sanctioned by Her Majesty in Council on Nov. 23, 1857, and any other concession granted, or to be granted, in respect of the water supply of the island, or any extension thereof.

OSWESTRY WATER SUPPLY.—The Oswestry Town Council have finally adopted a scheme for an improved water supply, prepared by Mr. H. Rofe, C.E. It is intended to construct a reservoir to contain 24 million gallons of water on land purchased at Penygwly. Tenders were received some time ago for carrying out the work; but, as they all exceeded the Engineer's estimate, amended plans and specifications were prepared, and fresh tenders invited. At a special meeting of the Council, held last Thursday, the Engineer recommended that the lowest tender—that of Messrs. J. Jevons and Sons, of Dudley, for £9939—be accepted. The recommendation, after a long discussion, was unanimously adopted.

PONTEFRAC TOWN WATER SUPPLY.—Last Tuesday, a meeting of the rate-payers of Pontefract was held in the Assembly Rooms to consider the proposed new water supply. The Chairman (Mr. Robson) stated that all agreed a better supply of water was needed; but the question was which would be the cheapest and best scheme to adopt. Mr. W. R. Maud spoke at some length, and gave the reports of analysts on the water at present used. He proposed—"That this meeting, while recognizing an additional supply of water to be necessary, believes the Roall scheme to be unnecessary, expensive, and doubtful." The Mayor (Mr. Alderman Mathers) and others spoke in favour of the Roall scheme, and met with some opposition. The resolution rejecting the Roall scheme was carried by a great majority.

THE PROPOSED ELECTRIC LIGHTING OF EXETER.—At the meeting of the Exeter Town Council last Wednesday, a report presented by the Special Committee on Electric Lighting was considered. The Committee had opened tenders, on a seven years' basis, for lighting by electricity the selected district. The Committee pointed out that the lowest tender represented a cost of £1486 17s. 6d. per annum, while the present cost of lighting the same district by gas was, according to the Surveyor's report, £666 11s. 8d. The total illuminating power of the existing gas-lamps would be 2000 candles, while that of the electric light would be 32,000 candles. Having regard to the large increase in the cost, as compared with that of gas, the Committee did not recommend that any of the tenders should be accepted; and in this the Council concurred.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST. (For Stock Market Intelligence, see ante, p. 756.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.					£ s. d.
GAS COMPANIES.								
590,000	10	12 Oct.	10½	Alliance & Dublin 10 p. c.	10	174-184	-4	5 13 6
100,000	10	"	7½	Do. 7 p. c.	10	124-134	..	5 11 1
300,000	100	2 July	10	Australian (Sydney) 5½% Deb.	100	110-112	..	4 9 3
100,000	20	30 May	10	Bahia, Limited.	20	24-25	+½	8 0 0
200,000	5	11 May	7½	Bombay, Limited.	5	71-72	..	4 16 8
40,000	5	"	7½	Do. New.	5	54-55	..	5 4 2
380,000	Stock.	29 Aug.	11	Brentford Consolidated.	100	223-228	+1	5 3 1
125,000	"	"	8	Do. New.	100	164-168	+2½	5 4 2
220,000	"	13 Sept.	10	Brighton & Hove, Original.	20	43-45	..	4 13 4
320,000	"	28 Sept.	11	British.	20	43-45	..	4 15 9
50,000	10	13 Sept.	11	Bromley, Ordinary 10 p. c.	10	19-21	..	5 4 9
39,000	10	"	8	Do. 7 p. c.	10	13-14	..	5 14 3
328,750	10	30 May	8	Buenos Ayres (New) Limited.	10	144-154	..	5 3 2
200,000	100	2 July	6	Do. 5 p. c. Deb.	100	110-112	..	5 7 1
150,000	20	10 Aug.	7	Cagliari, Limited.	20	25-27	..	5 3 8
550,000	Stock.	12 Oct.	13½	Commercial, Old Stock.	100	258-263	-2	5 4 6
130,000	"	28 June	10	Do. New do.	100	209-214	..	5 0 5
121,234	"	14 June	12	Do. 14 p. c. Deb. do.	100	123-128	..	3 10 3
557,320	20	"	12	Continental Union, Limited.	20	45-46	..	5 4 4
242,680	20	"	12	Do. 7 p. c. & 72	14	30-31	..	5 8 1
200,000	20	"	9	Do. 7 p. c. Pref.	20	36-38	..	4 14 8
75,000	Stock.	28 Sept.	13	Crystal Palace District.	100	205-215	..	4 13 0
234,000	10	27 July	13	European, Limited.	10	254-264	..	4 18 1
120,000	10	"	13	Do. New.	5	184-194	..	5 0 0
354,000	10	"	13	Do. do.	5	124-134	..	4 16 3
5,468,600	Stock.	29 Aug.	13	Gaslight & Coke, A, Ordinary.	100	217-221	-2	5 3 6
100,000	"	"	4	Do. B, 4 p. c. max.	100	100-105	..	3 16 3
665,000	"	"	10	Do. C, D, & E, 10 p. c. Pf.	100	260-265	..	3 16 6
80,000	"	"	5	Do. F, 5 p. c. Pf.	100	125-130	..	3 16 11
60,000	"	"	7½	Do. G, 7½ p. c. do.	100	182-187	..	4 0 2
1,800,000	"	"	7	Do. H, 7 p. c. max.	100	167-172	..	4 1 4
463,000	"	"	10	Do. J, 10 p. c. Pf.	100	258-263	..	3 16 1
1,061,150	"	14 June	4	Do. 4 p. c. Deb. Stk.	100	120-123	..	3 5 0
294,850	"	"	4	Do. 4 p. c. do.	100	125-130	..	3 9 9
650,000	"	"	4	Do. 6 p. c. do.	100	175-178	..	3 7 5
3,600,000	Stock.	11 May.	10	Imperial Continental.	100	210-213	..	4 13 10
75,000	5	14 June	6	Malta & Mediterranean, Ltd.	5	5-54	..	5 9 1
560,000	100	1 Oct.	5	Mct. of Melbourne, 5 p. c. Deb.	100	113-115	+1	6 1 11
541,920	20	11 June	6	Monte Video, Limited.	20	20-21	..	5 14 9
150,000	5	30 May	0	Oriental, Limited.	5	9-9½	..	5 5 3
60,000	5	28 Sept.	7	Ottoman, Limited.	5	6-7	..	5 0 0
166,870	10	27 July	4	Pará, Limited.	10	5-6	..	6 13 4
420,000	100	3 May	6	People's Gas of Chicago—				
500,000	100	1 June	6	1st Mtg. Bds.	100	107-110	..	5 9 1
100,000	10	12 Oct.	10	2nd Do.	100	95-100	..	6 0 0
500,000	Stock.	29 Aug.	15½	San Paulo, Limited.	10	16-17	..	5 17 8
1,350,000	"	"	12	South Metropolitan, A Stock.	100	305-310	-1	5 0 0
141,500	"	"	13	Do. B do.	100	237-240	-1½	5 0 0
550,000	"	28 June	5	Do. C do.	100	245-255	..	5 1 11
60,000	5	29 Aug.	11	Do. 5 p. c. Deb. Stk.	100	138-143	+3	3 9 11
				Tottenham & Edur'utn, Orig.	5	11-13	..	4 4 0
WATER COMPANIES.								
717,467	Stock.	28 June	9	Chelsea, Ordinary.	100	260-265	..	3 7 11
1,720,560	Stock.	12 Oct.	7	East London, Ordinary.	100	194-199	+1	3 10 4
700,000	50	14 June	9	Grand Junction.	50	128-127	..	3 10 10
708,000	Stock.	10 Aug.	10½	Kent.	100	270-275	..	3 16 4
1,043,800	100	28 June	9	Lambeth, 10 p. c. max.	100	255-260	..	3 9 8
406,200	100	"	7½	Do. 7½ p. c. max.	100	197-202	..	3 14 3
200,000	Stock.	28 Sept.	4	Do. 4 p. c. Deb. Stk.	100	117-120	..	3 6 8
500,000	100	27 July	12½	New River, New Shares.	100	345-350	+2½	3 9 3
1,000,000	Stock.	"	4	Do. 4 p. c. Deb. Stk.	100	123-127	..	3 3 0
902,300	Stock.	14 June	6	S'hwk & V'hall, 10 p. c. max.	100	166-171	..	3 10 2
126,500	100	"	6	Do.	100	157-162	..	3 14 1
1,155,066	Stock.	11 June	10	West Middlesex.	100	265-270	..	3 11 1

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chokes respiration, and blurs the visual aspect of outer objects. Lights are almost powerless to penetrate this mixture of mist and smoke. Scarcely can the wayfarer see one street gas-lamp at a time; he certainly cannot see the second. Drivers of vehicles are compelled to lead their horses and make sure of their course by observations of the kerb of the street pavement; and when they have to negotiate a wide crossing they must trust to Fate for getting to the corner for which they aim. The usual street noises are either hushed or strangely muffled and changed; but the improved acoustic properties of the thickened atmosphere are witnessed to by the startling distinctness of sounds usually unheard or diminished. All this, be it remarked, is characteristic of an old-fashioned yellow fog, which strangled our forefathers in the streets of London just as it does their successors to-day. The “London particular,” however, is no longer confined strictly to the Metropolis. The growth of towns in different parts of the country has prepared conditions as favourable to the development of the densest kind of fogs as used to be found in London alone; and consequently at the present day Manchester and other places are occasionally plagued with fogs which do not yield in vileness of character to anything that London can show. The other variety of fog, which we have already remarked as distinct from this deadly mixture of antique repute, is not so thick upon the ground, but is much blacker overhead. It does not so acutely affect the eyes or the lungs, and in this respect is more endurable; but no words can adequately describe the gloom where it enthrones itself on the housetops. To look up towards what should be the open sky is like gazing into a coal-cellar. Wayfarers flit along the streets like disembodied spirits; and vehicular traffic is carried on as though in a cavern. The general aspect of the streets and shops is much the same as that presented on a murky, wretched night. The window-glass seems dirty, and the gas looks bad, yet comfortable, for everybody hastens to light up in order to dispel the unnatural dusk. If a fog of this kind were to happen at night, it would not be very noticeable except for the deadness of the air, which renders breathing unpleasant, although not in the same way as a pungent yellow fog. The influence of the invisible carbonic acid, which is probably present in abnormal proportion in the stagnant air, is sensibly felt by all animate beings. This and the blackness at midday combine to make London in a fog of the kind now under notice a place to be shunned during the continuance of the infliction. Fortunately these fogs are frequently very local, and the slightest movement of the air clears them away.

Dwellers in London during the past few weeks have had every reason to regard the smoke and fog abatement movement in which their Lord Lieutenant designate, the Duke of Westminster, took such a lively interest some years since, as the dearest of failures, so far as concerns its primary object. In subsidiary aspects, the agitation undoubtedly effected some good while it lasted. It demonstrated anew, if such demonstration was needed, the connection between coal smoke and the worst characters of town fogs. It placed a definite ideal before the designers of domestic fireplaces; and it assisted to make gas cooking-stoves popular. If this popularity had depended wholly on the recommendation that such stoves do not contribute to make fogs obnoxious, however, it is only too probable that human selfishness would have soon forgotten it. People will consult their own convenience and profit, whatever missionary enthusiasts may say to induce them to take loftier views. Consequently, when the gas cooking-stove is introduced into a household, although its admission may have been procured or assisted by the exhortations of those whose aim was smoke prevention, its continuance will depend upon its economy, efficiency, and practical convenience in action. Good intent does not excuse indifferent performance in these matters; and this is the reason why the application of the Smoke Prevention Acts is so troublesome in the case of factories. The dilettante smoke abatement agitators knew nothing whatever about the economy of steam-raising and general factory furnace work; and accordingly they made themselves very ridiculous, and damaged their own cause, by the extravagance of their assertions respecting the money benefit of smoke-preventing appliances. Even when the law relating to smoky chimneys is as impartially enforced as it is in London, it is difficult to do justice between the manufacturer and the public. In very many instances, of course, the adoption of coke for direct-acting furnaces, and the supersession of these by gas-furnaces, would mitigate the nuisance which brings the factory-owner before the

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 6, 1888.

INVINCIBLE FOG.

WHAT has become of the well-meaning people who banded themselves together a few years ago for the purpose of conquering and driving out the curse of English town life during the long winter months—smoky, choking fog! Alas! the Smoke Preventionists have gone, but the fog remains. They have retired absolutely worsted from the encounter with the foul foe, who still holds possession of the field. As these lines are being written, London lies literally gasping for breath under one of the blackest and most persistent fogs that have ever visited the valley of the Thames. It is a perfect example of that variety of the London fog which has been distinguished of late years from the traditional “pea-soup” fogs so clearly described by Dickens in his tales of London life. We still get too many specimens of this type of fog to forget what it is like. It is the thickness of what has to serve for air, which makes the eyes smart and weep,

Magistrate; but very often the administrator of the law is appealed to in terms which he can hardly resist. What is the Magistrate to do when a manufacturer shows that he has spent a great deal of money on various devices warranted to protect him from the operation of the law, and has found little or no relief from any of them? We do not say that the law forbidding the production of smoke from factory furnaces cannot or should not be enforced, but only that it is not so easy a matter as making a speech upon the subject. There are many factories in London and other places at present working without polluting the air with smoke; but we are not aware that any economy in the consumption of fuel in these factories is directly traceable to its suppression. Fear of the smoke inspector induces careful stoking; and this is something to the good, smoke or no smoke.

After all has been said and done, however, with reference to the abatement of the smoke from factory chimneys, the fact remains that it is the domestic hearth that is the chief offender in the matter of aggravating town fogs. London, with the other large towns of Great Britain that have established fogs of their own after the London pattern, grows bigger every year. Each successive winter lengthens the distance to be traversed by the prevailing winds between their first entering what may be called the town on one side and leaving it on the other. The influence of the radiation of roads, pavements, walls, and roofs, replacing that of green fields and gardens, extends every year. The cultivation of the rose, and the successful growing of fruit on trees freely exposed to the air yearly retreat to more distant suburbs. The hill covered with villas that last year saw the fog creeping round its base for the first time, is submerged this year. The friction of the light autumn winds against so many miles of chimneys and roofs tires them out before they have half crossed the desert of houses, and prevents them from reaching the meadows beyond. So the interior of the town is buried in fog, even though the outskirts are clear, until a stronger breeze arises and wafts the dingy pall away, or the rain washes it down, blackening the fleeces of sheep even as far away as the Sussex downs. There is little hope of deliverance from this state of things. The gas-stove does good, doubtless, as far as it goes; and coke is useful in its way. It is not easy, however, to see what can remedy an evil so great, so persistent, and so deep-rooted. Nature and man have co-operated in creating it; and it seems idle for one partner alone to think of undoing the joint work.

REDUCTION IN THE PRICE OF GAS BY THE CHARTERED COMPANY.

FOLLOWING the sitting of the Court of Directors of The Gas-light and Coke Company on Friday last, the Secretary and General Manager (Mr. J. Orwell Phillips) sent out an intimation to the effect that the price of common gas in the Company's district would be reduced to 2s. 6d. per 1000 cubic feet as from the beginning of the new year. We sincerely congratulate the Directors and their able General Manager upon this announcement, and have not the slightest doubt that the effect of the reduction upon the Company's business will be all that they can desire. The intelligence has been very well received by the London newspapers; and in coming down so handsomely in their selling price, without any pressure from outside, the Directors of the Company have testified to their wish to retain the patronage of the public, as well as taking the best means for securing it. It will be some time before the publication of the accounts of the undertaking for the current half year permits any one to ascertain the circumstances in connection with the revenue account which have enabled the Directors to make this great sacrifice; but it is open to an observer to imagine that the returns for the past quarter and the prospects of the future must have been very reassuring. However this may be, the Directors may be certain of the best wishes of all sincere friends of the gas industry of the country for the success of the enterprise which they have now displayed. They have done a bold thing and an unexpected; but they have put their hands to nothing that, with careful management and ordinary good fortune, can be said to surpass the limits of prudent administration.

THE END OF THE COAL STRIKE.

THE anticipations expressed in these columns with regard to the issue of the coal-miners' strike have been justified by the result. The crisis is over, and the men have won. This is the sum and substance of the story, although there may be a few isolated cases which constitute exceptions to the general rule of resumption of work at an advanced rate of wages. The

price of coal has slightly risen, but the attempt of the retail dealers to make use of the fact of the threatened strike for the purpose of putting up their rates by 2s. and 3s. per ton has failed. A sudden rise in prices coincident with the beginning of a general strike was only to be expected; but on the whole the movement has succeeded in its primary object without very greatly disturbing trade. Those journals which, in the supposed interest of the coal-owners, were most emphatic in declaring that the advance of wages demanded by the men could not be granted, and must accordingly be resisted to the utmost, have had to "sing small" since the masters, after making a vain show of firm resistance, gave way one after another rather than keep the pits idle. It must be very galling to an advocate to lose his case through the surrender of his client; but in this instance there was nothing else for it. It is to be hoped that the men will not be misled, by the ease with which they have won their battle, into thinking that they can do the same again whenever they choose. There are times, of course, when it would pay owners better to shut up their pits than to work them at an additional charge of 10 per cent. for wages; but the men's advisers probably know pretty well how the facts really stand at any time, and are not likely to push matters to extremities without making tolerably sure of their ground. Those owners are wisest who have met the demands of their men most fairly and openly. Some who have endeavoured to pare away the benefit of the higher rate of pay by insisting upon additional conditions, have had to give way after all; but in such cases the victory of the men has become a triumph which neither side is likely to regard in the right light for a long time to come. There is nothing more to be said upon the subject, except to recognize the good humour, or at least absence of riot and outrage, that has distinguished this last from some other industrial campaigns of the kind. True, it did not last long enough for the men to be driven desperate; but, as the record stands, one would fain hope that it may be taken as an indication that the spirit which reached its greatest development during the cutlers' strikes, in the personality of Broadhead at Sheffield is no longer extant in the district which has been the scene of the coal-miners' strike of the present year. The men have probably learnt, from extended experience and improved tuition, that wages questions, being essentially economical, are susceptible of economical treatment and solution, and that the murder of a mine manager or two is not the best way to improve their own position.

THE DINSMORE GAS PROCESS.

THE watchful chronicler of gas engineering progress passes in review all sorts of devices for increasing the yield or decreasing the cost of illuminating gas from coal, and is frequently amused at the performances of inventors, who will persist in repeating, with more or less variation, the attempts of their predecessors to "revolutionize"—that is the favourite word—the ordinary process of carbonization. The latest of these schemes is that of the Dinsmore Gas Company, Limited, a Liverpool speculation started to exploit the invention of Mr. Dinsmore, one of whose patent specifications was published in the last number of the JOURNAL. The report of an extraordinary general meeting of the Company is given in another column; so that, to all appearance, the undertaking is a live concern, the promoters of which intend to appeal to the public for means to carry out their gas-making projects. It is therefore time to utter a word of caution. Essentially it is a process for increasing the yield of gas from coal subjected to destructive distillation by the expedient of returning the tar to the same action, with a view to converting it into gas. This is done by a system of inclined pipes in which the tarry vapours are carbonized instead of being immediately led away as in the ascension-pipes of ordinary carbonizing plant. By this means it is claimed that from Lancashire coal 1500 cubic feet more gas per ton can be obtained than in the usual way, while the illuminating power of the gas is raised from 16 to 22 and even 28 candles. Now, in the first place it is necessary to ascertain what are the capabilities of the raw material from which this additional yield of gas is said to be derived. It admittedly comes from the tar, and hence must be supposed to be in the tar. But suppose it can be proved that the tar does not, and cannot contain anything of the kind? What then becomes of the process? In the JOURNAL for Feb. 2, 1886 (p. 200), will be found a paper upon the "Enrichment of Coal Gas by Certain Hydrocarbons," read by Mr. G. E. Davis, F.I.C., &c., before the London Section of the Society of Chemical Industry, which opens with an examination of this very idea of attempting to make gas from coal

tar. We shall not quote from the paper, for our gas engineering readers know all about the fate of anybody who tries to turn tar into gas; and those who do not—among whom must apparently be classed Mr. Dinsmore and his friends—may most profitably be referred to the text. This paper simply cuts the ground from under Mr. Dinsmore's feet. It is superfluous to discuss the points of his apparatus when the raw material upon which it is designed to operate is known to be unsuitable for the purpose intended. It is hopeless to expect that a time will ever come when people will exercise common-sense precautions in making sure of their facts before lending their names to projects which the first comer with any knowledge of the subject can upset. Hence we do not look for any early release from the duty of keeping watch upon the entry of delusive schemes into the range of the interests to which we are specially devoted, and from the unpleasant task of bearing testimony to the folly and rashness, of their promoters. This Dinsmore example is merely the revival of a notion, the hackneyed nature and hopelessness of which would have been revealed upon the merest inquiry in the right quarters. The Chairman of the Company knows enough to confess that "the idea is 'not a new one,' and goes on to declare that "it had 'never been satisfactorily carried out'—to which we take the liberty of adding, "and never will be."

MR. JAMES SOMERVILLE ON GASHOLDER GUIDING.

GASHOLDER construction is all the talk just now among gas engineers on both sides of the Atlantic. The Southern District Gas Managers will discuss the question of the guide-framing of gasholders, upon the invitation of Mr. George Livesey, on Thursday next; and meanwhile we may draw attention to a remark made by Mr. James Somerville, of Indianapolis, in the course of a paper contributed by him to the American Gaslight Association at their recent congress. The paper was, like its author, more useful than pretentious; being made up of observations upon points of gas-works management that had occurred to the writer in the course of a long and fruitful experience. It was, in short, a sample of just such table-talk as an experienced engineer might retail at any time for the entertainment of his fellows or the instruction of a young man in whom the speaker felt interested. Among other things, the paper contained the following pregnant statement:—

My observation of the daily working of holders leads me to this conclusion: Whenever trouble has occurred, it can invariably be traced to one source—viz., the weakness of the bottom curb. We have a holder 130 feet in diameter and only 16 feet in height. Why it was built of these dimensions I cannot tell. It is strongly trussed. The centre of gravity is nearer the top than the bottom, so that a little gale of wind invariably tipped it over. Indeed, I have seen it at right angles—one side jammed into the tank, the other high in the air. . . . I found that every roller was out of place, and the bottom curb badly bent in. I substituted wrought iron for cast wherever it could be done with the rollers, and put a heavy log chain or brace against them on the inside, fastened to the curb, and jammed the rollers tight against the guides. I filled it up again, and no one was more surprised than myself to see how steady the holder has worked ever since—now nearly ten years ago. . . . There are twelve columns to the holder; but as for keeping it steady, it might as well be without them.

This is the strongest possible evidence in support of the position taken up by those who declare that the stability and steadiness of a gasholder chiefly depend upon the bottom rollers. As we have stated this view, it is briefly expressed in the remark: "Take care of the bottom guiding of a gas-holder, and the top will take care of itself." The saying does not, of course, contain the whole truth; but it conveys a very useful sample of it, and indicates the direction in which more may be obtained.

THE London correspondent of the *Manchester Guardian* states that a "Syllabus of Policy" for the new London County Council has been issued by a Liberal Association. In view of the coming elections, the matter is of interest. First in importance is placed the efficient and economic use of the public funds; and among the other subjects mentioned as requiring special attention are the abolition of the coal and wine duties, and the control of the gas and water supply. It is specified that the undertakings of the Metropolitan Gas and Water Companies are to be acquired at an "equitable valuation."

INVESTORS in gas and water stocks will see, by our advertisement columns, that excellent opportunities are now being afforded them for increasing their holdings in these substantial securities. Messrs. Thurgood and Martin will, early next month, offer for public competition, by order of the Royal College of Surgeons, £24,780 of stock in the Crystal Palace District Gas Company, and 375 fully paid £6 shares in the same undertaking (forming a portion of the bequest to the College by the late Sir Erasmus Wilson); and the Directors of the East London Water Company are inviting tenders for £53,000, being the third portion of the new 4½ per cent. perpetual debenture stock of the Company.

Water and Sanitary Affairs.

THE scientific interest that attaches to the deep boring of the Southwark and Vauxhall Water Company at Streatham has been the occasion of a recent article in *The Times*, in connection with a forthcoming treatise by Mr. William Whitaker, of the Geological Survey, on the geology of London. We have adverted on more than one occasion to the peculiar character of the Streatham well, in reference to the chance of finding the lower greensand, and the possibility of some further light being thrown on the question whether coal measures exist at a workable depth in the south-east of England. The Streatham well unfortunately demonstrates the absence of the lower greensand at that spot. This is somewhat at variance with the result achieved at Messrs. Meux's brewery in the Tottenham Court Road, where the lower greensand was found at a depth of 1000 feet from the surface. But 70 feet further down an entirely different formation made its appearance—belonging to the Devonian series. Water could not be obtained in any quantity; and the further prosecution of the boring was abandoned. Even the brief encouragement of going down through some 60 or 70 feet of the lower greensand has been wanting at Streatham, although a very useful supply of water is available from the upper strata, and will probably be turned to account. From the gault, the boring tool has passed into the forest marble beds of the lower Jurassic limestone. Mr. Whitaker calculates that the Jurassic rocks of the Streatham well are not likely to be very thick; and the point of interest consists in knowing what underlies them. A little more boring may help to solve one of the greatest problems in English geology. At Meux's brewery there was a plunge from the rocks of the secondary formation into a depth below the carboniferous strata. The intruding rocks of the primary formation were found inclined at a high angle, though in what direction does not appear. On the slopes of the ridge would lie the rocks of a later period; and among these might be found the beds belonging to the actual coal measures. The presence of the primary rocks at about 1000 feet from the surface has been proved by more than one deep boring in and near London. Above thirty years ago, Mr. Godwin-Austen elaborated his theory as to a connection between the coal-fields in the west of England and those of Belgium and the north of France. Well-considered reasons were shown for believing that the coal measures of a large portion of England, France, and Belgium were once continuous, and that the present coal-fields were merely fragments of a great original deposit, subsequently broken up in two directions prior to the deposition of the secondary rocks. Sir Roderick Murchison took a different view of the case; but the theory has nevertheless been countenanced by many distinguished geologists, and every deep boring in or near the valley of the Thames excites renewed hopes that the Godwin-Austen theory may be verified. It is a question of "striking ile." But the Directors of the Southwark and Vauxhall Water Company cannot devote the money of the shareholders to a problematical search for coal, however interesting such an enterprise might be from a scientific point of view. This principle was emphatically expressed at the recent meeting of the shareholders, by the Chairman, Alderman Sir H. E. Knight; and there is a risk that the boring, which has now gone down more than 1160 feet, will be stopped, unless the public appeal made by Mr. Whitaker for a special fund receives a prompt and satisfactory response. Collieries and iron-works in Kent and Sussex are not altogether desirable; but they would nevertheless add to the wealth of the nation.

After setting in motion sundry complicated and curious forms of law in connection with a criminal indictment directed against the Staines Local Board for "causing or suffering" sewage to flow into the Thames, the Conservators of the river find themselves foiled; and the sewage of Staines, so far as the town has any sewers, continues to flow as heretofore, except that henceforth it will be with the sanction of Her Majesty's Judges in the High Court of Justice. The legal considerations which have led to this result will be found in our report of the case, as argued in the Queen's Bench Division, and decided upon, last week. It will probably be news to many people to learn that it is possible not only for owners of house property to have a prescriptive right to use certain sewers, but for the Sanitary Authority of the district to be under no responsibility to prevent the said sewers from discharging their contents into the nearest river. It may be asked, What is the good of our Rivers Pollution Prevention

Act, or the Acts which give authority to our Conservancy Boards, or the Acts which constitute our local Sanitary Authorities, if a right to drain houses into sewers discharging into a river is to be recognized after this fashion in the Courts of Law? It is said, in respect to Staines, that the Conservators should take proceedings against the individuals who use the sewers, and not against the Local Board; the latter being powerless in the matter. But while the Local Board plead that they have no power to prevent the drainage of certain houses from entering the sewers, the owners of the houses may plead that they are not responsible for the destination of the sewage after it has once left their premises. They may contend that it is the duty of the Local Board to intercept the sewage and keep it out of the river. It is here that the practical part of the question interposes itself. There are three sewers at Staines discharging into the Thames; and it seems out of all reason to ask the owners of the house property connected with these sewers to deal with the sewage *en masse*. That is the function of the Local Authority, created for the very purpose of providing proper drainage for their district. If proceedings taken against the inhabitants are so far successful as to shut up the sewers, the only remaining resource is that of cesspools. Does the ancient use of a cesspool confer a vested right? If a man gives up his ancient cesspool, has he a claim to compensation? It is understood that there are peculiar difficulties which have hitherto prevented the adoption of a general system of drainage for Staines. But is Staines so exceptionally situated that it must differ from all the other towns in the kingdom? The London Water Companies are paying to the Conservators many thousands of pounds per annum in order that the Thames above their intakes may be protected from pollution; and yet certain sewers in the town of Staines are to be allowed to discharge into the stream. How was the drainage of London effected? How many houses had long enjoyed the privilege of draining into sewers which discharged into the Thames within the Metropolitan area? The main drainage works of the Metropolitan Board simply intercepted the flow, and carried the sewage off to Barking and Crossness. The recent judgment in the Law Courts has apparently been cramped and twisted by the terms of the "special verdict" to which it had particular reference, and by which its view was necessarily limited. The rusty machinery of an antiquated procedure was brought to bear upon a modern emergency, with which it was utterly unable to deal. The Staines sewage must be kept out of the river somehow; though how many years the lawyers will require in order to find out the proper way, seems beyond present calculation.

We learn from one of the Halifax local papers that Mr. W. Carr is going to Trinidad, under a two years' engagement, to superintend the erection of gas-works there.

At a special general meeting of the members of the Society of Telegraph Engineers and Electricians to be held next Thursday, a resolution will be submitted to change the name of the Society to "The Institution of Electrical Engineers." There is little doubt that the proposition will be agreed to; inasmuch as 837 members out of the 846 who have replied to the circular addressed to them on the subject early in the year have expressed approval of the change.

Our contemporary the *Builder*, referring to the judgment of Mr. Justice Stirling, in the proceedings taken by Mr. Lewis against the Weston-super-Mare Local Board, reported in our columns last week, expresses the opinion that the case will go to a higher tribunal. The point upon the construction of section 16 of the Public Health Act was as to the meaning of the word "necessary"—that is to say, whether it meant "desirable," or whether it meant "absolutely necessary." The Local Authority, it will be remembered, desired to have a pipe laid through the garden of the plaintiff. This was not the only course open to them; but, on the other hand, it was the most desirable one. His Lordship decided that the word "necessary" in the Act meant "desirable," or, as he expressed it, "necessary for the efficient discharge of the duty in the way which is most for the public interest." Our contemporary remarks: "There is much to be said on both sides; and it is always difficult to construe such a word as this, since different minds look at it from all kinds of standpoints. We are somewhat inclined to think, however, that the construction adopted by Mr. Justice Stirling gives almost too much latitude to public bodies, and scarcely safeguards private interests enough. Private property should not be interfered with by public bodies if it can possibly be avoided. According to this decision, it would seem allowable to cut up a garden by laying water-pipes beneath it, if, by so doing, a slightly shorter route could be taken, and a few pounds thereby be saved to the community; for, although such a method of carrying out the work would not be absolutely necessary, it would clearly be for the public interest to save money."

Essays, Commentaries, and Reviews

GAS AND WATER COMPANIES IN THE STOCK MARKET (For Stock and Share List, see p. 817.)

THE condition of the Stock Exchange markets during the past week has been on the whole rather quiet and dull; and they offer no feature of any interest. It was thought to be quite within the bounds of possibility that the Bank of England rate might be lowered on Thursday; but an unforeseen demand for gold kept it up. The Gas market has been brisk; and the "bears" have been active. A "boom" in electrics is being worked. No matter what the undertaking may be, so long as it is something electric (or even its title suggests electricity), that will do; and, of course, as a co-ordinate of the boom, gas is to be worked down. The run is being principally made against the Metropolitan Companies; but others share in it to a less degree. Whatever may be in the store of the future, at present the Gas Companies are not suffering. We believe that the ten months accomplished of 1888 have been for the London Companies a period of prosperity far above recent annual averages; and if the remaining two months should be proportionate, the accounts for the full year will be remarkable. They will be especially gratifying to those who keep cool and buy stocks when they are being run down, as now. It is significant, as indicating the estimate of the position formed by the Directors of The Gaslight and Coke Company, that they have already notified their intention to reduce the price of their gas by 3d. per 1000 cubic feet at the end of the year. This means a voluntary sacrifice of £200,000 off the annual gas-rental on its present scale. The result of the week's operations has been to lower Gaslight "A" 4; South Metropolitan "A" and "B," 2½ each; and Commercial old, 1. There has, however, been going on quietly during the week some good steady buying of some of these stocks at the reduced figures; and, though it is always difficult to forecast the next move (especially if people lose their heads and throw stock on the market), we should not be surprised to see the pendulum swing the other way. There has been a fair amount of business doing in Water, at average figures; but nothing to call for remark.

The daily operations were: Moderate business in Gas on Monday. Gaslight "A" and British fell 1 each. South Metropolitan "B" buyers were 2 lower. Water was quiet and unchanged. On Tuesday, Gas was rather more active. Commercial old receded 1; and Gaslight "A" and British fell 1 more each. Nothing in Water. On Wednesday Gas was very quiet; but knocking down quotations continued. South Metropolitan "A" fell 2½; "B," 1½; Gaslight "A," 1; and Imperial Continental, 1. Thursday, being the 1st of November, was a holiday. On Friday, Gas was very active; dealings being freely distributed through the list. Gaslight "A" was done at 24½—the lowest mark of the week; and the quotation fell 1. Water was brisker; and Southwark ordinary rose 1. On Saturday, Gas was a little better; and Gaslight "A" marked 24½ at the close. But business was very quiet. In Water, Southwark ordinary rose 1 more.

ELECTRIC LIGHTING MEMORANDA.

ANNUAL MEETING OF THE EDISON AND SWAN COMPANY—ALDERMAN F. PRIESTMAN ON THE BRADFORD ELECTRIC LIGHTING SCHEME—THE WHITEHALL ELECTRIC LIGHTING STATION—THE COST OF ARC LAMPS IN CANADA.

THE Edison and Swan United Electric Light Company held their annual general meeting on the 22nd ult.—the Chairman (Mr. J. S. Forbes) presiding. The profit and loss account for the year, as mentioned last week, showed a credit balance of £25,123, whereas that for the previous year was £16,221. According to the statement of the Chairman, the Company have laid out upon patents, goodwill, preliminary expenses, and old losses on working, the respectable sum of £304,028. The Chairman explained that when the Company began they for several years made losses upon revenue account; and these were all added together and entered against the time when they could be wiped out by profits. This time has come; and at the last meeting Mr. Forbes was able to assure the shareholders that the Company are "fairly on their legs as a money-earning concern." If the Company were absolutely free of legal troubles, it appears from this statement that they might honestly distribute this profit of £25,000 for the past year's working, because the Chairman assured the proprietors that this is the amount remaining clear after charging the concern with every proper outlay, and being somewhat liberal in the matter of depreciation. Unfortunately, however, there is the pending litigation with the Brush Company to be considered; and, having regard to the proverbial uncertainties of the law, the Chairman recommended, and the proprietors agreed, not to distribute this money, but to keep it in hand in readiness for any emergency. Coming to the question of the progress of electric lighting, Mr. Forbes somewhat cynically remarked that while the Company had come down from their early aspirations, and confined themselves to the humble task of lamp-making, the Directors were "very delighted to see other people embarking their capital and energy in the installing work." In other words, having abandoned the fascinating but disappointing work of gold-digging, Mr. Forbes is content to play the less conspicuous but more profitable part of sutler to the gold-diggers' camp. The meeting was more harmonious and satisfactory than are most gatherings of the shareholders of electric lighting companies; thanks probably to the adoption of the policy defined by the Chairman.

Alderman F. Priestman, of Bradford, as was mentioned in the

JOURNAL last week, has recently laid the foundation-stone of the Corporation electricity works; the occasion being observed with some ceremony. There was a meeting of members of the Corporation and leading townsmen, who were addressed by the Alderman (who is Chairman of the Gas Committee) upon the policy of the Corporation respecting the undertaking in question. He stated that the reason the Corporation had decided to lay down electric lighting plant was their determination to keep all such undertakings in their own hands. They will no more have an electric light company among them than they would suffer an independent gas company; and if the townspeople want electric lighting, it is the Corporation to whom they must look for it. This view of things is at least intelligible, whatever may be the diversity of opinions respecting its wisdom. Alderman Priestman says he is proud to have his name so prominently associated with the new enterprise, and we trust he will never have occasion to think differently. People who lay foundation-stones are allowed to be enthusiastic; but the man who knocks the building down in the fulness of time is in a better position to judge of its utility. Meanwhile, it appears from the Alderman's admissions and apologies that local opinion accuses the electric lighting works of hanging fire in some way. It is a long time since the Gas Committee were authorized to carry out the scheme; and there is as yet very little to show the public. The Bradford people are now promised that the works shall be ready for a start early next year; and the Chairman of the Gas Committee assures them that the light, when they get it, will be immensely superior to the Corporation gas. A remark like this reads strangely as coming from such a quarter; but Alderman Priestman has been Chairman and Vice-Chairman of the Corporation Gas Committee for ten years; and familiarity appears to have bred contempt in his case. He evidently does not belong to the race of those who agree to the counsel of the old saying, that "it is good to be off with the old love before you are on with the new." Fortunately, the aberrations of an Alderman are not likely to materially affect the fate of a large and prosperous gas undertaking.

The Deptford electric lighting station, which was briefly described by us last week as an outcome of the Grosvenor Gallery lighting experiment, is to be rivalled by the Metropolitan Electrical Supply Company, whose principal station is to be somewhere near Waterloo, on the Surrey side of the river, but whose only present installation is in Whitehall. It is expected that the rivalry of these undertakings will settle the question of alternating *versus* battery transformers, which now divides electricians; the Grosvenor Gallery interest being committed to the former, while the Whitehall speculators put their trust in accumulators. It is difficult to see, however, what can be expected to be proved by the Whitehall experiment, because it seems to be designed merely as a kind of domestic annexe to some great buildings of residential flats occupying the choice site between Whitehall and the Embankment. The supply of electricity for lighting is to be identified with the hot and cold water and passenger lift services, as well as with fire-prevention, and, possibly, boot-cleaning and dish-washing. No reliable economical data can be obtained from an installation of this character. It would be as feasible to attempt the estimation of the working power of a navy from observations of the strength put forth by a powdered Belgravian flunkey when carrying a five-o'clock tea-tray into his mistress's boudoir.

An estimate of the probable cost of a municipal electric light station for Montreal, drawn up by Mr. Badger pursuant to instructions received by him from the Light Committee of the City Council, may be of interest, as showing the expense of electric light plant and working the same in Canada. Supposing one arc lamp to be capable of displacing four gas-lamps in the streets, it is reckoned that to light the City thoroughly would require 650 arc and 500 incandescent lamps. The estimate of plant contemplates two generating stations, capable of supplying 600 arc lamps each, to be erected one at each end of the city, with a view to the reliability of the service. The works and plant for supplying 600 arc lamps with power to increase to 800 lamps if needed, are expected to cost, inclusive of everything, the capital sum of \$279,125, which is somewhere about £55,830. The working expenses of such an installation, calculated on the basis of 800 lamps, inclusive of all charges, interest on capital being reckoned at 4 per cent., are stated at \$87,091, or about £17,420 per annum, which works out to 29-8c. per lamp per night, or about £21 15s. per lamp per annum. This does not greatly differ from the cost of maintaining arc lamps for street lighting in this country.

AMERICAN WATER-WORKS.—According to some statistical reports on the water-works of the United States which have lately appeared in the *Engineering News*, there are in the New England States 287 of these undertakings, with 5291 miles of mains; the capital invested being \$84,993,000.

THE LIGHTING OF SOUTH AFRICAN TOWNS.—A Company under the title of the South African Lighting Association was registered last week, with a capital of £50,000, in £10 shares, "to supply gas, electric, or any other artificial light within Port Elizabeth and King William Town and elsewhere in South Africa, or any islands or countries near thereto." Among the first subscribers are the following well-known gentlemen connected with the gas industry:—Mr. J. Cloudsley, Mr. S. Cutler, Mr. D. Ford Goddard, and Mr. Corbet Woodall. The first Directors of the Association are to be Mr. D. Ford Goddard, Mr. J. Mansergh, and Mr. W. Woodall, M.P.

SIR WILLIAM SIEMENS.

READERS of the JOURNAL do not require to be introduced formally to the subject of Dr. William Pole's recently issued handsome volume;* or, for that matter, to the writer. As one of the Metropolitan Gas Referees, Dr. Pole is to a certain extent identified with the interest of gas lighting; and he has proved the reality of his sympathy with the industry by devoting his great literary powers in several instances to the treatment of gas engineering topics. In connection with his tenure of the position of Honorary Secretary of the Institution of Civil Engineers, Dr. Pole has been the biographer of several of the most distinguished members of that body, to whose professional labours the material progress of the nation and the world is so largely due. Sir William Fairbairn, Robert Stephenson, and I. K. Brunel are among the eminent engineers of whose posthumous renown Dr. Pole has, in a sense, taken charge; but neither he nor any other biographer of the leaders of modern science and industry can look to have a more striking subject for a personal memoir than the late Sir William, long known as Dr. C. W. Siemens. Of the many who made the great man's acquaintance in his later days, when he was at the apex of his fame, during the years immediately preceding his death full of honours and riches, there must have been few who did not sometimes reflect on the extraordinary features of such a career. Here was a German by birth, who, like Professor Max Müller, although in a different sphere, adopted England for his country, and rose to the highest eminence in his profession, notwithstanding the disadvantages that must attend the efforts of an alien in competition for the world's prizes with men of the race that has taught the rest of the peoples of the globe how to work. It seems natural for Englishmen to go out from their teeming native land, and take as a matter of course the high places of engineering in other countries; but by what means did a German conquer England so as to place himself at the head of the most English of professions? Such a conqueror must be a marvellous man, look at him in whatever light we choose. One must acknowledge that the true story of the life of such a man, however baldly told, provided that the facts are dependable, is bound to be interesting to all who find themselves in the same way of life, striving after the same kind of prizes, and encountering the same order of difficulties and hindrances. How much more then is such a biography likely to be instructive and interesting when written by an experienced and graceful author, instinct himself with sympathies both for his subject and for his readers? As an Englishman, an engineer, a man of science and of the world, as well as a man of imagination, Dr. Pole may be trusted to feel the quality and aim of that curiosity which Sir W. Siemens's career inspired in the more thoughtful of his countrymen, and consequently may be expected to understand in the proper spirit his duty as biographer. The inquiry that would rise to the lips of nine out of ten men who should be told anew of Sir W. Siemens's astonishing success in life, as success is popularly measured—how he came over from Germany a young man without any exterior advantages, and among an insular people reputed to entertain a prejudice against foreigners, rose to great honour and wealth, dying a Knight, with the awe-inspiring capitals F.R.S., D.C.L., LL.D., after his name, a special service in Westminster Abbey being held over his remains—the natural question, we say, that would arise in the mind of a hearer of such a tale would be, How was it done? What was there in the birth, training, position, or powers of the man that carried him all the long way from that solitary landing from the German packet to the last triumphant scene in the Abbey? It is a progress that would impress the most heedless who should stay for a moment to ponder over it. Let us see how Dr. Pole explains this great wonder, this romance of a prosaic age, this conquest of a time and with the forces of Peace.

The author, after briefly but most clearly and effectively giving his reader to understand that he is about to tell the story of an engineer, and explaining this last term in a very striking style, tells us that the Siemens family had been for three centuries country people, cultivators of the land, in a place called Wasserleben, on the northern edge of the Harz Mountains. The modern interest begins with Christian Ferdinand Siemens, born in 1789, the youngest son in a large family, who married early and settled as a farmer of Government land at Lenthe, near Hanover. All the family were well educated, thanks to the school and university system of the country. With the customary blindness to prudential considerations that often serves the good purpose of bringing out the resources of men and furthering the development of nations, the young couple Ferdinand (as he was usually called) and Eleonore Siemens had a large family of eleven sons and three daughters, of whom three sons and one daughter died in infancy. Knowing what we now do of the new industries that were to be created by more than one of these lads, giving employment in different parts of the world to tens of thousands of their fellow-men, it becomes a curious question for inquirers who admit the cogeny of the Malthusian principle of population, as to whether the Siemenses of Lenthe were not doing more good in giving William, Werner, Frederick, and Carl to the world than if they had consulted Malthus, and brought forth the prudential one or two offspring to carry on the family name. This, however, is a digression. Ferdinand Siemens was fairly prosperous as a farmer, but he could not do more for his numerous progeny than give them all a plain but substantial education. He

* "The Life of Sir William Siemens, F.R.S., &c." By William Pole, F.R.S. Illustrated. London: John Murray; 1888.

died in 1839, six months after his wife; and a few years later the family dispersed among their relations and friends. The exceptional quality of the new generation of Siemenses was first shown in Werner, the eldest son, who has been generally known as "the Berlin Siemens," and is deservedly honoured by Dr. Pole as the founder of the fortunes and reputation of the family. Born in 1816, Werner became a scientific soldier, distinguishing himself in the Prussian artillery service. He took up very warmly the new science of electricity, and became an authority upon telegraphy; founding with a friend the well-known house of Siemens and Halske, for the manufacture of electrical apparatus, while yet a military officer. The venture succeeded, and ultimately Werner quitted the army, and devoted himself to his own business. Honours have been showered thickly upon him, and he was ennobled by the Emperor Frederick III.; wherefore he bears the aristocratic prefix "*von*" to the family name. The brothers Siemens have worked so closely together throughout their lives, that it is impossible to tell the story of one without bringing in the others. This is especially true of William; because, although to the majority of Englishmen he seemed to stand for himself alone (none of the other brothers being visible in English business), he was really for the most part the representative of a fraternity in which Werner and Frederick, "the Dresden Siemens," were the great originators. The second son, Hans, is not heard of now, but he was a useful member of the brotherhood, for, having made money in distilling, he set up at Dresden the glass-works in which Frederick's regenerative furnaces were perfected. It is interesting to learn that the clever Frederick of later life ran away from school, and went for a sailor, working for two years before the mast. His good brother Werner, ten years his senior, and occupying the place of their dead father, tried to conform so far to the lad's taste as to get him into the Prussian navy; but while waiting for the appointment, which never came, Frederick took part in his brothers' electrical work, which interested him so deeply that he abandoned the sea, with the result that we know. The sixth son, Carl, is a good working member of the brotherhood—not much of an inventor, but an executive hand. The brothers Werner, William, Carl, and Frederick worked so well together that Dr. Pole admits the difficulty of exactly defining their personal shares in the many useful inventions and business enterprises for which the world is indebted to them. We may add to this remark of the biographer the observation—not at all intended to be understood in a depreciatory sense—that, from his figuring as the representative of the family in this country, William came in personally for a good deal of the honour and repute that was earned by the others, who were not merely in the background of absence from the country, but did not participate in his genius for publicity.

Dr. Pole's narrative of the childhood and youth of Sir William is highly interesting. As a boy he did not show any decided mechanical "twist;" and at first prepared for a commercial life. As in the case of so many other boys, his parents did not know what was to become of him, and it was by his brother Werner's desire that he was devoted to a mechanical career, studying at Magdeburg and at the University of Göttingen until he was 19 years of age, when he began to learn practical engineering and electricity. He corresponded regularly upon technical matters with Werner, who in all things supervised his educational course. Early in February, 1843, William started for London by way of Hamburg; his mission being to try to do some business in his and Werner's electric-gilding and galvanic battery inventions. He even then entertained the idea of settling in England, if he could see his way. His first business transaction in England was with Mr. Elkington, who was just then developing the electro-plating processes with which his name is historically united. It was from the Messrs. Elkington that the young German received his first lift in life, in the shape of a sum of £1600 for his patent. Strangely enough, Dr. Pole remarks that this process was not commercially used to any large extent. The biographer rightly lays stress upon the personal qualities of business tact and address that must have belonged to the young man of only 20 years of age who could negotiate a transaction of such importance in a foreign land, the language of which was strange to him. The ease with which this Elkington money had been earned stimulated the brothers to bring out other inventions, and William's success as a business agent stamped him out for the ambassador of the firm. Consequently, after a little more work in the Magdeburg machine factory, William started for London a second time, in charge of his brother's invention of a chronometrie governor, together with one or two other similar "notions," and associated himself with an English engineer, Mr. Joseph Woods, brother of Mr. Edward Woods, who was then practising in Westminster as a Civil Engineer. This device, though well spoken of by many eminent mechanical engineers of the day, does not appear to have been a permanent success. A printing process, likewise not successful, was also in hand at the same time; and the result of these failures was to plunge William, and through him the rest of the family, into money troubles. The Elkington success made them all too sanguine; and they undertook more than they could carry out, even if the schemes had been good for anything, which was unfortunately not the case. At this time it appears that the fortunes of the Siemens family were at a low ebb. Werner declined to have anything more to do with the governor and printing schemes, and renounced all benefit that might be derived from them by William in the future. The fraternal association was for the time broken. William had

realized and spent all his little patrimony in the attempt to make a success of these impracticable inventions. For two years and a half he worked at them fruitlessly; being often tempted to let them and the money sunk in them go, and to take a salaried situation. Although he could have secured his own livelihood in this way, he could not for a long time make up his mind to relinquish the prospect of getting back the money which his friends had entrusted to him to invest in his schemes. From this time for some years the history of the Siemens brothers is one of a succession of struggles. Messrs. Fox and Henderson paid William Siemens £400 a year for several years, and engaged to carry out some of his devices. But they lost a good deal of money by him; and the connection was ultimately severed. Werner Siemens and Halske meanwhile developed their electrical engineering business, which was a success from the first. This was the turning-point of their fortunes; for William was at last wholly engaged in representing the thriving firm in England, in which he was helped by Frederick. Werner's noble spirit is displayed in a letter offering this arrangement to the then unsuccessful brother, in which he says that William shall name his own share of the profits; "but do not make it too small," he urges, "for I would rather see five dollars in your pocket than two in my own."

The story of William's failure to make the principle of heat regeneration work in connection with steam-engines, leads up to Frederick Siemens's "happy idea," as Dr. Pole calls it, of the regenerative furnace. William pushed the discovery with his usual energy. Up to this time he had been very unfortunate with his own inventions; and Dr. Pole admits that the rotary water-meter was the first success that he achieved after he was settled in England. It is not concealed, however, that William Siemens did best as agent of, and afterwards as partner in, the firm of Siemens and Halske; the Charlton works being founded as a branch undertaking of the Berlin firm. The account of the introduction of the Siemens-Martin steel process is interesting; and the same may be said with emphasis of the story of the Siemens electric lighting inventions. There is very much in the biography which we cannot even allude to here. Suffice it to say that the writer has done his work well. He has given us a picture of the man, without indulging in too much laudation. He is sympathetic, but never fulsome, and does not conceal how much his subject owed to others. It is not his fault if one rises from the perusal of his book with a confirmed idea that, although William was in the end one of the most celebrated of the brothers Siemens, he was really neither the greatest nor the cleverest. The printing and general get-up of the book are all that can be desired. There are several illustrations; and the book is prefaced by a beautifully executed vignette portrait of the subject.

REDUCTION IN PRICE BY THE CHARTERED GAS COMPANY.—The Secretary and General Manager of The Gaslight and Coke Company (Mr. J. Orwell Phillips) informs us that the Directors have resolved, from and after the 1st of January next, to reduce the price of gas to private consumers on the north side of the Thames to 2s. 6d. per 1000 cubic feet for common, and to 3s. 1d. per 1000 cubic feet for canal gas. This will be a concession of 8d. per 1000 cubic feet in the former case, and 4d. in the latter.

PRESENTATION TO MR. W. STEPHENSON.—The *employés* at the Great Cambridge Street station of The Gaslight and Coke Company last Tuesday presented to Mr. W. Stephenson, who is vacating his position as Chief Clerk of the station, in consequence of his transference to the Company's offices in the Horseferry Road, a testimonial in token of their regard for him, and as a memento of his pleasant intercourse with them during his fifteen years' service. It consisted of an ebony and gold striking clock, and a dinner service for Mrs. Stephenson. The Engineer of the station (Mr. J. W. Randall) presented the gifts, accompanying them with a few kindly observations; and Mr. Stephenson acknowledged them in appropriate terms.

THE PARIS MUNICIPAL ELECTRIC LIGHTING STATIONS.—According to the Paris Correspondent of *Industries*, seven firms—viz., the Société Continentale Edison, the Société Lyonnaise, the Société Alsacienne, the Société d'Eclairage Electrique Jablochkoff, M. Patin (representative of Mr. Ferranti), M. Victor Popp (representative of the Thomson-Houston Company), and M. Crenod-Sautter—have tendered for the supply of the plant required for the electric lighting stations which the Paris Municipality are about to establish. The tenders were opened on the 26th ult., and handed over to a Sub-Committee, under the presidency of M. Mascart, who will examine the merits of the rival schemes, and recommend one for adoption. The decision is expected to be given in about six weeks.

THE GAS INSTITUTE TRANSACTIONS FOR 1888.—The volume of Transactions of The Gas Institute for the present year was issued to the members last week by the Secretary (Mr. W. H. Bennett), under whose editorship the book has been produced. Beyond the papers read at the meeting of the Institute in June, with the discussions thereon, it contains, in an Appendix, the communications presented by Dr. Wm. Wallace and Mr. Geo. Livesey—on "The Effect of Temperature on the Quality of Gas produced in Gas-Works at different Seasons of the Year," and on "Commissions"—which there was not time to lay before the members. The other matter consists of the report of the proceedings at the meeting of the donors and subscribers to the Benevolent Fund, the usual lists of office-bearers and members, the rules, and the statements of the financial position of the Institute.

Notes.

"WATER OIL GAS" FOR STEEL MAKING.

What is called in the newspaper reports "water oil gas" is in course of trial as a fuel for use in the conversion of steel at the Barrow Steel-Works, Barrow-in-Furness. The oil used is commercial creosote, not treated in any way for purification. From the creosote tank the oil is pumped to the furnaces, where it is passed through tubes kept hot by the flame of a portion of the gas produced. The gas thus made is mixed with superheated steam, which is stated to be prepared by passing steam at the initial pressure of 80 lbs. to the square inch through copper pipe heated to about 2000° Fahr. After the combination of the steam with the gas, the mixture is led to steel-furnaces, which were previously heated by Siemens producer gas. The combustion in the furnaces is described as perfect, and the heat obtained as most intense. The supplies of oil and steam are under the control of one man. An important claim made by the patentee is that, by the use of his so-called "water oil gas," a portion of the sulphur is eliminated from the steel. The process is described as being very convenient and clean, and not expensive in application. The cost of the creosote is stated as 1½d. per gallon; and from 25 to 30 gallons will produce a ton of finished steel. The process is said to be preferable for many reasons to the Siemens gas-heating arrangement previously employed; but no satisfactory evidence in support of this claim is offered.

THE FUEL VALUE OF WEATHERED COKE.

The American *Age of Steel* discusses briefly the question whether coke is injured for foundry purposes by long exposure to weather; stating that a wholesale coke merchant has contended that coke is really improved by this treatment. It is remarked, in support of this observation, that about 375,000 bushels of coke were supplied to a blast-furnace, but not used for four or five years, during which time the fuel was stored in a damp place close to a river. Finally, a neighbouring steel-works, being in straits for fuel, sent for this old stock as a last resource; and, to the surprise of everybody concerned, more and better iron was made by its means than had been customary with fresh fuel. At a small stove foundry also, a strike of coal operatives compelled the manager to dig up a few waggon-loads of coke that had lain neglected for several years in a damp cellar, subjected to the action of dripping water. This dirty-looking stuff gave splendid results in the cupola. From this, while it is not inferred that it is economical to allow coke to crumble and weather for years, it by no means follows that what remains after such neglectful treatment is worthless.

THE COMPOSITION OF COAL DUST.

At a recent meeting of the North of England Institute of Mining and Mechanical Engineers, Professor P. P. Bedson, D. Sc., of the Durham College of Science, contributed to our knowledge of coal dust by reading a paper dealing with the composition of this material. He stated that some time ago a member of the Institute drew his attention to the remarkable behaviour of a particular class of coal dust at one of the collieries under his superintendence, and suggested that it would be desirable to ascertain whether it contained gases, like coal itself. The author stated that the investigations of Herr von Meyer in Germany and of Mr. W. J. Thomas in this country, have demonstrated that coal holds varying quantities of gases enclosed in it—the gases consisting mainly of mixtures of carbon dioxide, nitrogen, oxygen, and marsh gas (CH₄). The gases enclosed in the coal were obtained by placing it in suitable vessels and exhausting them by a Sprengel pump, and at the same time heating the coal at 100°C. (212° Fahr.); drawing off the released gases by the continual flow of mercury. An account was then given by the author of the results obtained by submitting to a similar process coal dust collected fresh from the screens. The dust was found to contain, like coal itself, gas occluded in it, and in considerable volume. The analyses of these gases indicated a general resemblance in composition to those obtained by Herr von Meyer, and further that the combustible portion of the gases consisted in all probability in part of hydrocarbons related to olefiant gas (C₂H₄) and of members of the series to which marsh gas belongs, similar to those forming the natural gas issuing from petroleum wells. The author thought that, as a coal dust from one source only had been examined, it would be premature to draw any general conclusions from the results obtained; and it is his intention to submit coal dusts and coals from different sources to similar examination. Should further investigations confirm the results obtained, the existence of gases enclosed in coal dust, together with the nature of the combustible portions of these gases, will, it is thought, aid in some measure to explain the influence of coal dust in colliery explosions.

THE WROUGHT-IRON PIPE INDUSTRY IN AMERICA.—There are 24 wrought-iron pipe works in the United States—1 in Massachusetts, 2 in New York, 14 in Pennsylvania, 1 in Delaware, 1 in West Virginia, 2 in Ohio, and 3 in Illinois. Of the 14 in Pennsylvania, 6 are in Pittsburgh. All the others are in the eastern part of the State; 4 being in Philadelphia. The growth of this industry has been remarkable during recent years; and it now consumes a substantial proportion of iron produced. This kind of pipe is used in America for purposes not dreamed of a few years ago; and the promise is that it will occupy a still wider field. Originally made

for conveying water, steam, gas, oil, &c., it is now also employed in the construction of cars, for railing and fencing, and in numerous other ways.

A NEW CREOSOTE LAMP.—There has recently been introduced a new lamp which will compete with those already in use for the burning under pressure of inferior oils. The principle of the apparatus is that compressed air is used to effect the combustion of the oil only for a short time after the lamp is lighted. A coil placed over the flame serves to generate steam wherewith the pressure is supplied. The lamp is thus, excepting at the commencement of operations, self-acting.

A LARGE IRON RESERVOIR.—The largest iron reservoir ever constructed in America is that for Malden, Massachusetts. The city has made a contract with the Cunningham Iron-Works Company, of Boston, for the sum of \$20,940, to build a wrought-iron reservoir to contain 1,158,000 gallons of water. It will be 75 feet in diameter and 35 feet high, and be formed of plate iron ¾-inch in thickness, and a tensile strain of 50,000 lbs. per square inch of section. The weight of water when the reservoir is full will be about 4344 tons.

THE DINSMORE GAS PROCESS.—We are asked to state that the illustrated description of the Dinsmore gas apparatus which appeared in our "Register of Patents" last week (p. 764) does not show the final arrangement of the plant as now in operation at the Widnes Gas-Works. The design contained in patent No. 15,852, of which we gave an abstract, was only an experimental one; and the Dinsmore Company have, we understand, since developed the invention, and taken out further patents (which will shortly be published) to make it suitable for gas manufacturing purposes.

PROPOSED ELECTRIC LIGHTING OF THE MANSION HOUSE.—At the meeting of the Court of Common Council last Thursday, Mr. J. Judd moved to refer to the General Purposes Committee the consideration of the best means of lighting the Mansion House by the electric light, with power to obtain tenders and estimates for the necessary works, and to submit them to the Court. For the purpose of their inquiry, the Committee were to be authorized to expend a sum "not exceeding twenty guineas." This was approved, after a protest from Mr. Morton, that the expenditure was "useless and wasteful."

AMERICAN GASLIGHT ASSOCIATION.—Mr. George Shepard Page, who, it will probably be remembered, was on a visit to this country at the time of the last meeting of The Gas Institute, as representative of American associations of gas managers, has sent us, under date of the 24th ult., the following brief notice of the recent meeting of the above-named Association, reference to which was made in our columns last week:—"The sixteenth annual meeting of the American Gaslight Association has just concluded its session at Toronto, Canada. During nearly all the years since its organization, we have been largely aided in our deliberations by the contributions of our friends on the other side of the border—Mr. H. W. Pearson, Secretary and General Manager of the Consumers' Gas Company of Toronto; Mr. F. W. Gates, President, and Mr. T. Littlehales, General Manager, of the Hamilton (Ontario) Gas Company; Mr. R. Baxter, General Manager of the Halifax Gas Company; Mr. J. F. Scriver, Manager of the Montreal Gas Company; and D. H. Geggie, Manager of the Quebec Company. It was therefore high time that the Americans crossed the border. It would be impossible to say too much in praise of the efficient management by the Committee of Arrangements, or of the great hospitality of the Consumers' Gas Company and the citizens of Toronto. Great surprise was expressed by many Americans who had never before visited Toronto at the extent, prosperity, and enterprise of this great city. Its public buildings and private residences would do credit to any metropolis of the Old or the New World. But the greatest astonishment was experienced during the inspection of the magnificent new works of the Consumers' Gas Company, now nearly completed. They will not be surpassed in any country. A splendid banquet was tendered to the members of the Association by the Consumers' Gas Company. The menu card that was prepared for the occasion contained some amusing and unique designs, the work of a young native Canadian artist. Regret was expressed that the meeting had not been honoured by the presence of a delegation from The Gas Institute. The following officers were elected for the ensuing year:—President—Mr. A. B. Slater, Treasurer and General Manager of the Providence (R.I.) Gaslight Company. Vice-Presidents—Mr. Emerson M. Millin, Vice-President and Engineer of the Columbus (Ohio) Gas Company; Mr. J. P. Harbison, Treasurer and General Manager of the Hartford (Conn.) Gas Company; and Mr. W. H. White, Gas Engineer, of New York. Members of Council—Mr. W. H. Pearson, Secretary and General Manager of the Consumers' Gas Company of Toronto (Canada); Mr. T. Turner, President and Engineer of the Charleston (S.C.) Gas Company; Mr. G. G. Ramsdell, Treasurer and Manager of the Vincennes (Ind.) Gas Company; Mr. A. B. Boardman, General Manager of the Macon (Georgia) Gas Company; Mr. W. Cartwright, Engineer of the Oswego (N.Y.) Gas Company; Mr. C. W. Blodget, Secretary of the Williamsburgh (N.Y.) Gas Company; and Mr. R. E. Chollar, Manager of the Topeka (Kansas) Gas Company. Secretary and Treasurer—Mr. C. J. R. Humphreys, General Manager of the Lawrence (Mass.) Gas Company. The next annual meeting is to be held at Baltimore (Maryland), in October, 1889. A large number of new members were elected."

Technical Record.

MIDLAND ASSOCIATION OF GAS MANAGERS.

The Thirty-third Quarterly Meeting of this Association was held, on Thursday, the 18th ult., at the Grand Hotel, Birmingham. The PRESIDENT (Mr. Henry Hack, M. Inst. C.E., Engineer of the Saltley works of the Birmingham Corporation) occupied the chair, and there was a good attendance of members and friends.

The HON. SECRETARY (Mr. W. R. Cooper, of Banbury) read the minutes of the previous meeting, and they were confirmed.

ELECTION OF NEW MEMBERS.

The PRESIDENT proposed the election of the following gentlemen as members of the Association:—Mr. E. H. Millard, of Hinckley; Mr. J. C. Belton, of Wellington, Salop; and Mr. W. W. Hulse, of Longton.

Mr. TAPLAY seconded the motion, which was carried.

THE PROPOSED LECTURES ON GAS MANUFACTURE.

The PRESIDENT: Gentlemen—You will remember that at the last meeting in Birmingham, a Committee was appointed with reference to the matter of lectures on gas manufacture. They have since had the subject under consideration, and have seen Dr. Tilden, of Mason's College, and discussed the idea fully with him. He kindly stated that he believed the Governors of Mason's College would be willing to further the object as much as was in their power; and, subject to the approval of the members of the Association, he himself would in January next undertake to give a course of lectures upon the chemistry relating to gas manufacture. The Committee recommended that this offer be accepted. They believe the funds at their disposal will cover the cost of the lectures. I therefore beg to move—"That the recommendation of the Committee be approved, and that they be authorized to arrange terms and all other matters with Dr. Tilden."

Mr. W. NORTH (Stourbridge): In order that the matter may be discussed, I will second the motion.

Mr. H. TAPLAY (Stoke-on-Trent): In rising to move an amendment, I would remind the meeting that, when this subject was first discussed, it was decided that a professional man should be employed to give instruction to the members of the Association. This was slightly modified sometime afterwards, on the proposition of a member of the Council of The Gas Institute, that the funds to be employed for the purpose be thrown into the general funds of The Gas Institute. [A VOICE: No; not "thrown into the funds."] Well, the money was virtually to be voted for The Gas Institute.

The PRESIDENT: Voted for gas lectures.

Mr. C. HUNT (Birmingham): In conjunction with The Gas Institute, to be expended in this locality.

Mr. TAPLAY: As The Gas Institute will probably undergo serious revision, I desire to propose that the matter be left open for the present, and that the money for the lectures be not voted at this meeting. When the Institute is revised, and matters put straight, we may consider the whole matter again.

The PRESIDENT: I am bound to point out that the money has already been voted. You can propose that the matter be deferred, but not that it will be rescinded, without giving notice.

Mr. TAPLAY: I do not want to rescind it at the present time; but I simply wish the consideration of the expenditure of the money to be deferred.

Mr. V. HUGHES (Tipton): Is the money being expended in connection with The Gas Institute.

The PRESIDENT: It is not intended to be expended in connection with The Gas Institute.

Mr. HUGHES: Then it is not being spent in accordance with the resolution.

The PRESIDENT: It is not being expended at all at present.

Mr. HUGHES: To my mind, the resolution does not want rescinding, because it is a new scheme that is suggested by the Committee; and we may either accept or reject it.

The PRESIDENT: It is only carrying out the idea approved at a previous meeting. The lectures were to be entrusted to a local Committee; and this Committee has been formed by you.

Mr. HUGHES: And the funds of The Gas Institute were to assist us; but we are getting none.

The PRESIDENT: Not at present.

Mr. HUGHES: What I want is information on the subject. First it was proposed to have special lectures for ourselves; and then we had a scheme which was to be in connection with The Gas Institute. But now we have another proposal without The Gas Institute.

Mr. HUNT: I am sure that what the President intended to explain was that the first thing this meeting has to determine is whether we shall go on with the scheme in the present unsettled state of affairs with respect to The Gas Institute. Your Committee deliberated upon this point; and having regard to the fact that they were able to place before you a scheme on all fours with that which would in all probability have been adopted in conjunction with the Institute, and at a cost not exceeding the sum voted by the Association, they felt it to be their duty to put the matter in your hands. We have, however, no feeling at all on the subject. If you adopt the resolution, you will be doing precisely the work which was intended in conjunction with The Gas Institute; but it is for you to say whether we shall go forward alone, or postpone action for, perhaps, an indefinite time.

Mr. B. W. SMITH (Smethwick): The reason of this matter being

introduced to-day was that, in view of the unsettled condition of The Gas Institute at present, the Lecture Committee did not think it wise to defer it for another year. Hence they thought it better to bring forward some proposition for the meeting to discuss.

Mr. W. WINSTANLEY (Newcastle): Is it proposed that the lectures shall be in Birmingham only, seeing that some of the members come from Derby, North Staffordshire, Shrewsbury, and other places at a distance?

The PRESIDENT: The present recommendation is that the first course shall take place at Mason's College.

Mr. WINSTANLEY: Then I will second the amendment, as I think the lectures should be arranged to be given in different centres, so as to meet the requirements of members living at long distances from Birmingham, and who could not possibly attend if they are to be restricted to Birmingham only.

Mr. P. SIMPSON (Rugby): When the question of our balance was referred to, it was thought it would be a good thing to have an experienced man to give lectures to the Association; but when The Gas Institute took the question of technical education in hand, and proposed that courses of lectures should be given in different parts of the country, we thought it better to wait and see what they would do. As, however, things have taken the course they have, I do not think we should ignore the wishes of our members by passing the matter over. We considered it our duty to recommend that a lecture or lectures be given; and it was considered that we were only carrying out what was your wish, before the Institute recommended their proposal. We have no desire to work against the Institute. Considering the offer we had from so experienced an authority as Dr. Tilden, the Committee thought if they could arrange for a course of lectures in Birmingham, which is our centre, they would be meeting the wishes of the members.

Mr. TAPLAY: That may have been understood by the Committee, but not by the members. In my opinion, and that of members I have spoken to, with the assistance of The Gas Institute, we should have a lecturer for the members of the Midland Association. Well, now, the proposed lectures are not confined to the members of the Midland Association, but are to be open to students; and every one connected with gas-works could come in by paying a small fee. I did not look at the matter in that light, and did not understand it in that way at first. I thought it was proposed to have a series of lectures throughout the country, in centres where men in years could go and learn something. I take it that, as members of this Association, we do not want elementary lectures. If you have a lecturer who gives advanced views to a lad of sixteen, what good would that be to me? We want a man from whom we can learn something ourselves. Speaking personally, I am a little bit disappointed. I have no doubt the Lecture Committee have very fully weighed the matter; but I do not see what advantage the whole of the Association would get out of it. You take the Association's funds, and pay them to a lecturer for somebody else; and it may be made a whip for our own backs. I confine myself now to moving an amendment to defer the matter, and if necessary I will give notice that the resolution be rescinded at the next meeting.

Mr. HUNT: Allow me to correct Mr. Taplay. It was not intended by the resolution adopted at the meeting of The Gas Institute last time to provide lectures for members only. Members were to have the privilege of attending the lectures free; but it was not contemplated to exclude others, who were to be admitted on payment of a fee. In the proposal before the meeting, we should not be departing in the slightest from the original proposition submitted to The Gas Institute and discussed at the June meeting. It is on precisely the same lines as then laid down, and upon which the Institute Committee would now have been at work had they continued in existence.

Mr. TAPLAY: I accept Mr. Hunt's explanation; but the matter was not in the minds of the members generally in that shape.

The PRESIDENT: I admit that, at the last meeting in Birmingham there was at first some little doubt as to what was intended; but after the explanations given, I take it the members knew perfectly well what was proposed. Mr. Taplay has been speaking of the benefits of a lecturer for ourselves as compared with The Gas Institute scheme. They are, of course, two quite distinct things. I may say that it is proposed to have six lectures for a course; and no doubt one of them can be made to coincide with the date of the February meeting of the Association.

The amendment was then put and carried by ten votes to seven.

DISCUSSION ON MR. LEWIS'S PAPER.

The discussion on Mr. Lewis's paper—on "The Competition of Petroleum with Gas for Lighting Purposes"—deferred from the previous meeting at Bath, was next taken; and it will be reported in the forthcoming issue of the JOURNAL.

AN OFT-REPEATED QUESTION: ARE HIGH CARBONIZING TEMPERATURES CONVENIENT AND PROFITABLE?

Mr. C. TAYLOR (of Derby) then read the paper, bearing the above title, which was given in the JOURNAL for the 23rd ult. (p. 719).

The PRESIDENT: I am sure we are all indebted to Mr. Taylor for bringing this subject before us; and if we are able to agree with many of the things mentioned in the paper he has kindly read, we shall all, I think, disagree with the concluding remark "that the subject is probably wanting in interest." In my opinion it is one of the greatest interest that can be brought forward, to all engaged in gas manufacture; and I should think it will lead to an animated discussion. There may be a difference of opinion as to what really constitutes high heats and low heats. Mr. Taylor seems to define them as the difference between producing 9000 and 10,000 cubic

feet, presumably from the same coal. Upon this point the members may perhaps contribute their opinion during the discussion which I now invite.

Mr. W. NORTH (Stourbridge): The paper opens up such a wide subject, that I think it would be better if we could defer the discussion. The whole question of regenerative furnaces will come in; and with such a large subject, I should be sorry to see it disposed of in the short time still at our command.

Other members having expressed the same view, as there was some further business on the *agenda*, it was agreed to postpone the discussion.

THE REPORTS OF DISTRICT GAS ASSOCIATIONS.

Mr. C. MEIKLEJOHN (Oldbury) moved—"That the reports of District Associations be no longer supplied gratuitously from the funds of this Association." His notice of motion, he said, arose from the decision to devote £10 towards establishing a centre for gas lectures, and because this would entail a deficit of about the sum granted for these reports. He gave notice of the motion as it was very unwise to propose expenditure exceeding their income; and, secondly, because he considered the £10 could be expended in a much better way. He questioned if more than one-tenth of the members read the papers, except as they appeared from time to time in the *JOURNAL*.

The PRESIDENT said it was not intended to present the District Association reports to the members again, unless the Committee brought forward a recommendation to that effect.

Mr. HUNT stated that, owing to the unsettled state of The Gas Institute, the establishing of lecture centres had been postponed; so that the expenditure would not be incurred.

Mr. MEIKLEJOHN under the circumstances withdrew his motion.

ELECTION OF OFFICE BEARERS.

The PRESIDENT: The next business is the election of President for the ensuing year. I beg, on behalf of the Committee, to propose the election of Mr. Charles Taylor, of Derby, to this position for the ensuing year. We have known him a considerable time; and he has been a useful member on the Committee. He has been a valuable and tolerably regular attendant at our meetings, and has taken a fair part in our discussions. He is in every respect, I think, fully qualified for the honour the Committee recommend you to confer upon him.

Mr. CRANMER: I have pleasure in seconding the proposition.

The resolution was carried with applause.

Mr. TAYLOR: Mr. President and gentlemen,—In electing me to fill the office of President, I am sure I feel you have done me a very high honour. I am only afraid that, in following so able a President as Mr. Hack, I may fail to fulfil your expectations, and to administer the affairs of the Association as successfully as he has done. I thank you very sincerely and heartily for the honour you have done me.

Mr. SMITH proposed the re-election of Mr. P. Simpson, of Rugby, as Treasurer of the Association.

Mr. F. J. NORTH seconded the motion, which was unanimously agreed to.

Mr. SIMPSON said he was much obliged to the members for their continued confidence. They were getting very rich, and ought to have someone they could trust. (Laughter.) However, he would do his best, as they wished him to continue in office.

The PRESIDENT said he was sorry to announce that Mr. Cooper felt himself no longer able to carry on the duties of Secretary. He was exceedingly unwell in February last, and felt he could not go on to the end of the year; but with the offer of help made to him, he had consented to do so till the present annual election of officers took place.

Mr. W. NORTH proposed that Mr. J. S. Reeves, of Bilston, be elected to the office of Honorary Secretary.

Mr. J. WARD (Brierley Hill) seconded the motion, and it was carried unanimously.

The PRESIDENT observed that there were three members to elect to serve on the Committee, including one to take the place of the new Secretary. He moved the election of Mr. Cooper (Banbury), Mr. Littlewood (West Bromwich), and Mr. Bell (Stafford).

Mr. WINSTANLEY seconded the motion which was agreed to.

On the motion of the PRESIDENT, seconded by Mr. HARRIS, Mr. W. T. Tew, of Warwick, and Mr. J. T. Lewis, of Wellingborough, were elected Auditors.

VOTES OF CONDOLENCE.

Mr. W. NORTH: We have to mourn the loss of two members of the Association during the year—Mr. Collett, of Dudley, and Mr. J. H. Smith, of Sutton-in-Ashfield. It has been suggested that letters of condolence be sent to the friends of these deceased members; and I move that this be done.

Mr. SIMPSON seconded the proposition, which was unanimously carried.

VOTES OF THANKS TO THE PRESIDENT.

Mr. TAYLOR: I beg to move a vote of thanks to the retiring President for the services he has rendered to the Association during the past year, which is the second year of his presidency. I have a very high opinion of Mr. Hack, who has been as successful as he has been earnest in his efforts on behalf of the Association. I hope we shall, at no distant day, again see him in the position he has filled so well. I have great pleasure in proposing a very cordial vote of thanks to Mr. Hack.

Mr. H. WOODALL (London): I beg to second the resolution. It would be impossible to find a better man for the position he has held than Mr. Hack. He has all the qualifications which go to

make a chairman. His urbanity is known to all; and he is particularly fitted for office by his care in all matters coming before him. If I want exact information, I do not know where I could go for it better than to him.

The resolution was carried, with acclamation.

The PRESIDENT: Gentlemen,—I thank you most sincerely for the kind and hearty vote of thanks you have accorded me on the termination of my office to-day. When I entered on the post two years ago, I had great misgivings as to my fitness to occupy it; remembering the ability of those who had filled it before, and that some of them had also so ably occupied the similar, yet more important, position in The Gas Institute. In deference, however, to your kind wishes, I accepted the honour; and though I may not have come up to your expectations, I can conscientiously say that I have endeavoured to discharge the duties in a satisfactory manner. I hope that the kindness and support I have received from you at our meetings and at all times will be extended to my successor.

POSITION OF THE GAS INSTITUTE.

Mr. SIMPSON: I ask the President just to allow me a minute or two. I am glad to see representatives from the Council of The Gas Institute here; and as we are at present members of the Institute, I would ask if they would put something before us, before we pay another guinea, as to what steps are to be taken to rectify the existing state of things. Something should be done, or some may cease to be members before any vote is taken.

Mr. WOODALL: I am sure you will all sympathize with me in the position in which I am placed. It is simply a policy of reticence which is being pursued by myself and other members of the Council up to the present. But it is, I think, more than ever desirable that every member of the Institute should continue to pay his subscription and continue on the list of members. I can scarcely say more than that. The Council meet in November; and I have no doubt our policy will be put before the members then. I do not think it is desirable I should be drawn out to say more than this now.

THE RETIRING SECRETARY.

Mr. W. NORTH, in moving a vote of thanks to the retiring Secretary (Mr. Cooper), said that, with all respect to the gentleman elected, he wished they could have kept Mr. Cooper in office longer. They owed him their thanks for his services during the past two years; and knowing himself what the work was, he had much pleasure in proposing a vote of thanks to Mr. Cooper for what he had done.

The PRESIDENT seconded the motion; remarking that it would be a great omission not to give Mr. Cooper a hearty vote of thanks. Mr. Cooper had been a right hand to him during his own term of office; and he could fully understand the demands made before him.

The motion was carried, with applause.

Mr. COOPER heartily thanked the members for the kind vote they had passed in his favour. He said he took the office of Secretary because there was then a little difficulty about it; but he had had a most excellent President to work under, and he had perhaps sometimes taken the liberty of dictating as a kind father would. (Laughter.) They had all worked together most harmoniously; and his two years' service had been a pleasure to him. He declined the office again, not because he was afraid of work, but because of being overworked; and he explained that public work in Banbury as well as his professional work fully occupied him. Mr. Reeves would, he believed, find the same help and indulgence which he had received in holding the office.

This concluded the business of the meeting.

IMPROVED PUBLIC LIGHTING IN WHITECHAPEL.—Since the perpetration of the outrages at Whitechapel, to which reference was made in the *JOURNAL* for the 9th ult., the Works Committee of the District Board have had under consideration the necessity for improving the lighting of the district. At the last meeting of the Board, the Committee recommended a number of alterations in the arrangements of the lamps and burners at certain places where more light is urgently needed; and they were all agreed to.

ELECTRIC LIGHTING IN BERLIN AND VIENNA.—The correspondents of *Industries* in Berlin and Vienna give glowing accounts of the progress of electric lighting in these cities. The representative of our contemporary in the former city says that the work done by the Edison Company there is so good, that the public and the municipal authorities have perfect confidence in their ability to extend their central station work still further; and a concession has been given to the Company for the establishment of two new stations—one in the centre of the town and the other in the south-east quarter, where most of the engineering works and other factories are situated. Both stations must be ready within two years; and each must be able to supply current for 6000 glow lamps burning simultaneously. The station in the centre of the town will eventually be increased to a capacity of 24,000 lamps, and the other station will be increased to 12,000 lamps; the annual increase to be not less than 6000 and 8000 lamps respectively. In view of this extension of their business, the Edison Company propose to increase their share capital at present by £150,000, and later on by £300,000. In Vienna, all the public buildings will soon be lighted by electricity. For the contract for lighting the Houses of Parliament all the principal Austrian electric lighting engineers tendered. The order has been obtained by Messrs. Siemens and Halske. The new Town Hall is also to be lighted electrically by the 2nd prox.—the day of the Emperor's Jubilee.

GASEOUS FUEL.

By J. EMERSON DOWSON, M. Inst. C.E., &c.

[A Paper read before the British Association at Bath, Sept. 8, 1888.*]

At the York meeting of the Association in 1881,† I had the privilege of explaining for the first time, an apparatus with which I had succeeded in making a cheap fuel gas; and I gave the economical results of working some gas-engines with it. Since then I have gained a much wider experience in connection with this subject; my apparatus has been considerably improved; and the gas made in it has been much used, not only for driving engines, but for heating in many industrial processes. I propose, therefore, to give a short account of the development which has taken place, and of some of the more important results obtained.

Like other generator gas, mine is made by passing steam and air through incandescent fuel; and gas so made can be taken direct from the generator and burnt in a furnace without being purified or cooled. For such work large flames are used; and it is comparatively easy to deal with them. When, however, the gas is required for a gas-engine or for small burners, the conditions are very different. The gas must be clean, or troublesome deposits will occur in the pipes and cocks; and it must pass through a gasholder to ensure uniformity of pressure in the distributing pipes. It must also be cool; and this is especially the case for gas-engines, as, within certain limits, the cooler and denser the gas, the greater is the energy in the limited volume which can enter the cylinder. It is also essential that when small jets of gas are used, as in small burners, the gas should be fairly strong and of uniform quality, or the flames will not burn steadily. To anyone accustomed to the manufacture of ordinary lighting gas, these remarks, may, perhaps, seem too elementary; but it should be remembered that generator gas is usually required in considerable quantity, and that, to avoid large gasholders, it should be made as quickly as it can be consumed. In one case I have had to provide plant to make gas at the rate of a million cubic feet per day, or about 90,000 cubic feet per working hour; and, without extensive appliances, the cooling and cleaning of so large a volume of gas is not so simple as it may at first sight appear.

The original invention dealt with the generator only; but I have since found it necessary to devise a complete set of gas plant, to meet the requirements of practical work. In nearly all cases it is important that the apparatus should occupy as little room as possible; and the accompanying illustrations show the arrangement usually adopted. The steam-boiler is small, and specially made with a superheating coil, so that dry steam enters the generator. The gas from the generator passes through water in the washer, and then through a scrubber containing coke moistened by water. The scrubber is placed inside the gasholder tank, so as to occupy as little space as possible. The rise and fall of the gasholder is made to regulate the supply of steam to the injector; so that to a certain extent the production of gas can be regulated automatically to suit a varying rate of consumption. In some special cases the gas is passed through oxide of iron, to remove all traces of sulphuretted hydrogen; but for general purposes chemical purification is not necessary. The whole is very compact; and a plant large enough to drive an engine of 50 indicated horse power occupies a ground space of only 9 feet by 10 feet. I have always taken the view, and it has been confirmed by practice in many places, that when the consumption of gas is regular there is no need for a large

holder, provided the generator is well able to make gas at the maximum rate of consumption. In the case of engines, for instance, the gas plant is to the gas-engine what the boiler is to the steam-engine; and it is no more necessary to have a large reserve of gas than to have a large reserve of steam.

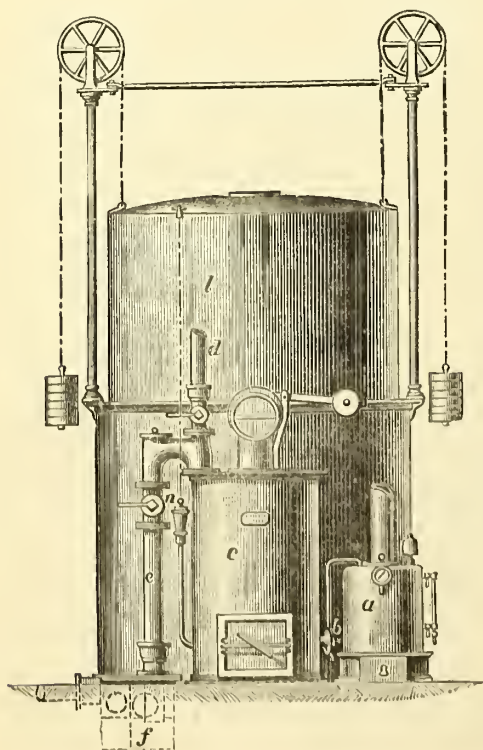
As regards the composition of the gas, it necessarily depends somewhat on the quality of the coal used, and on the fuel column being kept deep enough to ensure a reduction of the carbonic acid. It has been analyzed independently by Professor W. Foster and others; and, roundly speaking, the gas now made has the same composition as that made some years ago. I then thought that possibly in a large generator, containing a great mass of fuel at a high temperature, the percentage of hydrogen might be increased and that of the carbonic acid reduced. Trials since made have, however, shown that the average composition is much the same, whether the gas be made at the rate of 1000 cubic feet per hour in a small generator, or at the rate of 15,000 cubic feet per hour in a large one. In 1881 I stated that for gas-engines it was then necessary to use 5 volumes of the generator gas for 1 volume of ordinary lighting gas, to develop the same power. Theoretically, the comparative explosive force of the two gases is as 3·8 : 1; and it was evident that so long as practice required 5 to 1, the weaker gas was not being used to the best advantage. Since then some important modifications have been made in the "Otto" gas-engines; and I am glad to say that it is now necessary to use only four volumes of the generator gas. On this point, therefore, theory and practice are now fairly in accord. By calculation, the calorific power of 100 litres (3·53 cubic feet) of an average sample of the generator gas is 143,213 units of heat; while that of 100 litres of ordinary 16-candle power lighting gas is 569,264 units. Tests made with a calorimeter and in other ways confirm these figures approximately.

In 1881, only one engine of 3½-horse power had been worked with this gas; and this showed a consumption of 1·46 lbs. of coal converted into gas per indicated horse power per hour. Since then a large number of engines have been worked with it—one indicating over 80-horse power; and many independent tests have been made. Details of these will be found in a paper of mine contained in the Proceedings of the Institution of Civil Engineers for last year; * and on the present occasion it will be sufficient to give a few instances only. For more than four years Messrs. Crossley Bros., the English makers of the "Otto" engines, have used this gas exclusively at their works for an average of about 150-horse power; and, after a careful trial extending over 35 weeks, they found that the fuel consumption averaged only 1·3 lbs. per indicated horse power per hour, including all waste and the coal burnt in the generator every night and during Sunday (112 hours per week), when the fire was alight although there was no work. At the time of this trial, the construction of the generator rendered it necessary to draw the fire every two or three weeks to remove the clinkers adhering to the fire-brick lining. Since then I have altered the generator, so that when the fire has once been lighted, it need never be drawn. One of these generators has now been running continuously for upwards of a year; and Messrs. Crossley estimate that this saves about 20 tons of coal per annum. It is also worthy of note that at these large works, owing to the use of gas, there is no chimney except for the blacksmith's shop. The returns sent me by eleven users of "Otto" engines working regularly in different places, and each averaging 35-horse power,

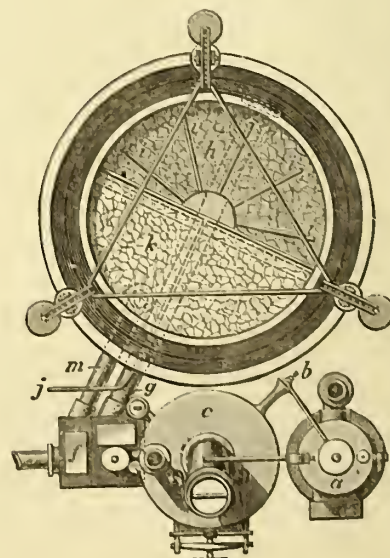
* An abstract of the paper was given in the JOURNAL for Sept. 18 (p. 507).

† See JOURNAL, Vol XXXVIII., p. 472.

* An abstract of this paper appeared in the JOURNAL for Aug. 23, 1887 (p. 369).



- a. Steam producer and superheater.
- b. Injector.
- c. Gas generator.
- d. Chimney and waste pipe.
- e. Down pipe conveying gas to hydraulic box.
- f. Hydraulic box.
- g. Inlet-pipe of gasholder.
- h. Wet scrubber.
- i. Water-spray pipes.
- j. Water-supply pipe.
- k. Dry scrubber.
- l. Gasholder.
- m. Outlet-pipe of gasholder.
- n. Steam and air escape valve.



also show an average fuel consumption of about 1·3 lbs. per indicated horse power per hour. Messrs. Ibotson, of the Colnbrook Paper-Mills, were supplied with a single-cylinder "Otto" engine to indicate about 45-horse power with this gas, on the guaranteed condition that the engine and gas plant could be worked continuously day and night, and that the fuel consumption should not exceed 1½ lbs. per indicated horse power per hour. A trial was made extending over two weeks—the engine being indicated day and night at frequent intervals; and the result showed that the guarantee was, in all respects, fulfilled. The "Otto" engine makers in Germany have made exhaustive trials with this gas in connection with several of their engines, and have fully confirmed the results obtained by Messrs. Crossley in this country. Professor K. Teichmann, of the Royal Technical School of Stuttgart, and Mr. F. Böcking, Chief Engineer of the Rhenish Society for examining steam-boilers, made a joint test of a twin-cylinder "Otto" engine worked with this gas. The engine developed a brake power of about 52-horse power; and the total fuel consumption, including that used for the superheating boiler, was 1·6 lbs. per brake, or barely 1·3 lbs. per indicated horse power per hour. Professor Witz, of Lille, a well-known scientific authority on the gas-engine, has tested two Delamare-Debouteville engines worked with this gas—one of 9-horse power, and the other of 25 effective horse power. The first trial gave a consumption of 89 cubic feet of gas, equal to 1·33 lbs. of coal per brake horse power per hour. I have not exact particulars of the second trial; but I understand from the maker of the engine (Mr. Thomas Powell, of Rouen) that the result was even more favourable. Seeing that all these results have been obtained under practical working conditions, the record is certainly satisfactory; and I am pleased to add that I have also many letters testifying to the ease with which the gas plant can be managed. This is an important point; for if the saving of fuel could only be effected in a complicated way, the apparatus could not be generally adopted. The total number of engines already made to work with this gas is 71; and the aggregate horse power is 2390, or an average of nearly 34-horse power each.

I consider myself justified in saying that gas power is now fairly launched in competition with steam power; and, to my mind, there are reasonable grounds for supposing that eventually the former will, to a great extent, supersede the latter. In this view I am confirmed by the late Professor Fleeming Jenkin, who, in his lecture at the Institution of Civil Engineers on "Gas and Caloric Engines," remarked: "Since theory shows that it is possible to increase the efficiency of the actual gas-engine two or even three-fold, then the conclusion seems irresistible that gas-engines will ultimately supplant steam-engines. The steam-engine has been improved nearly as far as possible; but the internal-combustion gas-engine can, undoubtedly, be greatly improved, and must command a brilliant future." It has been proved that the absolute efficiency of the gas-engine—i.e., the ratio between the indicated horse power and the total quantity of heat generated by the fuel per minute—is already about double that of the best steam-engine. As regards the mechanical efficiency—i.e. the difference between the gross indicated power developed in the cylinder and the effective power given off on the brake—in the condensing steam-engine it is taken at about 80 per cent., and in the non-condensing engine at about 85 per cent. In the gas-engine, I showed, in my paper at the Institution of Civil Engineers before referred to, that the average of several samples given was about 84 per cent. The "Otto" and other compression engines are of comparatively recent invention; and it is fair to assume that further improvements will yet be made, as the principles on which they should be based are now well understood. An important modification, for instance, has only recently been made in the "Otto" engine—the slide-valves being entirely dispensed with.

We have seen that the results already obtained with this generator gas are good; but I cannot help feeling that still better ones can and will be obtained when the engine is really designed to give the best effect with a gas of this kind. It is well known that in the "Otto" engines each new charge of gas is diluted with a portion of the products of combustion from the previous charge; and, for reasons I need not discuss, this answers very well with ordinary lighting gas. But, as generator gas such as mine has only about one-fourth the explosive power of the other gas, it is a disadvantage to dilute it with products of combustion. Sooner or later this point will, no doubt, receive due attention, especially as the economical use of gas-engines of high power must depend on their being worked with cheap gas. Looking to the probable extension of gas power, it is, in fact, most important that the best possible engine should be made for the fuel gas.

For gas-engines as now made, it is important that the generator gas should be as clean and free from sulphur compounds and ammonia as ordinary lighting gas. With this in view, the best fuel to use is anthracite, as it does not yield tar or other condensable products, which foul the pipes and valves. It is also suitable because it does not cake, and because it makes a dense fire free from holes. Good qualities of anthracite yield but a small percentage of clinker and of sulphur compounds, and no ammonia. With some special precautions, ordinary gas coke can also be used. The quality of gas coke varies, however, very much in different localities; and this is doubtless due, in some measure, to the different kinds of coal from which the coke is made, but also to the varying heats to which it is subjected in the retorts of different gas-works. Some coke yields very large quantities of clinker, and is quite unfit for use in such an apparatus as mine. Other samples yield less clinker; but, owing to the comparatively

low temperature to which they have been subjected in the retorts, they retain hydrocarbonaceous bodies, which vaporize in the generator, and are afterwards troublesome to remove from the gas. As before mentioned, these difficulties are not met with when the hot generator gas can be taken direct to a furnace; but when it is necessary to cool and clean the gas (as for engine work), special precautions must be taken.

Several trials have shown that when the gas apparatus is worked with anthracite, the actual fuel consumption is about 13 lbs. per 1000 cubic feet, including that used for producing the steam required; but, to cover all sources of waste, as well as inferiority of quality, I usually allow 15 lbs. per 1000 cubic feet passed into the holder under ordinary conditions of temperature and pressure. On this basis the yield of gas is a little over 149,000 cubic feet, or, allowing for the presence of 50 per cent. of nitrogen and carbonic acid, say 74,500 cubic feet of combustible gas per ton of fuel consumed.

To determine the working cost of a gas-engine driven with this generator gas compared with a steam-engine and boiler, the more simple and direct way is to take in each case the weight of fuel used per horse power per hour, as it is no more necessary to determine the volume of gas consumed than it is to know the volume of steam used. We have already seen that with this gas the fuel consumption of several "Otto" engines doing practical work in different places averages only 1½ lbs. per indicated horse power per hour. The wages of the attendant, the cost of repairs, and the other working expenses, are about the same as with a steam-engine of equal power. The great difference is in the consumption of fuel; and, to make an exact comparison, I have taken the returns last published by the Manchester Steam Users' Association for all engines indicating under 100-horse power for which the net fuel consumption is given. The details of these returns will be found in Appendix II. of my paper read before the Institution of Civil Engineers; and from these it appears that the average fuel consumption is 7 lbs. per indicated horse power per hour. If, however, an average be taken of five engines, each indicating 20-horse power, the fuel consumption will be over 11 lbs. per indicated horse power per hour. It is instructive, too, to note what Sir Frederick Bramwell said on the fuel consumption of steam-engines in actual work, in his address (January, 1885) as President of the Institution of Civil Engineers. He said: "In an investigation instituted last year by the Corporation of Birmingham, when considering whether they should approve of a proposal to lay down power-distributing mains throughout their streets, it was found on indicating some six non-condensing steam-engines taken indiscriminately from among users of power, and ranging from 5 up to 30 nominal horse power, that the consumption in one instance was as high as 27·5 lbs., while it never fell below 9·6 lbs.; and the average of the whole was as much as 18·1 lbs. per indicated horse power per hour."

It is quite true that in competitive trials at the Royal Agricultural Society's shows, the fuel consumption of the best portable engines, working under the most favourable conditions for a short time, is slightly below 2 lbs. per indicated horse power per hour; but this result can only be obtained by the most careful "nursing" of the fire by highly-paid skilled attendants, who salt the fire—so to speak—with a slight sprinkling of coal at very frequent intervals. In any case, we may safely say that, with gas power, the fuel consumption, under ordinary working conditions, is at least 50 per cent. less than with non-condensing steam-engines of equal power. With gas there is the further advantage that it can be conveyed to any part of the works without appreciable condensation; that separate engines can be used for different lines of shafting; and that any department working overtime can have its engine supplied with gas from a single generator. With steam, however, there is much condensation, if it is carried far, and much loss of fuel if a large boiler has to be fired to keep a small amount of shafting at work.

I have so far confined my remarks chiefly to the application of improved generator gas to motive power; and there is no doubt that the recent departure in this branch of mechanical science is one of great importance. I am, however, glad to add that a considerable advance has also been made in the use of this gas for heating of various kinds. At the Gloucester County Asylum it has been in daily use, for a variety of purposes, for about five years. All the kitchen work for the staff and inmates is done with it; and there is no ordinary fire in the kitchen. About 300 quartern loaves are baked with the gas every day, at a cost of about 1s. only for fuel. The gas is also employed for two 12-horse power (nominal) "Otto" engines, which pump water and drive a dynamo for electric lighting. The average cost of the gas is about 2d. per 1000 cubic feet, including wages, repairs, and all incidental expenses, or about 8d. for the equivalent of 1000 cubic feet of ordinary lighting gas. The anthracite costs about 13s. per ton. This gas is used on a large scale at the cocoa-works of Messrs. Van Houten and Son, of Messrs. Cadbury Bros., and of Messrs. Russ-Suchard and Co. Careful trials at the first-named works showed that the cost was under 1½d. per 1000 cubic feet or only 6½d. for the equivalent of 1000 cubic feet of the town lighting gas, with which comparative tests were made. The anthracite costs 16s. per ton. [The author gave the names of other firms who use the gas for industrial purposes.]

This gas is also used for melting type-metal, for heating bat-forms, and for other work in a hat manufactory. It has also been adopted for glass-blowing in an electric lamp factory, and for many other industrial purposes. I have, however, mentioned enough to

show that gas of this kind can be, and has been produced and applied successfully; and there is every reason to believe that its use will extend, especially as the gas-making apparatus is easy to work. I am not at liberty to state the annual saving effected by several firms who use the gas; but it is very considerable. The cost of the gas somewhat depends on that of the fuel and on the scale of working; but, speaking generally, the equivalent of 1000 cubic feet of ordinary lighting gas costs from 6d. to 1s. Compared with solid fuel, gas has certainly many advantages. It is under complete control; the heat derived from it can be kept constant or varied at will; it is comparatively easy to ensure complete combustion with but little chimney draught; it is more economical; and there is an entire absence of smoke. When solid fuel is used, it is necessary to introduce more than twice the quantity of air theoretically required for combustion, in order to drive away the products of combustion and to ensure a sufficiency of oxygen being brought into contact with the surfaces of the fuel. This large supply of air can only be drawn in by a strong chimney draught or other artificial means; and this causes a very rapid withdrawal of heat from the fire. Further than this, there is invariably some escape of smoke and partially burnt carbon in the form of carbonic oxide.

It is admitted that there is a demand for fuel gas; but for many purposes the ordinary lighting gas is too expensive, and the mere fact that it is made for lighting renders it so expensive. The percentage of illuminating constituents in coal gas is, indeed, very small; 20-candle power gas containing about 6½ per cent. and 16-candle power gas, as in London, containing only about 4 per cent. The remaining 93½ per cent. or 96 per cent. is composed of non-luminous heating gases; and the addition of the small proportion of illuminants adds greatly to the trouble and cost of producing the gas, and any great reduction of its present cost is improbable. It is therefore rational to suppose that for fuel purposes the lighting constituents should be dispensed with.

Assuming that we have a good and cheap fuel gas, there remains the question of how to apply it advantageously to whatever has to be heated; and here, I regret to say, difficulties often present themselves. It is one thing to have a combustible gas, but quite another to find suitable apparatus to be heated with it. Take, for instance, the case of a circulating boiler for heating a building. There is not one suitable for gas. There are a very few very ingenious little boilers for heating a small quantity of water; but as it would be too costly to heat a large one with town gas, there has hitherto been no inducement for boiler makers to trouble about a large size. In fact, the pioneer of gaseous fuel not only has to provide the gas, but in most cases he has also to devise the means of using it for the different purposes required. I have often been asked if generator or water gas can be used economically for heating ordinary steam-boilers; and I have always been obliged to answer in the negative. I have seen examples of nearly all the water-gas plants used in the United States and elsewhere, and I am aware that several attempts have been made to heat boilers with gas of this kind; but, so far as my knowledge goes, none of them have been successful from an economical point of view. In the first place, if the flames come in contact with the comparatively cool surface of the boiler, there is such a rapid withdrawal of heat that some of the gas does not attain the temperature necessary for its combustion. In the next place, there is no overlooking the fact that there must be a considerable loss of heat when the incandescent mass of fuel is enclosed in a gas generator, away from the boiler, instead of being on a grate within, or immediately under the boiler. I venture to think that the true solution of this important question is to be found in the production of gas within the boiler itself, and not in a separate apparatus. The mass of incandescent fuel would then assist, by conduction and radiation, in heating the boiler.

Reviewing the subject generally, I think it will be admitted that if the progress made has not been rapid, it has at least been sure; and, judging by experience gained in several countries, I find that more attention is given to gaseous fuel every year. It is a subject, too, that is now much better understood technically than it was only a few years ago; and my belief is that every year will see gas more largely used. Speaking more particularly of my own contribution to the subject, it is only right that I should acknowledge my indebtedness for the encouragement I met with when I read my first paper on the subject in 1881. It has often occurred to me since that my own experience in this respect may be taken as a fair illustration of one of the practical advantages of the British Association mootings to a beginner, whose success must depend to a great extent on the help he derives from useful criticism and advice.

Register of Patents.

CLEANING OR SEPARATING AMMONIACAL LIQUOR AND OTHER MATTERS FROM TAR.—Kriyenbnhl, J. G., Petersen, H. C., and Bruneister, C. C., of Copenhagen. No. 15,067; Nov. 4, 1887. [8d.]

This invention relates to the cleaning or separating of ammoniacal liquor and other matters from tar by a process so conducted as to render the tar fit to be used in tar distilleries or for technical or other purposes. The tar (containing ammoniacal liquor and other matters) is conducted into a tank so constructed that the tar leaves it at the pressure and temperature necessary for further treatment and allowing the ammoniacal liquor that may be separated to be taken off. The temperature for the tar in this vessel should be about 45° Celsius (113° Fahr.); but will, of course, vary with the different tars.

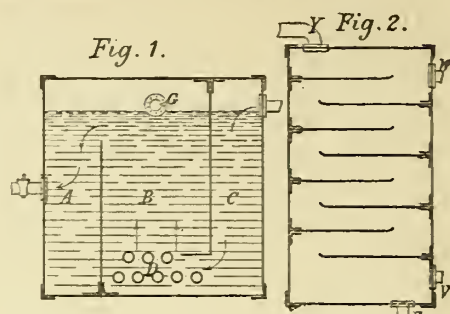


Fig. 1 represents a tank suited for the purpose. It is divided into compartments A, B, and C, with passages for the tar under one partition and over the other. The tar enters at the right, and passes down the compartment C under one partition, and between the steam coil D (by which the needful temperature is obtained), then up through the compartment B and over the other partition, and out at the left. G is an overflow-pipe, which maintains the level of the tar in the tank, and serves also to carry off the ammoniacal liquor therefrom. The tar passes out rid of part of the ammonia water, and is transferred into the revolving drum of a centrifugal machine or separator, which may be ordinary apparatus of this kind, but is preferably arranged as hereafter described. The tar has thus separated from it the ammoniacal liquor, which is drawn off from the drum through one pipe or outlet; whilst the pure tar is drawn off by another one.

In this treatment much of the impurities contained in the tar come against the wall of the drum, and may be removed by a special tube or outlet inserted for this purpose, or by making one of the other outlet tubes moveable from its normal position. If it be desired, however, that these impurities should remain in the tar, the revolving drum of the centrifugal machine may be so constructed that they are continuously drawn off along with the tar. Either before or after the treatment in the separator, the tar can be washed systematically with water, so that all the ammonia hydrate and other soluble matter is washed out; and, if desired, any water left from this process may be removed by subsequent treatment of the tar in the centrifugal machine.

A suitable washing vessel is shown in fig. 2. It is divided by horizontal plates, with passages past them alternately at opposite sides of the vessel. The tar enters at Y, and runs down over the plates, and leaves at the outlet Z. The water enters at V and leaves at W; so that the flow of the tar and water are in reverse directions.

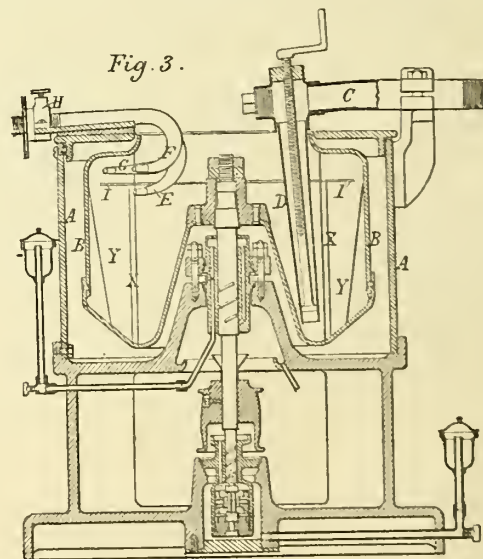


Fig. 3 represents in vertical section a centrifugal machine or separator suited to the purposes of this invention. A is the outer casing, and B the revolving drum. C is the pipe and D the conical nozzle, through which the tar is fed into the drum B. There is a screwed rod, having at the bottom a valve to close, open, and regulate the passage through the conical nozzle; the rod being provided with a turning handle. When the machine is in operation, the ammonia water takes a position inward of the tar, as indicated at X and Y; X showing the ammonia water and Y the tar. The ammonia water is drawn off by the tube E; the tar being drawn off by the tubes F and G. When the machine is in full operation, these tubes are adjusted on the slide H, so that their inlet orifices are at the distance from the machine shown with regard to the tube F. Occasionally the tube G is screwed to the position shown in the illustration to draw off through it the layer of refuse and dirt which accumulates on the walls of the drum; and whilst this is being effected, only a small quantity of tar is fed into the drum. When the dirt is removed, the tube G is moved back, and fixed in a position like that of F, and the supply for tar to the drum is opened. The annular plate I should be fixed at a lower elevation (as shown) than is the case with ordinary centrifugal machines or separators.

GAS-ENGINES.—Sturgeon, T., of Ilkley. No. 16,309; Nov. 28, 1887 [8d.]

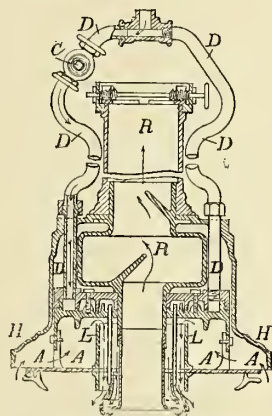
In patent No. 8879 of 1885, there is described a gas-engine having two pistons working in a cylinder, and in which the charge of mixed gas and air is ignited under compression between these pistons; the charge being supplied by means of another piston working in a cylinder at right angles to the working cylinder. The present patentee finds, however, that in small engines where the total amount of gas used is so slight that it is not so necessary to study economy in this respect, and where it is more essential to keep down the first cost, one of the

pistons in the working cylinder may be dispensed with, together with the beam and crank and other parts appertaining to it.

The present invention, therefore, consists in constructing a gas-engine as follows:—A working cylinder and a charging cylinder are used, placed at right angles to each other. There is one piston in the working cylinder, and one in the charging cylinder; and these pistons are connected to the same crank on the crank-shaft—one being connected direct, by means of a connecting-rod, and the other through the intervention of a connecting rod, sway-beam, and link. The action of the pistons will thus be such that one is moving through the middle or quickest part of its stroke, while the other is at about the end or slowest part. Thus, while the charging piston is at the quickest part of its inward stroke, rapidly driving a new charge of gas and air into the working cylinder, the working piston will be at about the end of its outward stroke, where it exposes the exhaust ports, and allows the products of combustion from the former charge to be expelled as they are displaced by the entrance of the new charge. In this engine one end of the working cylinder is closed, and the ports are so arranged that the new charge will be delivered as close as possible to the closed end; so that the new charge as it enters may sweep the products of combustion of the former charge before it. This is accomplished by making the port of a peculiar form. Thus, if the charging cylinder be horizontal, and the working cylinder vertical, the ports in the slide-valve, and in the face it works against, are made vertical; but as the port leading into the working cylinder approaches the interior, a twisted form is given to it, and not merely twisted, but also askew. Thus, as it opens into the working cylinder, it does so in a horizontal position close up to the cylinder cover.

REGENERATIVE GAS-LAMPS.—Kuhnt, A., and Deissler, R., of Berlin. No. 1134; Jan. 25, 1888. [11d.]

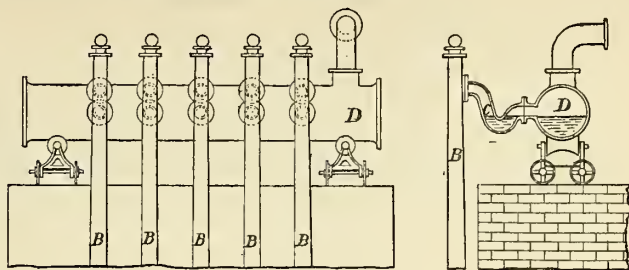
This invention (according to the patentees' statement) relates to gas-burners in which the gas is heated intensely, and freed from all impurities; and the air is heated thoroughly previous to being admitted before and behind the gas-flame. Moreover, the invention covers a device applied to the chimney-tube, having for its purpose to regulate the intensity of the annular flame.



As will be seen from the illustration, the gas chamber of the lamp consists of a plate provided with annular ribs, screwed on the bottom plate, also provided with ribs. The edges of the ribs bearing upon the opposite plates have serrations, through which the gas passes. The size of the serrations decreases from the inlet to the outlet of the gas chamber, so as to throttle the gas passing through, and heat it intensely. Besides this, "the gas leaves all impurities in the annular compartments formed by the ribs, and enters the burner-pipes thoroughly cleaned." An annular series of these burner-pipes are in connection with the last compartment of the gas chamber, as shown in the illustration. To the bottom plate of the chamber is attached the globe-holder A, the upper part of which forms the chamber for admitting the air to the flame. Between the cylindrical casing H, covering the burner and the globe-holder, is an annular space for the admission of air to the chamber L, whence the air is conducted to the upper part of the burner-pipes. A certain quantity of air passes between the burner-pipes and descends to the flame; while the remainder of it flows to the outer part of the flame. By this arrangement the air is intensely heated before passing to the flame. The centre of the apparatus is occupied by the chimney-tube R, to the lower end of which is attached a spout ending in a flange to spread the flame. The regulating-device, secured to the upper end of the chimney tube, is constructed as follows:—Semi-annular plates, supported by the chimney-tube, are connected to each other by means of a right and left hand screw, by turning which to the right or to the left, the plates are made to approach or to recede from each other. The aperture of the chimney-piece, and with it the intensity of the flame, is in this way increased or decreased. The ascending cross-plates disposed within the chimney-tube prevent any dust falling through the chimney-tube, and catch and collect the soot produced by the flame, as well as regulate the ascension of the combustion gases. The gas is conveyed to the gas chamber through the branch gas-pipe D (provided with a cut-off cock C), which runs down close to the chimney-tube R, in order to heat the gas before it is burned.

SEAL-PIPES FOR REDUCING THE PRESSURE IN GAS-RETORTS.—Palmer, R., of Sheffield. No. 2943; Feb. 28, 1888. [8d.]

This improved seal-pipe (shown in the accompanying drawing) can be attached to any shape of hydraulic main, and offers only a slight resistance to the discharge of gas from the retort. When the charge is in and the lids secured, the first discharge of gas displaces the water seal, allowing the gas to have free access to the hydraulic main D. As the discharge of gas becomes weaker from the retorts, the water seal returns to its position in proportion to the volume discharged; and when all the gas is given off from the retort, the seal becomes perfect against any gas backing down the ascension-pipe B.



It will also be seen, says the patentee, that the pipe C, inasmuch as it reduces the pressure on the retorts, prevents to a great extent blowing and leakage. With this seal-pipe the life and durability of the retorts will be prolonged; and the simplicity of the arrangement allows for increased capacity in the hydraulic main D—thereby giving a greater area for the flow of gas. These objects are attained by securing the seal-pipe C at one end to the vertical ascension-pipe B from the retorts, and the other to the hydraulic main D. The ordinary H pipe used between the ascension-pipe and the hydraulic main is entirely dispensed with. The pipe C is charged with water or the distillate or residuals from the carbonization of the coal in the hydraulic main.

GAS-ENGINES.—Nash, L. H., of Brooklyn, U.S.A. No. 10,350; July 17, 1888. [1s. 7d.]

By this invention the patentee claims certain improvements in gas-engines and in the mode of operating them. Space will not admit of a description of the author's claims, which are no less than 88 in number. The letterpress, which occupies 19 pages, is illustrated by six sheets of drawings, embracing 21 illustrations.

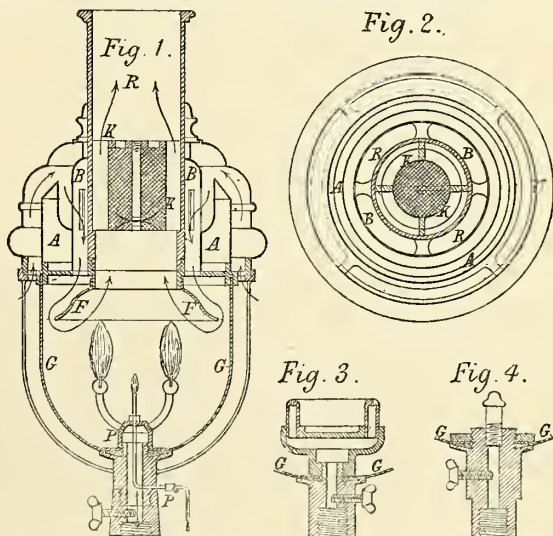
SILENCING THE EXHAUST FROM GAS-ENGINES.—Nobbs, F. G., of Exeter. No. 11,444; Aug. 8, 1888. [6d.]

This apparatus for rendering practically noiseless the exhaust from gas or petroleum engines consists of discharging the exhaust into a chamber specially devised for the purpose of deadening the sound thereof, instead of carrying it into pipes and discharging it at the side or on the top of the building where the engine is working. In this way a saving is effected in the exhaust-pipes, and the nuisance caused by the exhaust is abated.

The apparatus is intended to be either built in the ground, in any convenient position, or to stand upon the floor beside the engine; and the exhaust-pipe is arranged to terminate in a cone, for the purpose of dispersing the exhaust and the sound issuing therefrom when discharged. The chamber is filled with ordinary gas coke, or any other material sufficiently porous to absorb the vapour from the exhaust, enclosed in a wooden or other casing with a lattice-work ventilating cover.

REGENERATIVE GAS-LAMPS.—Butzke, F., of Berlin. No. 11,471; Aug. 9, 1888. [8d.]

This invention relates to gas-lamps with preparatory heating of the combustion air; the different arrangements being shown—figs. 1 and 2 being a vertical and a horizontal section of the lamp; and figs. 3 and 4, two modifications of it. The lamp is screwed on an ordinary gas-pipe by means of the burner P, to which the glass globe G is fastened. The heating chamber A, made from copper or other good heat-conducting material, is slanted off at the top in the direction of the air-inlets. It

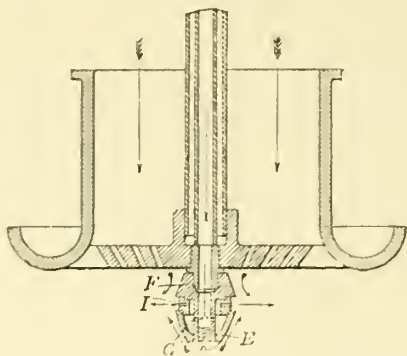


is only used to heat the air passing round its outside—the air not circulating in the vessel A. It surrounds the chamber B, which is provided with slits in its outer circumference, through which the air is forced to pass. The air in the chamber is strongly heated by the burner, and causes a current of air to flow up in the direction of the arrows. This air is heated on its passage along the walls of the chamber; and after being heated, it flows out against the reflector F, by which it is guided to the flame. The glowing asbestos body K is held in the chimney R by hooks. The combustion gases in passing through the chimney impart most of their heat to the "glow body" K, which radiates its heat to the walls of the chimney, and by this means helps to heat the air. In the modified form (fig. 3), the bars for supporting the central division plate are dispensed with, which is an advantage, as they always throw a deep shadow; and the heating apparatus rests on the glass globe G. The "glow body" K is fitted with a conical flanged tube provided with holes; so that the heat has free access to the body K.

REGENERATIVE GAS-LAMPS.—Mücke, J., and Stern, W., of Berlin. No. 12,117; Aug. 22, 1888. [6d.]

The main object of this invention is to prevent the deposit of soot, rust, or impurities of any kind in the burner.

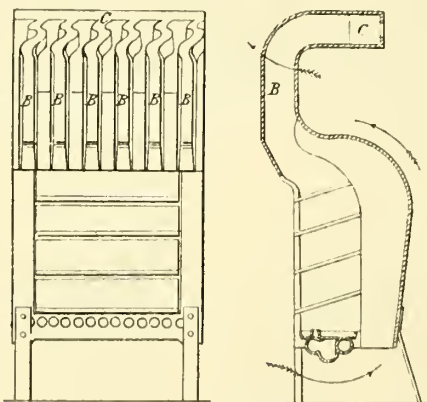
For this purpose, there is placed in the gas-tube a pipe of glass, porcelain, or any such material as is not liable to be oxidized or attacked at the heat required. The upper end of this tube is closed; but there are provided near the upper end lateral holes for the admission of gas. The inner pipe communicates with the burner; while the outer one is closed below. Any rust, &c., in the gas-pipe will thus fall outside the pipe, and not arrive in the burner. Furthermore, to keep the burner



clean from soot deposited from the flame, the air feed to the flame is so contrived that it does not mingle with the gas; and therefore the latter is not burnt until it arrives at a certain distance from the burner. In a burner with radial jets (as shown), this is done by placing above and below the jets, at a distance therefrom, raised ribs or flanges in such a manner that the air for feeding the flame is deflected outward thereby to mingle with the gas at a distance from the orifices of the burner. The manner of construction suitable for forming these flanges is illustrated. The part F with the upper flange is screwed on the base of the gas-inlet, and continued in the form of a pipe with lateral openings G into a chamber formed by the burner cylinder I, with orifices for the gas and the conical base E; forming (by its upper edge) the lower flange, and secured in place by a screw, which closes the lower end of the tube F.

GAS-STOVES.—Wilson, C. C., of Leeds. No. 12,283; Aug. 25, 1888. [6d.]

This invention has firstly for its object to arrange the gill-shaped flues of gas-stoves, that carry off the combustion gases to the chimney, to project forward from the face of the stove before passing back to the chimney outlet, in order to bring their heating surfaces (against which the air from the room passes) well forward into the room, so as to increase the heating power of the stove; and, secondly, to construct the Bunsen burners in such a manner that, for the purpose of reducing the heat, the outer jets of the burner can be entirely turned off, while the inner ones remain more or less full on, instead of regulating by turning the whole of the jets lower, whereby the possibility of the flame flashing back to the gas-inlet nozzle when the jets are turned down very low is avoided.



The heating arrangement of the stove may be of any known construction; but that described in patent No. 5209 of 1884 is preferred. Instead, however, of providing it with gill-shaped flues leading up directly from the top of the stove, the top is closed over, as shown; and in front of the upper part a casing is formed, constituting a number of gill-shaped flues B that project beyond the face of the stove, and, after rising a certain distance, curve over the top to the back, where they unite in a common chamber C, which communicates with the chimney. The flues, consequently, afford heating surfaces that project beyond the face of the stove, against which surfaces the air circulating round the back of the stove passes on its way into the room.

APPLICATIONS FOR LETTERS PATENT.

15,407.—MUDGE, D. P., "The prevention of the choking of pipes from the retort to the hydraulic main in gas-works by means of battle-plates placed in the mouthpiece of the retort." Oct. 26.

15,410.—LEEDS, L. W., and the L. W. LEEDS PATENT FLOOR-WARMING STOVE COMPANY, LIMITED, "Improvements in stoves for burning gas or liquid fuel." Oct. 26.

15,418.—THOMPSON, W. P., "Improvements in or relating to gas-engines, and in carburetors applicable therefor." A communication from D. S. Begun. Oct. 27.

15,471.—MILLS, G., "Improvements in wet gas-meters." Oct. 27.

15,509.—PRATT, T., "Improvements appertaining to valves applicable for reducing the pressure of liquids or gases in pipes." Oct. 29.

15,503.—HURST, G. I., "Improvements in gas-engines." Oct. 30.

15,616.—MERCKE, H., "Improvements in the construction of self-registering water-meters or meters for other liquids." Oct. 30.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

THE RELATIVE ECONOMY OF GAS-ENGINES AND HYDRAULIC POWER.

SIR,—In reference to the article in your issue of the 30th ult. (p. 762), on the "Economy of Ordinary Coal Gas as a Motive Power," I wish to point out that the figures quoted from my paper published in the Transactions of the Institution of Civil Engineers, and from the remarks made during the discussion, are hardly comparable. I explained in the paper the reasons for the apparently high average charges for the hydraulic power. These average figures do not correspond to the cost per indicated horse power per hour of running the engines for a few hours on a brake. The power to be adopted in any given case will, on the average, be settled by what would be the total average cost of running the machinery with the different systems of power available. For the special objects which the hydraulic power companies have been established to promote, both theory and experience seem conclusively to show that hydraulic power is the cheapest and best.

It would be traversing the ground covered by my paper to enter more fully into this question; but, in confirmation of my views, perhaps I may be permitted to add that there are now nearly 800 machines regularly working from the mains of the London Hydraulic Power Company, all set to work during the last five years, in competition with gas, steam, and other power. These machines are mostly for lifting and other intermittent work. On the other hand, the use of gas-engines for the general driving of machinery has hardly been affected by the Company's operations.

I do not wish in any way to detract from the great merits of the gas-engine; but it appears to me that to advocate its use for such purposes as pumping water for working lifts, in competition with direct hydraulic pressure, is not likely to be a successful policy.

E. B. ELLINGTON.

Palace Chambers, Westminster, S.W.,
Nov. 2, 1888.

THE MIDDLEMAN.

SIR,—It is greatly to be regretted that a public question of so much importance as the coal supply to our gas and other corporations should be overlaid with personal and side issues, such as those raised in your "Correspondence" and other columns on the 30th ult. We will dismiss these personal attacks, and the inferences it is desired should be drawn from them, by quoting a reflection of Hamlet: "Be thou chaste as ice, as pure as snow, thou shalt not escape calumny."

Calumny requires a victim, and in this instance the calumniator has selected the poor unoffending middleman. We should think that he is himself greatly astonished at the success that has attended his bold venture, seeing that he has drawn no less distinguished a person than the President of The Gas Institute. Because, forsooth, he has had experience of the smartness of a "very clever fellow"—whom, surely, he ought to have known, and been able to cope with, unless his position enormously overrates him—he denounces a whole class of men, as honourable in character as Mr. Woodall himself, and without whom commercial life would undergo a great change, and that not for the better.

Mr. Woodall writes: "On one occasion, I found that our intimate friend had been paying a commission to a casual acquaintance on coals supplied to me, and that naturally enough he had given me credit for having shared in the plunder." It is much to be regretted that the contractor, being an "intimate friend" of Mr. Woodall's, should not have thought and known differently than to have given him credit for sharing any plunder. Mr. Woodall informs us, in the other case of which he writes, that it was a colliery who was paying a commission to the "very clever fellow;" but he does not state if his "intimate friend" is a colliery owner, colliery representative, or a middleman. Pray has Mr. Woodall never dealt with a middleman?

The commission system is hateful, and deserving the severest condemnation. But to try to fasten the responsibility for that system upon the middleman is to take a very narrow, one-sided, and unjust view of the question. Mr. Woodall, in the plenitude of his narrowness, suggests that there is no need of a negotiator, and that a gas company "is sure of being supplied with what it bargains for when dealing with the colliery direct," who, *volens volens*, becomes the negotiator that Mr. Woodall so unceremoniously dismisses as a superfluity. Nay, more, there stands another "negotiator," the representative of the colliery owner, who will have his voice in the making of contracts. Does Mr. Woodall think that these "negotiators" everywhere will be pure, and stainless from the guilt of bribes? His faith is large and strong; but his knowledge is sadly imperfect. It is not long since, Sir, that an advertisement appeared in your JOURNAL from several manufacturers of gas-meters, to the effect that in future they would not allow any commissions on their transactions, which one may take to be clear proof that commissions had been previously paid.

The middleman, if upright and honest—and to insinuate that the class to which he belongs is not honest or upright is a foul calumny—by reason of the competition that he encounters, is bound to supply the article for which he tenders, and becomes a buffer against any collusion between the agents of the two contracting parties.

Has Mr. Woodall forgotten the "Salford Scandal"? There the system which he appears to desiderate was in full and perfect working. No middleman there stood between the Corporation and certain collieries; but two well-known collieries were found to have paid large sums by way of corrupt commissions which were negotiated through their own representatives.

The recent colliery strikes will afford to a reasonable mind the most conclusive argument in favour of the "middleman." A contract entered into with a particular colliery is absolutely at the risk of a gas company or corporation. A strike is fatal. The system admits of no elasticity. We have ourselves, within the last few weeks, had applications for several thousand tons of gas coal from gas undertakings throughout England, in order to cover deficient supply due to the suspension of work at particular collieries. Fortunately for these applicants, "the happy day" has not yet come when the free and independent middleman is no longer to be found in the land, and when the

"incorruptible" gas engineer, and the equally "incorruptible" corporation official, will be left to go their way practically unchecked and uncontrolled. Until the law of supply and demand is regulated, the middleman will, we feel confident, be able to prove his *raison d'être*; and therefore, thanking you, in anticipation, for inserting this letter, we will now dismiss the chimera of his suggested abolition.

THE MIDLAND COAL AND CANNEL COMPANY,
Nottingham, Nov. 5, 1888. WORTHINGTON CHURCH.

WATER BY MEASURE.

SIR,—In reply to "True Measure," in the last number of the JOURNAL, I beg to state that I am acquainted with three "low-pressure" water-meters—viz., Parkinson's, Cowan's, and the Bascul. But why these meters or any others ought not to be used for a domestic supply, I have already stated in the article referred to.

As a further objection to the use of low-pressure meters, it is certainly a most inconvenient position to fix a meter over the cistern. My experience is that in modern towns, they are placed in the roof; and it being necessary to read water-meters once a month, and to be constantly repairing and changing them I think if placed there they would be voted a great nuisance by most householders, and condemned by all water inspectors, as well as imposing an unnecessary expense on the companies for inspection, reading, and repairs.

I wait for "True Measure" to explain why his low-pressure meter ought to be used and fixed over a cistern? What is the name of the meter? And why is such a meter and position superior to the present class of meters and methods of fixing? Also, how will he get over the difficulty of the new "fad" demanded by the medical profession, of connecting the drinking-water tap direct from the main? Then there is the garden supply for a large number of houses, which must be delivered under pressure, and would require another class of meter.

I quite concur, Sir, in your statement that cisterns are a necessity. This was sufficiently explained in the JOURNAL for Dec. 20, 1887 (p. 1090).

I am exceedingly obliged to Mr. R. F. Grantham for his kind remarks, and his concurrence in the main objects of the paper in question. It is gratifying to know that such an authority is entirely opposed to a supply of water by meter for domestic purposes.

Nov. 3, 1888.

"METER."

OFFICIAL COAL-TESTING FOR BELGIAN RAILWAYS.

SIR,—During a recent journey on the Continent, I had the pleasure of inspecting a coal-testing station near Brussels, which interested me very much. I also witnessed a test; and thinking that your readers may like to know a little about it, I subjoin a few notes.

At this station the coals supplied to the Government Railways by the various contractors are tested daily for their evaporative power, in a precise and scientific way, by means of locomotive boilers. If the coals do not come up to the necessary standard, the contractors are either fined or the coals not accepted. In this way, some thousands of tests have been made with every variety of coal, and much valuable data obtained; so that the State know much more about their coal than we do with our English coal.

The whole station seemed to me to be well arranged for prompt, accurate, and practical results.

I am anxious to find out whether in other countries there are any similar coal-testing stations, worked either by the large Railway Companies or Marine Departments of Foreign Governments. Perhaps some of your Continental readers would kindly enlighten me as to this. I am informed that the Railway Companies in France and Germany do not test their coal for its evaporative power in a methodical way; and the same want of any experiments is to be regretted in England.

Bermondsey, Nov. 8, 1888.

BRYAN DONKIN, JUN.

[ENCLOSURE.]

Notes on the Belgian Station for Testing the Evaporative Power of Coal used on the Locomotives of the State Railways.

The coals suitable for the grates of the locomotives are divided into four categories, and must be capable of evaporating (depending on the quality) from $4\frac{1}{2}$ lbs. to $7\frac{1}{2}$ lbs. per pound of coal. The tests are made at a station especially installed for the purpose; and the above quantities of water have to be evaporated at pressures varying from 90 lbs. to 120 lbs., and the coal supplied must be able to keep up this pressure.

The contractor must supply about $\frac{1}{2}$ ton for the trials. The draught is produced in the usual way from a locomotive, by a steam jet in the chimney; and it is varied according to the quality of the coal, from $2\frac{1}{2}$ to $4\frac{1}{2}$ inches (water pressure).

The contractor may be present during the trial. Only a certain percentage of incombustibles is allowed; and the average size of the coal is also accurately defined—that is to say, the coal is not accepted unless 25 per cent. is of certain fixed dimensions. The water evaporated is carefully measured in long tanks; and the locomotive boilers and grates at the station are exactly similar to those used on the State Railways.

THE GAS-WORKS AT THE HANWELL SCHOOLS.—The question of the manufacture of gas at the Central London District Poor Law Schools at Hanwell, to which reference was made in the JOURNAL for the 23rd ult., was again the subject of a discussion at the meeting of the School Managers yesterday week. The Clerk (Mr. East) read a report of the Farm Committee, to the effect that Mr. Broadberry's letter had been considered, and that estimates had been obtained for removing the present iron retorts from one of the arches, and substituting clay retorts, as suggested by that gentleman. The Committee recommended the Managers to accept the estimate of Messrs. J. and H. Robus for the work, and that Mr. Broadberry be employed to inspect it while in progress. On this report there was a long discussion, in the course of which it was stated that, since the estimate was obtained, Mr. Broadberry had given the Committee to understand that the sum mentioned would not cover the cost of the necessary works. Mr. Cooksey objected to the Committee taking action to have the gas-works continued in operation before the Managers had determined whether or not they would go on making gas, or purchase it from the Brentford Gas Company, who had offered to supply the schools. Mr. Dunn said the Committee would not bind the Managers to any expenditure before this question had been determined. He, however, desired the Managers to know that if they could manufacture gas at the price given by Mr. Broadberry (2s. 7d. per 1000 cubic feet), they would save £120 per annum. Eventually the report was referred back to the Committee to obtain full particulars as to the cost of the necessary works.

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

FRIDAY, NOV. 2.

(Before Mr. Justice Kay.)

In re THE ARBITRATION BETWEEN THE YEADON LOCAL BOARD AND THE YEADON WATER-WORKS COMPANY.

This was a motion by the Yeadon Water-Works Company to set aside the award made in an arbitration between themselves and the Local Board of Yeadon. The circumstances under which the arbitration took place will be in the recollection of our readers; but it may be of interest to recapitulate them, as follows:—The Company, which had previously existed as a limited liability undertaking, was, in 1870, incorporated by Special Act of Parliament. In 1887, owing to the great drought in the summer of that year, the Company had much difficulty in supplying their district with water. In July, 1887, the Local Board asked the Company whether they would be willing to sell their undertaking to them, and, if so, on what terms. This application was followed by a formal notice from the Board, under section 52 of the Public Health Act, 1875, requiring them to supply each house in the district with water, suitable and proper for drinking and ordinary domestic purposes, at the rate of not less than 20 gallons per head per day. The offer for purchase was declined by the Company, who insisted that they were using their utmost endeavours to maintain a sufficient water supply. Ultimately, in December, 1887, the Board served the Company with notice of the appointment of an Arbitrator, under sections 179 and 180 of the Public Health Act; the notice setting forth that the matter to be dealt with by him was "a difference as to whether the water which the Company are able and willing to lay on is proper and sufficient for the purposes for which it is required within the district." Thereupon the Company appointed an Arbitrator on their side. On Jan. 3, 1888, the Arbitrators had a meeting; but nothing was done, beyond extending the time for making the award, until Feb. 20. On Jan. 10 the Arbitrators again met, and appointed an Umpire. On Feb. 1 the Arbitrators and the Umpire held their first meeting, and were attended by the Solicitors for both parties. The Solicitor for the Company endeavoured to limit the scope of the inquiry to the question whether the Company were bound to supply 20 gallons of water per head per day, according to the original notice; but the Solicitor for the Local Board objected to this limitation. Thereupon the Company's Solicitor withdrew, and took no further part in the proceedings. The meeting was then adjourned *sine die*. On April 19 last, notice to attend having been given to both sides, the Umpire made his award (the Company not being represented on the occasion), determining that the Company were not able and willing to supply water proper and sufficient for the purposes set out in the original notice, or for the requirements of the Local Authority therein mentioned, and also that the purposes for which water was required under the notice were reasonable; and he ordered the costs of the reference and award to be paid by the Company. The Company then served the present notice of motion to set aside the award on various grounds, especially on two—viz., (1) that the award had not been made within the time required by the Public Health Act; and (2) that the main question whether a supply of 20 gallons of water per head per day was reasonable had not been gone into by the Umpire. From evidence given by the Umpire, there seemed to be some doubt whether he had considered this question specifically.

Mr. RENSCHAW, Q.C., and Mr. EYRE appeared for the Company; Mr. MARTEN, Q.C., and Mr. F. T. PROCTOR for the Local Board.

Justice KAY, in giving judgment, said the first objection to the award—viz., that it was not made within the time required by the Public Health Act, 1875—depended on section 180, sub-section 9, which provided that "the time for making an award by an umpire under this Act shall not in any case be extended beyond the period of two months from the date of the reference of the matter to him." The question was, What was he (Justice Kay) to take as the "date of the reference" to the Umpire? There was no evidence before him to satisfy him that there was any reference to the Umpire, as distinguished from the Arbitrators, before Feb. 20; and, accordingly, the award was made within the two months allowed by the Act. He therefore could not accede to the objection on the point of time. The other objection was one of more difficulty. The 52nd section of the Public Health Act, under which the arbitration had been conducted, was in these terms: "Before commencing to construct water-works within the limits of supply of any water company empowered by Act of Parliament, or any Order confirmed by Parliament, to supply water, the local authority shall give written notice to every water company within whose limits of supply the local authority are desirous of supplying water, stating the purposes for which and (as far as may be practicable) the extent to which water is required by the local authority." Two things were required to be stated in the notice—viz., the purposes for which water was required by the local authority, and (as far as might be practicable) the extent to which it was required. Now, the purposes and the extent were both stated in the original notice given to the Company. Then the section proceeded: "It shall not be lawful for the local authority to construct any water-works within such limits if and so long as any such company are able and willing to supply water proper and sufficient for all reasonable purposes for which it is required by the local authority; and any difference as to whether the water which any such company are able and willing to lay on is proper and sufficient for the purposes for which it is required, or whether the purposes for which it is required are reasonable, or (if and so far as the charges of the company are not regulated by Parliament) as to the terms of supply, shall be settled by arbitration in manner provided by this Act." Now, it would be observed that the extent to which the authority in question required the water was not one of the matters to be settled by arbitration, nor was the reasonableness of the extent one of the matters to be submitted. That which was to be submitted was the ability of the Company to supply water which was proper for all reasonable purposes, their ability to supply water which was sufficient for those purposes, and their willingness to supply it for those purposes. The reasonableness might be left out of consideration in the present case, because as to this there was no question. His Lordship then went through the evidence in the case and the award, and said it was clear that the Company were not in a position to comply with the requirement to supply 20 gallons of water per head per day, or anything like it. They were actually supplying only about 4 gallons per head per day to their customers; and, according to the report of their own Engineer, they were not in a position to supply more than $8\frac{1}{2}$ gallons. There was no attempt on the part of the Company to prove before the Umpire that 20 gallons a day were not required; but ample evidence was given that this was a reasonable quantity. The Company did not bring forward evidence on the subject, because they knew they could not supply 20 gallons a day. In his Lordship's opinion, this was an attempt on the part of the Company to get rid of the effect of an award which was quite reasonable, had been properly made, and was free from irregularity or mistake, so far as he could make out; and therefore the motion must be refused, with costs.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

MONDAY, OCT. 27.

(Before the LORD CHIEF JUSTICE and Mr. Justice GRANTHAM.)

THE QUEEN v. THE JUSTICES OF CHESTER.—LIABILITY FOR DAMAGING A PUBLIC LAMP.

This case raised a novel point as to the liability for damage to a gas-lamp, and came before the Court in the form of a motion to make absolute a rule nisi granted in June last (see JOURNAL Vol. LI., p. 1156) for a *mandamus* to the Justices of Chester to state a case for the decision of the High Court of Justice; the application being made on behalf of the Chester Gas Company.

Mr. MARSHALL, who appeared to show cause against the rule, stated the facts of the case, as follows:—A person named John Challoner was sued by the Company to recover £3 for damages to a gas-lamp. The defendant's son was, on the 27th of April, moving a load of furniture, when, on going down a hill, a portion of the harness broke, and the horse, becoming unmanageable, ran against a lamp-post and broke it. An information was laid under the 20th section of the Gas-Works Clauses Act, which renders any person causing damage to property of a gas company liable to a penalty not exceeding £5. The Justices, after hearing evidence, dismissed the case—the Chairman stating that the wrong person had been brought before them; and upon an application being made to state a case, they refused, on the ground that it was frivolous. This was all that took place in open Court; but the Justices had made an affidavit in which they stated that they had considered the whole of the facts, and that their decision was based upon the entire case—the statement of the Chairman that the wrong person was brought before them being only one point in the case. They were satisfied, from the evidence, that Challoner was not responsible for the accident, as he was not in charge of the horse; and the harness broke, not through any defect, but through the steepness of the hill down which the boy was driving. Further, the Justices were satisfied that the boy in charge of the horse was not responsible, as he had lost all control over the animal. They also found that the lamp-post was not fixed at the proper distance outside the kerbstone. Counsel from these statements argued that if anybody was responsible it was the Local Authority or the Company themselves; and the section under which the information was laid required to sustain a conviction that the damage should be done by some "person," which was not the case here, as shown by the affidavit of the Justices.

Mr. FULLERTON, who appeared for the Company, contended that the statements made in the affidavit of the Justices had no foundation in fact or in law, and were in themselves absurd. It was hardly necessary for him to point out that harness must be defective if it were not strong enough to enable its wearer to take its load up; or down the hill; but he might mention that the Company had no choice in the selection of the places where gas-lamps were erected. They had to be erected in whatever places were ordered by the Local Authority. The question was a most important one in the public interest; and he hoped their Lordships would therefore order the Justices to state a case.

After some further argument, their Lordships made the rule absolute.

WEDNESDAY, OCT. 31.

(Before Justices FIELD and WILLS.)

THE QUEEN v. THE STAINES LOCAL BOARD.—THE SEWAGE POLLUTION OF THE THAMES.

This was an indictment for polluting the River Thames by allowing sewage to pass into it; the prosecutors being the Thames Conservators. The case was tried in February last, before Baron Huddleston,* when a special verdict was found; and on this the matter now came on for argument.

Mr. CRUMP, Q.C., and Mr. BANKS appeared for the Conservators; Sir HENRY JAMES, Q.C., and Mr. TINDAL ATKINSON for the Local Board.

Mr. CRUMP said the proceedings were taken under sections 64 and 65 of 29 and 30 Vict., c. 83, which was known as the Thames Navigation Act, 1866. The first of the above sections provided that where any sewage or other offensive matter is caused or suffered to flow into the Thames, or into any river or water-course connected with the Thames, the Conservators, within a reasonable time after knowledge of the fact, should give notice in writing, under their common seal, to the person or body causing or suffering the same, requiring him or them to discontinue the flow within a certain specified time. By the 65th section, if, after reasonable notice, the persons causing or suffering the flow of noxious matter did not discontinue the same, they were guilty of a misdemeanour, and were liable to an indictment. In September, 1879, notice in the form prescribed was given to the defendants, which was not complied with; and, in the years 1881-4, proceedings were taken against the Local Board, and they were then convicted and fined on each accusation. These convictions and the imposition of the penalties not having had the desired effect, the Conservators indicted the Local Board. A true bill was found by a Special Grand Jury; and on the case coming on for trial before Baron Huddleston, by agreement between Sir Henry James and himself, the facts were stated in the form of a special verdict. The learned Counsel then proceeded to read the special verdict, the important point of which was that certain persons in Staines had acquired a prescriptive right to drain into the sewers, which eventually led into the Thames, if such right could be acquired in law. The contention of the prosecution was that the drains and sewers were vested in the local authority, who had complete control over them; and even conceding that owners of houses and tenements had a right to discharge sewage into the drains, this did not affect the liability of the Local Board in respect of the outfall of the main drain into the Thames. The nuisance complained of was not the passing of sewage into the drain by the owners of houses, but the passing of the sewage into the Thames. The Board had power under the Public Health Act to block up any sewer on providing another equally convenient.

A discussion arose as to whether the terms of the special verdict were complete and satisfactory to both sides; and learned Counsel having expressed their satisfaction with them, the further hearing was adjourned.

THURSDAY, NOV. 1.

Mr. CRUMP resumed his argument this morning, and submitted that no prescriptive right was proved so as to cover the offence. There could be no prescription in the face of the Act of Parliament, as was laid down in "Goddard on Easements," and shown by the case of the *Rochdale Canal Company v. Radcliffe*.

Justice FIELD pointed out that the prescription in this case was of a different nature to an easement resting on an implied grant. There it was a case of immemorial usage. He knew that some of the houses in Staines, or one at any rate, dated back to 1646.

Mr. CRUMP submitted that any such right could be put an end to by Act of Parliament, and that this had been done by the Act of 1866.

Justice FIELD remarked that no doubt Parliament could take away a man's rights, even without compensation; but he had never known such a case.

* See JOURNAL, Vol. LI., p. 428.

Mr. CRUMP said the right to use any drain was subject to the powers of the Sanitary Authority to stop up the drains under the Public Health Act, section 64. Any right to pass sewage into the Thames which might have been acquired by usage was determined on the passing of the Act.

Justice FIELD observed that in the special verdict he did not find it stated as a fact that the respondents had committed any offence. The Court had no power to draw inferences on a special verdict. It was stated that the respondents had not passed any foul matter themselves, or consented to the passing of any foul matter.

Mr. CRUMP said that the Board had failed to discontinue the flow on receiving notice, and had been convicted repeatedly of this offence. He submitted that the special verdict did in effect find that the offence had been committed.

Justice WILLS pointed out that it had been held in similar cases that the proper remedy was by *mandamus*, and not an injunction.

Mr. CRUMP said an injunction was a totally different remedy. He knew the cases to which his Lordship referred, and which his friend relied on; but he should distinguish them on the ground that an injunction was a matter in the discretion of the Court, whilst an indictment for misdemeanour varied the simple question whether the offence mentioned in the Act of Parliament had been committed. The cases referred to were *Glossop v. The Heston and Isleworth Local Board*, and *The Attorney-General v. The Guardians of the Poor of Dorking*, in which private persons sought to obtain relief; and on the question of the balance of convenience and inconvenience, an injunction was refused. He asked for judgment that the Staines Local Board had committed an offence; and it was not open to the defendants, under such a proceeding, to argue that it was inconvenient, expensive, or even impossible, to carry out works which would prevent the nuisance. They simply sheltered themselves under the alleged prescriptive rights of the owners of houses. He submitted that this was no answer to the case; and that judgment must be entered in accordance with the special verdict, that the defendants were guilty.

Sir H. JAMES submitted that on the verdict the defendants were entitled to be found not guilty. This was a criminal charge; and Mr. CRUMP's argument was that, if one man could prevent another committing an offence, and did not do so, he committed it himself, and this had been discredited from in express terms by a very high authority. It might strike the Court that if the river was being polluted, there ought to be some means of preventing it. This was given by the 6th section of the Act; and the Conservators, who were the body having this duty cast upon them, and having large funds for the purpose, ought, if their contention was right, that no prescription could exist to send sewage into the Thames, to proceed against those persons who were creating the nuisance, and not against the Local Board, who, he contended on authority, had no power to stop it. If they wished to force the Local Board to provide a better system of drainage, they ought to proceed by *mandamus*, in which case the Board would be entitled to show what they had done, or were doing, to carry out the duties imposed upon them.

Justice WILLS observed that he did not understand why the Local Board had not required the Conservators to prosecute the persons who sent down the sewage.

Sir H. JAMES said he was instructed that they had done so. This was an indictment for a criminal offence; and before they could be convicted, it must be shown that they had caused or suffered noxious matter to flow into the Thames. It was true that, under the Public Health Act, the sewers were vested in the defendants; but that was only a qualified vesting, as was laid down by Sir George Jessell in the Dorking case. He said there that this vesting only gave them a qualified ownership, subject to the rights of any other persons to make use of the sewers. Under this indictment, if the Local Board had spent hundreds of thousands of pounds in endeavouring to provide a perfect system of drainage, it would be no answer at all—in fact, there was no evidence before the Court that the Local Board were not constructing works at the present moment. The learned Counsel then quoted passages from the judgment of Sir George Jessell in the Dorking case, in which it was laid down that a local authority was not bound to bring an action to prevent a person having a prescriptive right to send sewage through sewers vested in them from doing so, and further expressed the opinion that such an action would fail if brought. He also referred to the case of *Glossop v. The Heston and Isleworth Local Board*, and submitted that judgment must be for the defendants.

Mr. CRUMP, in reply, said the remedy which the Conservators were seeking to enforce was the one pointed out by the Act of Parliament. It was not for them to apply for a *mandamus*. They had nothing to do with providing for the drainage of Staines, or any other district. Their functions were defined by the Act, and were confined to preventing the entry of polluting matter into the river. They found such matter coming into the river from sewers vested in the Staines Local Board; and, in accordance with the Act, they had given them notice to discontinue such flow within a reasonable time—viz., thirteen months; and this not having been done, and having taken summary proceedings on several occasions, when the defendants pleaded guilty, and fines were imposed, and the nuisance still continuing, they had no alternative but to prosecute by indictment. If the Act of 1866, together with the Public Health Act, imposed an intolerable burden on the Local Board, their remedy was to go to Parliament for relief. Shortly his argument was that the person who suffered the sewage to flow into the Thames from the three sewers in question was the local authority in whom the drains were vested. They had the right under the Public Health Act to stop up or divert the sewers.

Justice WILLS pointed out that the right was only conditional on providing equally convenient sewers; and before a man could be held guilty for not closing a sewer, it must be shown that it was possible for him to comply with that condition. It seemed to him the special verdict was hopelessly deficient in this respect.

Mr. CRUMP contended that the onus lay on the defendants to show they could not stop up the drains over which persons claimed prescriptive rights. They suffered this sewage to pass, because they did not prevent it. The question of penalty, of course, would be in the discretion of the Court.

Justice FIELD said this was a case of great public importance; and if he had entertained any doubt about it, he should have reserved judgment, because it seemed to him that, if the opinion of the Court was (as it was) that the indictment failed, there would be very great difficulty on the part of the Conservators in performing one of their chief duties—that of keeping the Thames free from pollution. But he entertained no doubt whatever about the case, which appeared to him to be entirely covered by the authorities which had been alluded to by Sir H. James. Having gone through the sections of the Act of 1866, and also of the Public Health Act of 1875, to see what were the duties and powers of the Conservators on the one hand, and of the Local Board on the other, he referred to the special verdict, which found in terms that no sewage matter had been passed into the Thames by the Local Board, or with their consent; and the only question therefore was whether they had suffered it to pass. He thought it was clear that a prescriptive right to pass sewage, such as was

claimed by certain house-owners in Staines could be acquired; and it was stated that such owners did drain into the sewers communicating to the Thames in the exercise of their prescriptive right. Was that an averment that the defendants had suffered sewage to pass? It could not be said that they "suffered" that which others had a right to do. In order to "suffer" it, they must have the power to stop it; and it seemed to be decided by the two cases cited that they had no such right. If there had been no authority, he should have said that the verdict must be "not guilty," because there were no sufficient averments in the verdict to found a judgment of "guilty;" but the cases cited put the matter beyond doubt. There must be judgment for the defendants.

Justice WILLS entirely concurred in the decision.

Mr. ATKINSON applied for costs.

Justice FIELD said the Court had no power to give costs in such a case

Miscellaneous News.

THE CHARGES IN CONNECTION WITH THE HALIFAX GAS-WORKS.

The *Halifax Courier*, referring to the above matter last Saturday, said: "The Sub-Committee appointed to deal with the matter of the gas coal contracts met on Thursday. We understand that they have obtained evidence to satisfy them that the cannel coal which has been supplied by Mr. Wrigley is not hand-picked as agreed for by contract; and in consequence of this the Committee have decided to cancel the contract with Mr. Wrigley, and purchase the quantity required elsewhere. One of two things will no doubt follow—either Mr. Wrigley will sue the Corporation for breach of contract, or the Corporation will have to take the initiative and seek damages from Mr. Wrigley. The contract was entered into about May last, and was for 6000 tons of coal. A portion of that has, of course, been delivered."

In connection with the same matter, the *Ashton-under-Lyne Reporter* (which, our local correspondent says, probably represents the view taken by Mr. Wrigley) stated as follows:—"The Halifax gas troubles are now coming to a head, so far as the coal contracts are concerned. It will be remembered that the Mayor charged one of the contractors with delivering cannel inferior to that contracted for. As this comment upon a running Corporation contract was uttered in the Council chamber, it has been ruled by Counsel that the Mayor was within his rights in criticizing any contract from his seat in the Council, and that in any action-at-law he would be justified in pleading privilege. Being anxious to challenge the absolute faithfulness of the cannel deliveries, in point of quality and in every other respect, Mr. E. G. Wrigley and his Solicitor (Mr. W. Cobbett) had an interview with the Mayor, and it was arranged that the Halifax Corporation should enter an action against Mr. Wrigley to recover a fixed sum per ton for alleged inferior quality. This the Corporation have now decided to do; and Mr. Wrigley will defend the action. The public will now, of a certainty, shortly be able to form correct opinions from proper and reliable evidence. The difference between them is not that of substituting one cannel for another, but it is whether the cannel delivered was hand-picked or screened-picked cannel. Mr. Alderman Riley has declined to prosecute Mr. T. K. Fox unless he will charge him specifically with receiving commissions on coal or other contracts, or in some specific way will define what is meant by being guilty of 'malpractices,' which may mean anything or nothing."

SALFORD CORPORATION GAS SUPPLY.

THE HUNTER CASE.—THE CORRESPONDENCE WITH MR. ELLIS LEVER.—THE PROPOSED AMALGAMATION OF MANCHESTER AND SALFORD.

At the Meeting of the Salford Town Council last Wednesday—the Mayor (Mr. Alderman A. L. Dickens) in the chair—the above-named matters were under consideration.

The Mayor said that at the last meeting of the Consultative Committee, it was thought desirable that some statement should be made, in consequence of certain observations passed in the Council Chamber some months ago relative to a letter which had been received from Mr. Hunter's Solicitor, offering the Corporation the sum of £20,000 in connection with matters which formed the basis of the proceedings in which they were then engaged. The statements so made were enlarged upon outside the Town Hall. Remarks were made in the newspapers; and it had been said that Salford had lost £20,000 because of the non-acceptance of the offer which had been made. It was thought, therefore, that, in the interests of the borough, the matter should be set at rest; and with that object a case was submitted to Sir Charles Russell. When in London recently, he (the Mayor) called upon Sir Charles, who had since, acting in concert with Mr. Poland, presented the following written opinion on the matter:—" (1) We are clearly of opinion that the representatives of the Corporation would not, under the circumstances stated, have been justified in entering into any agreement for the acceptance of a sum of money which would have been carried by implication the condition that the prosecution should practically be waived by the appearance of representatives of the Corporation as witnesses on behalf of the prisoner. (2) We are clearly of opinion that the Corporation could not have acted in any other way with reference to the offer made. Before the defendant pleaded guilty, the representatives of the Corporation would have acted illegally in entering into any such agreement as that proposed; and all the parties who entered into such an agreement would have rendered themselves liable to be charged with a criminal offence. After the defendant had pleaded guilty, and before sentence, we are equally clear that the representatives of the Corporation could not have accepted the sum offered in the letter of April 12, on the condition that the Mayor and possibly one or more members of the Corporation should enter the witness-box and do what was possible on behalf of the prisoner when brought up for sentence. The only straightforward and open course was for the defendant to pay into the Chancery Division of the High Court any sum he thought fit; being the amount of the commissions he had improperly and illegally received, without any condition being attached to such payment so far as the criminal proceedings were concerned; leaving the Judge, when the whole facts were stated to him, to take into consideration, in the defendant's favour, the amount of money he had paid by way of restitution. We may add that we warned the Town Clerk that neither he nor the representatives of the Corporation should enter into any bargain such as that proposed connected with the criminal proceedings." He added that he thought comment upon this opinion was unnecessary.

The subject of the correspondence which has taken place between the Mayor and Mr. Ellis Lever, relating chiefly to the constitution of the Sub-Committee to be appointed to receive certain information which this gentleman has promised to give on certain conditions, was then introduced. Mr. Lever, it will be remembered, strongly objected to the Sub-Committee nominated by the Council at the last meeting (see *ante*, p. 645). As Mr. Lever persisted in his objection, the Mayor ultimately wrote to him, asking him to name the members of the Council to

whom he was willing to give certain information referred to in his letter of Sept. 26. To this request Mr. Lever replied by wire, on Oct. 25, stating that he had been engaged at Leeds for three days investigating the coal supplies of the Corporation, and that on his return he would reply to the Mayor's last letter. On the 27th he wrote: "In reply to your letter of the 22nd inst., I beg to say that my intention, as expressed in my letter to the press of the 26th of September, was that my nominees—who would be members of the Council—should elect the third member of the Sub-Committee. With regard to your request that I should give you the names of my nominees, I think you will agree that if the Council do not see fit to accept my nomination, the gentlemen named will be placed in a very anomalous and unpleasant position. Unless the Council lacks faith in some of its members, there can be no reason why an open resolution should not be passed, leaving the names to be supplied afterwards." Another portion of the correspondence related to a statement made by the Mayor at the last meeting of the Council—that Mr. Lever had had many opportunities of communicating to the Council any information he possessed, and had not availed himself of them. This statement Mr. Lever denied; and he gave the names of certain members of the Council to whom he had imparted certain information in his possession, but these members had neglected to make use of it. On the suggestion of the Mayor, the members of the Corporation referred to explained the circumstances under which they had obtained the information from Mr. Lever, and endeavoured to show that it was communicated in such a form that no use could be made of it.

Mr. F. S. PHILLIPS next moved the following resolution:—"That the resolution of the Council passed on the 3rd of October in reference to the frauds alleged by Mr. Ellis Lever to be now going on in the supply of coal to the gas-works be rescinded, so far as it relates to the appointment of a Committee, and that, in lieu thereof, this Council consents to Mr. Lever's proposal that he shall nominate two members of the Council, who, being so nominated, shall themselves appoint a third, to whom he will disclose evidence of such frauds; and that the said members so selected shall be appointed to form themselves into a Sub-Committee, to receive such evidence, and to report thereon to the Council." He remarked that the motion was merely the outcome of communications with Mr. Lever. This gentleman had declined to accept the Committee which had been appointed by the Council; and he (Mr. Phillips) took the liberty of suggesting that Mr. Oliver Heywood should be asked to nominate a Committee. This suggestion was not agreed to by Mr. Lever; and as it was desirable that the matter should be brought to an issue, he (Mr. Phillips) proposed his resolution.

Mr. H. ROPER seconded the motion.

The Mayor said the Committee suggested in the resolution was one similar to that which Mr. Lever himself had asked the Council to grant him; and it certainly was one which would be judge and jury. However, when the Committee was appointed, he would take great care that he was present himself, in virtue of his office as Mayor, as Chairman.

Mr. SNAPE said that as Mr. Lever seemed to think that he could only communicate his information to gentlemen of his own selection, he was prepared to give way, although he thought Mr. Lever was altogether wanting in fairness. He would suggest that a shorthand writer should be engaged to be present during the proceedings.

Mr. G. W. GADD expressed his full conviction that they would find Mr. Lever would back out of it.

Alderman WALMSLEY asked what would be the effect of adopting the resolution.

The Mayor said Mr. Lever would be communicated with, and asked to substantiate the statements he had made in his letter to the papers on the 26th of September.

Mr. RYECROFT said he thought they had been wasting too much time in discussing the matter. If Mr. Lever had any information to communicate to the Corporation which would be of any value, he thought they ought not to hesitate in accepting it in the way Mr. Lever proposed to give it.

Mr. H. LORD said that, as Chairman of the Gas Committee, he thought it was to be regretted that Mr. Lever had not accepted the Committee nominated by the Council; but at the same time he cordially invited Mr. Lever, if he had any information to give, to let them have it, so that they might put an end to the rumours that were going about.

The resolution was then carried unanimously.

Alderman WALMSLEY had placed the following motion on the paper:—"That a Committee be appointed, consisting of 16 members of the Council, to take into consideration the report recently issued by the Association for dealing with the question of the amalgamation of Manchester and Salford, and to report thereon; also that such Committee be authorized to call in such professional assistance as it may deem necessary." He said that, as this was the last meeting of the Council for the municipal year, the powers of the Committee he wished to appoint would expire that night; and therefore he would postpone his motion till the next meeting of the Council. At the same time he remarked that the subject would be thoroughly investigated before a decision was come to on the proposals of the Association.

STARTLING REVELATIONS BY A FORMER COUNCILLOR.

At one of the meetings held in Salford prior to the municipal elections, some extraordinary revelations in connection with the circumstances which have during the past twelve months attracted so much attention to the gas undertaking of the Corporation, were made by a candidate (Mr. Ward), who had formerly been a member of the municipal body, and sought re-election in place of a retiring councillor. In view of the matter now specially engaging the attention of the Council, as shown by the proceedings reported above, it may be of interest to reproduce the remarks of the gentleman in question.

Mr. Ward, in the course of his address, said that his audience would no doubt have seen that Mr. Ellis Lever had been writing to the newspapers, and posing as a man interested in the welfare of Salford. He (Mr. Ward) had been asked many times why the old Gas Committee, of which he was formerly a member, did not consider Mr. Lever's tenders in 1886. They were not considered in 1883, and perhaps not in 1880. He was quite satisfied that the name of Mr. Lever should be struck off the list of those who had sent in tenders, for this reason: Mr. Lever offered them Wigan 4 feet Golborne coal at 9s. 6d. per ton, and the Committee did not look at any tender at such a price; the highest they considered being 8s. 5d. to 9s. Had his offers been at 8s. 6d. per ton, they would have been considered with the rest of the tenders. After the *Hunter v. Lever* trial, a letter appeared in the newspapers from Mr. S. Norbury Williams, asking for subscriptions to recoup Mr. Lever for the expense he had been put to in defending himself. Hunter was compelled by the Gas Committee to prosecute Lever. When Hunter sent in his resignation as Gas Manager, he (Mr. Ward) moved in Committee that it be not accepted, but that he be dismissed, and that an Investigation Committee be appointed. These resolutions were passed; but they were stolen from him in the Council. Subsequently he wrote to Mr. Williams, asking if he was able to give any information as to the success of his appeal for funds for Mr. Lever.

Mr. Williams sent for him, and said, "The reason I did not prosecute that appeal was because I received a letter from a certain gentleman who knows what's what." Mr. Williams eventually gave him a copy of the letter. [Mr. Ward here read a letter from Mr. C. W. Provis, auctioneer, Manchester, dated Oct. 6, 1887, making some libellous charges against Mr. Lever.] He (Mr. Ward) had not only done his best, while a member of the Council, to prevent corporate officials doing wrong, especially Mr. Hunter, but he had set his face decidedly against Mr. Ellis Lever. He happened to know how often Lever had been at the Bloom Street offices with the former Gas Manager; and he happened to know, from conversation with Mr. Hunter, that Mr. Lever had made certain offers to him with regard to the sale of coal. But he would afterwards have treated Hunter as he did Matthew Hiltor, formerly a member of the Manchester Corporation Gas Committee. On one of Mr. Lever's journeys to Bloom Street, he met Mrs. Hunter—that was in 1886—and said to her: "I cannot prevail upon your husband to take my house at Colwyn Bay. Will you try?" She said: "Oh, I have nothing to do with it." He had seen a letter from Miss Lever to the Hunters regarding the house. What was all that for? Was it not an effort to get hold of the Corporation official? He made those statements on the information of Hunter; and he could produce letters in proof thereof, if asked to do so. They would remember that, at the first hearing of the Hunter trial in London, an adjournment was granted in order that an umpire might be appointed to decide what amount Hunter should refund to the Corporation. One was nominated by Hunter's Solicitors; but he was rejected by the Corporation. There would have been some startling information had Hunter put on paper what he knew; but they would not give him an opportunity. This was kept back by the late Town Clerk (Mr. Graves). The Consultative Committee refused to accept £22,000, which was offered by Hunter. The Town Clerk would not allow it to be accepted, and £28,000 was asked. This amount was not there; but the £22,000 was in the hands of Hunter's Solicitors. He (Mr. Ward) said at the time it was refused, "It is your last chance." He contended that it would cost the ratepayers £5000 above any money they would get from Hunter, through the inefficient, slow, and bungling way in which the prosecution had been conducted. The late Town Clerk, more than anyone else, was to blame. Mr. Graves owed £100 to Hunter; and when it came to a close crisis in the prosecution, the amount had to be repaid. Where did he get it from? Why, he went to two Aldermen, and they found it for him, and the money was paid. They had not got at the whole truth yet. In 1880, when the contracts for coal and cannel were let, Alderman Keeney and Mr. Mandley, who had done so much to cry down Hunter, both coincided in the resolution passed that three members of the Committee, with the Gas Engineer, be appointed to select the contractors. This was placing in Hunter's hands a way to "do" them. They had no such system in 1886; a full Committee of 12 members out of the 16 were present when the contracts were accepted. He, therefore, blamed Messrs. Keeney and Mandley for the cause of the whole of the gas scandals for which Salford was suffering. He concurred in the resolution for dissolving the Gas Committee on the distinct understanding that all the new members, of which he was one, should be re-elected on the new Committee. As he was not re-elected, he felt that his character was gone. He entered the Council with a character, and according to some people he was not to be trusted now.

In the course of his reply to questions, the candidate said, in response to an inquiry as to how, if the Committee accepted the coal and cannel tenders, Hunter could put 3d. or 6d. per ton on the coal, that the tenders offered the last time the coal contracts were let consisted of 48 different colliery proprietors and agents, which embraced 72 different classes of coal and cannel. The tenders were presented to the Committee in sealed envelopes; they were opened and initialed by the Chairman, and then handed over to the Gas Engineer to be tabulated. Copies were subsequently sent to each member of the Committee; and they were afterwards accepted.

MR. ELLIS LEVER AND THE LEEDS GAS COAL CONTRACTS.

The Sub-Committee appointed by the Gas Committee of the Leeds Corporation to deal with the charges made by Mr. Ellis Lever in connection with the gas coal contracts, to which several references have been made in our columns, were busily engaged last week in investigating the statements made by him in the report he presented on the results of his examination of the coal at present being supplied to the Corporation. It will be remembered that the coal tested by Mr. Lever on its way to the works was, as he asserted, deficient to the extent of from 6 to 15 per cent. in quality, as compared with that submitted to the Corporation when the tenders were accepted; and that even in some cases it was found to be inferior by from 20 to 30 per cent. He also condemned the existing system of checking and weighing the coal. The Sub-Committee had a meeting last Tuesday, under the presidency of Mr. P. Gilstou, the Chairman of the Gas Committee; the Town Clerk (Sir G. W. Morrison) and the Secretary of the Gas Department (Mr. J. Lupton) being in attendance. Mr. Lever was not present. The Chairman and Managing Director of one, and the Trustees and Manager of another colliery Company who supply coal and cannel to the Corporation were called in to explain away the allegations of Mr. Lever; and they stated that men were specially appointed at the pits to see that coal of the proper quality was sent off, and if any inferior coal had found its way into that supplied to the Gas Department, it must have occurred through the carelessness of these men. They utterly denied, however, the possibility of so large a percentage of inferior coal being conveyed to Leeds for the purpose of gas making. On the following day, the Sub-Committee, accompanied by the representatives of the collieries concerned, proceeded to the siding of the London and North-Western Railway Company at New Wortley, where two trucks of coal which had been examined by Mr. Lever were standing. A quantity of cannel coal was shovelled from each truck, and examined by the representatives of the two collieries, who both declared that this particular coal was quite up to the sample from which they had sold coal to the Corporation. One of these representatives was so confident that he offered, if the coal did not yield a result equal to sample, to give 100 guineas. Afterwards the Committee proceeded to the Meadow Lane works, where samples of coal which had been laid aside by Mr. Lever in safe keeping for future examination were selected. One sack from each sample of the cannel taken from the trucks by Mr. Lever was placed upon the ground and examined, and in both cases the coal contractors declared that there was no "hub" (which Mr. Lever says is useless for gas manufacturing purposes) present in the material. The Committee then determined that a preliminary trial should be made, by the coal tester to the Corporation, of a specimen of this "hub" from one of the collieries. The test was accordingly made straightway; and it gave a result of 10,700 cubic feet of gas per ton of coal, with an illuminating power of 26.73 candles, tested by the standard flat-flame burner. On the completion of this trial, another experiment was made from a sample of the "hub" from the other colliery referred to by Mr. Lever; and this showed returns equal to a yield of 11,900 cubic feet of gas per ton of coal, with an illuminating power of 25.53 candles. The Committee then determined that the slack, the "hub," and the pure cannel, selected by

Mr. Lever, together with samples from the bulk of coal taken from each of the trucks whence the coal tested was taken, should be placed in the hands of Mr. Thomas Fairley, F.C.S., the Borough Analyst, to examine and report upon. Later in the day, the Town Clerk wrote to Mr. Lever informing him of this arrangement, and also of the results of the test made at Meadow Lane. He further intimated that the Sub-Committee was anxious to afford him every facility for making a further examination of the coal in the two trucks in question, and that the material would be placed at his disposal, in order that he might submit it to any analyst of standing whom he might choose to name. On Thursday, Mr. Lever sent to the Leeds papers the following telegram:—"I wish it to be known that I have not been invited to meet the Committee appointed last Friday [Oct. 26] and the representatives of the collieries whose material I have examined and condemned as containing foreign matter contrary to the stipulations of their contracts. I am prepared to vindicate my statements that the cannel contains 'hub,' slack, and pyrites. I will also undertake to bring Mr. James Paterson, F.G.S., to examine the cannel, 'hub,' and slack, to report upon it, and make independent commercial analyses. How comes it that my detection of inferior material in waggon 65 corroborated the analysis made on the 6th of October, when the cannel showed 25 per cent. of inferiority?" In a later telegram, Mr. Lever stated that he had wired to the Mayor of Leeds as follows:—"Will you make it known to the Press to-night that I have not been asked to meet the Committee of Investigation or to interrogate the contractors, neither was I present yesterday when the alleged testings took place. I do not believe in such investigations, nor will the public." In reference to the first telegram, the *Leeds Mercury* last Friday was authorized to state that, for the purpose of testing the coal contained in the trucks inspected by Mr. Lever along with the Sub-Committee, four sackfuls were taken. In each instance one sackful was used by the Sub-Committee for the purpose of their own test; the other sacks being placed under lock and key, and put into the possession of Mr. Fairley, for the purpose of analysis. The results will be published in due course. The Sub-Committee say they are quite satisfied with the result of the ordinary test made at the works to ascertain the illuminating value of the coal selected by Mr. Lever. Moreover, they will not offer any objection to that gentleman, or any other person concerned, having independent analyses made of the coal now in the possession of Mr. Fairley. They were not aware that Mr. Lever had expressed any desire to attend the meetings at which the representatives of the collieries concerned were present; but when the analysis is officially made by Mr. Fairley, every opportunity will be given to Mr. Lever, and any analyst he may wish to employ, to check the tests—the same facility being afforded to the colliery contractors concerned in the matter.

PARTICK, HILLHEAD, AND MARYHILL GAS COMPANY.

An Extraordinary General Meeting of the above Company will be held next Thursday, for the purpose of considering resolutions authorizing the Directors to enter into an agreement with the Corporation of Glasgow for the sale to them of the whole of the Company's undertaking and assets, at the net price, over and above the Company's liabilities, of £122,370; and sanctioning the payment to the holders of the 5½ per cent. preference shares of the amount of their shares and 10 per cent. premium, and to the holders of the ordinary shares of the amount of their shares, less 10 per cent. discount. With the notice convening the meeting, the Directors issued a circular placing before the shareholders the circumstances which have led them to submit the special resolutions referred to therein. In it they explained that the Corporation of Glasgow are desirous of obtaining an extension of the boundaries of the city, so as to include a part, if not the whole of the district supplied by the Company. The Directors, considering that such extensions, if carried out, would be prejudicial to the interests of the Company, appeared before the Boundary Commission, and pointed out in what ways the scheme would injuriously affect the Company; dwelling specially on the possible loss of the lighting of the streets and common stairs, and the eventual sacrifice of the supply of gas to the dwellings approached therefrom. The Commissioners promised that, if they reported in favour of annexation, they would specify that any claim the Company might have for terms, either as to future rights or compensation or otherwise, would have to be dealt with if their recommendation were carried into effect. After this deliverance had been pronounced, the Directors were approached in an informal manner by influential members of the Town Council of Glasgow, who indicated that, if satisfactory terms could be adjusted, the Corporation would be prepared to purchase the Company's undertaking. The Directors agreed to entertain the proposals made; and various conferences were held between representatives on both sides, with the result, as our readers are aware, that the Council have agreed, and now offer, conditionally upon a Bill being carried before Aug. 15, 1889, for the annexation to the city of the district supplied by the Company, to purchase the Company's undertaking on the terms already stated. It is a part of the proposed arrangement that, if the Annexation Bill is passed by the above date, a Bill is to be introduced into Parliament in the session of 1890, empowering the Corporation and the Company to carry out the arrangement; and provision is made under which the Company's business will be carried on as usual until the transfer is completed—the preference shareholders receiving in the meantime their full dividend, but the dividend to the ordinary shareholders being limited to 4 per cent. The Directors say that, in judging of the terms offered, the shareholders should keep in view (1) that, while it is no doubt uncertain whether an extension of the boundaries of Glasgow will take place or not, the fact of a Commission having reported in favour of extension cannot be left out of account; and (2) that it is doubtful how far it would be found possible to insert in any Annexation Bill clauses adequate to protect the Company's interests. The Directors are of opinion that the terms offered should be accepted. Pending the acquisition of the works by the Corporation, the Directors are putting them into a condition to adequately meet the calls made upon them. They have just set to work another new telescopic gasholder, 100 feet by 50 feet, bringing up their storage capacity to 20 hours' consumption. All the heavy ironwork of a gasholder, 100 feet by 40 feet, which stood in the way of improvements at the Tradeston Gas-Works has been removed, adapted, and entirely replated and resheeted satisfactorily, to suit the requirements of the Company, by the Airdrie Iron Company. This, with 1800 yards of railway laid down through the works, a large condenser and washer-scrubber, increasing the height of the old scrubbers, and doubling the storage capacity for tar and liquor, with sundry other improvements, has been found necessary to satisfy the increasing demand for gas. These extensions have been carried out under the supervision of the Company's Engineer and Manager (Mr. Levi Monk).

KETTERING WATER SUPPLY.—At the meeting of the Kettering Water Company last Thursday it was resolved to carry out the scheme for obtaining a fresh supply of water to which reference was made last week (p. 771). It is estimated that for the completion of the work an outlay of £32,000 will be required. The Local Board, it will be remembered, are now considering the advisability of purchasing the undertaking.

WENHAM COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Tuesday, at Winchester House, Old Broad Street—Mr. D. A. TRAILL CHRISTIE in the chair.

The notice convening the meeting having been read, the Directors' report was presented.

The CHAIRMAN, in moving the adoption of the report, remarked that although the Company only dated from May last, the accounts had been made up as representing a whole year, in order that the business might be a continuous one. The charges were substantially less; and in the current year they would be still further reduced. The manufacturing gross profit account showed a balance of £28,561, or a falling off of £9800, as compared with the previous year. Of this amount, however, at least £1500 was owing to the rise in the price of metal and the increased discounts allowed to the trade; but the main disappointment had been in the Continental department, especially France. Owing to certain ill-advised transactions, they had found it necessary to reorganize their business in that country. They had terminated the engagement of their Agent, and had selected as his successor one who they hoped would prove to be "the right man in the right place." As yet it was too early to speak of results; but the Directors had already very favourable impressions of the prospect there seemed to be of the new Manager inaugurating a more successful *régime*, although for some time he would have to contend with an inheritance for which he was in no way responsible. Both in France and in Germany there had been local difficulties and oppositions to contend against; and these had certainly led, in the year under review, to a diminution in the profits, irrespective of other special causes. In the case of Germany, where the Company were most energetically and ably represented, the falling off in the volume of business had been due, as mentioned in the report, partly to the competition of other systems of lighting supported by local interest, and partly to the adverse influence on business generally of the preoccupation and anxiety more or less prevailing during the late changes in that country. Both of these causes had operated in the way of producing a certain suspense; and between the two, and the necessity they entailed for increased expenditure in trying to push business in face of them, and the tendency of purchasers to prefer the less expensive forms of lamp, there was enough to account for the less favourable result the Directors had unfortunately experienced. If, while still reckoning on the German branch for a very solid contribution to the profits, it was difficult to speak with the certainty one could wish on all points of the outlook of the two Continental branches of the business, it was satisfactory to see, on the other hand, the growing popularity of the Company's system of lighting at home, as indicated by the substantial increase—3000—in the number of lamps sold as compared with those disposed of in the previous year; and the prospects were encouraging. The net profit had been £13,175, out of which they had paid an interim dividend of 5 per cent. They now proposed to apply £2000 in reduction of patents and business purchase account, and to recommend a dividend of 3d. a share; making the total distribution for the year 6½ per cent. on the capital of the Company.

Mr. TYZER seconded the motion, which, after a long discussion, was carried unanimously, and the dividend recommended declared.

The other business having been disposed of, including a resolution reducing the number of Directors to six, thanks were accorded to the Board, and the proceedings closed.

DINSMORE GAS COMPANY, LIMITED.

An Extraordinary General Meeting of this Company was held in Liverpool last Wednesday—Mr. M. GURRIN in the chair.

The notice convening the meeting having been read,

The CHAIRMAN, in presenting the Directors' report, said the Company was formed about twelve months ago for the purpose of acquiring patents taken out by Mr. Dinsmore for making coal gas.* After carrying on experiments at the works in Emlyn Street, arrangements were made for some trials on a manufacturing scale at the Hoylake as well as at the Widnes Gas-Works. The ordinary production of gas from Lancashire coal was about 10,500 cubic feet per ton; and the illuminating power about 16 candles. Consequently, cannel had to be used to raise it. But cannel was expensive; and the price of gas was consequently increased. Experiment had shown that the hydrocarbons contained in the tar produced in the manufacture of gas could be converted into gas during the process; and the value of the gas be much more than the value of the tar residual. This the Dinsmore process accomplished; and preliminary experiments showed that from a ton of Lancashire coal 12,000 cubic feet of gas could be generated, ranging from 22 to 23 candles in illuminating power. At Hoylake, from 11,300 to 12,650 cubic feet were produced per ton, and the illuminating power was 20 to 21 candles; but not more than half the tar was used. At Widnes, from Yorkshire coal, 13,000 cubic feet of gas were produced; and the illuminating power was from 20 to 24 candles—using not more than one-third or one-half of the tar. With Yorkshire coal by the ordinary process at Llandudno only 10,748 cubic feet of gas were produced; and the illuminating power was 18 candles. The Directors were fully convinced that satisfactory commercial results could be obtained by the process, and that in some towns it would effect a saving of many thousands of pounds annually. Broadly speaking, the nature of the invention was the addition of a duct or secondary retort placed above the ordinary retorts in a bench of two, four, or six, as might be found most useful. Into this duct was conveyed the gas from the ordinary retorts, and at the same time there was also conveyed a small stream of tar, which, falling upon the highly-heated surface, was converted into gas, leaving a solid carbon residual. This conversion of the tar into gas and mixing with the ordinary gas in a heated chamber was the Dinsmore process. The idea was not a new one; but it had never been satisfactorily carried out.

Mr. WATSON said he had heard it freely stated on "Change that the Hoylake tests proved a failure.

The CHAIRMAN said this was scarcely accurate, though, owing to defective furnaces, they had to burn more fuel than they should have done. At Widnes no more fuel was used than usual. He moved—"That the Directors be authorized to pay Mr. Dinsmore, out of the funds of the Company, such sum or sums of money, or to give him such other consideration as the Directors may think fit, in exchange for the acquisition by the Company of any present or future inventions or discoveries by Mr. Dinsmore, or the interest of Mr. Dinsmore therein, which the Directors may in their discretion think it desirable to acquire; and to enter into any agreement or agreements from time to time for such purpose, notwithstanding the agreement made between Mr. Dinsmore and others of the one part, and the Company of the other part, dated the 17th day of November, 1887." He remarked that this resolution would enable the Company to acquire any other of Mr. Dinsmore's inventions they might deem desirable.

Mr. M'CONKEY seconded the motion, and it was carried.

A vote of thanks to the Chairman terminated the proceedings.

SOUTHWARK AND VAUXHALL WATER COMPANY.

A Special General Meeting of the shareholders of this Company was held last Tuesday, at the Offices, Sumner Street, Southwark—Alderman Sir H. E. KNIGHT in the chair—for the purpose of sanctioning the creation of the debenture stock authorized by the Company's Act of 1886.

The SECRETARY (Mr. A. Jelley) having read the notice convening the meeting,

The CHAIRMAN said the shareholders were aware that when they obtained the Act of 1886 for carrying out additional works, the House of Commons required that they should raise the extra capital by debenture stock, which was to be offered to the public by tender or sold by auction. The Directors proposed to offer the stock to the public by tender; but they had given the shareholders special notice, thinking that they might like a preference given to them, though the Board were compelled, under the Act, to take the highest tender. The time had arrived when they found it was necessary to issue a portion of the capital; but this could not be done without the shareholders' approval. The Directors had, therefore, asked them to attend that meeting to give the Board authority to raise the £300,000 sanctioned by the Act, although they purposed issuing only £100,000. The new works authorized by the Act were in a very forward state of progress. The Directors had, according to the best of their business knowledge and ability, financed the operations so far, till the time had arrived when they found that new capital must be raised in the interests of the Company. He concluded by moving—"That the sum of £300,000, being the sum authorized by the Southwark and Vauxhall Water Act, 1886, to be raised by the creation and issue of debenture stock, be, in exercise of the powers conferred by the said Act, raised by the Directors by the creation and issue of debenture stock to that amount, to be called 4 per cent. debenture stock, on such terms and conditions and at such time and in such manner consistent with the said Act, as the Directors may from time to time deem expedient."

A SHAREHOLDER asked what would be the minimum price.

The CHAIRMAN replied that on the last occasion they issued debenture stock, it went at £109 10s. In the case of the present issue, they had not decided upon the minimum; and it was not usual to do so until the stock was offered. The minimum would be that which was most consistent with the interests of the Company; but it was a question which the Directors would have to carefully consider. In reply to a further question, he said that the capital was required for a new main from Hampton running through the whole of their district to Nunhead. A large portion of the main was laid. It was a 40-inch main, and would cost the Company possibly £80,000, or £90,000. They had some very large filtration works also to carry out at Hampton. A new engine-house would have to be built, and a new station at Wandsworth; and there were reservoirs, engine-houses, and other works to be constructed.

Alderman D. H. STONE seconded the motion, which was carried.

The CHAIRMAN, replying to an inquiry as to the position of the well at Sireatham, stated that they had now reached to a very great depth. The well was an interesting work to geologists, and to the public generally; but it must not be forgotten that the Company were only interested in it as a Water Company. They had no power or right to spend the money of the Company in other ways than in searching for water. In the course of the previous week, they went through some hard rocks; but they were now in a more yielding substance, samples of which had been submitted to Professor Whitaker. They had done everything consistent with their duty as water caterers so far, and nothing beyond it. If the Professor advised them that there was a fair probability of water being found at a lower depth, they might spend more money in going deeper to discover it; but if his report was against that probability, they would not go down farther. If, however, in the latter case any scientific gentlemen were interested, and would like to continue the boring, they could probably arrange with them to use the Company's plant. With regard to the well itself, it was a success, as they had found, in the upper greensand, a large supply of beautiful water, which they would utilize; and it would afford them some millions of gallons of water per day for use in the district. The money which had been spent had, therefore, been wisely expended, as by that means they had procured a good auxiliary supply to that which they drew from the River Thames. Then they could also fall back on the other springs. He conscientiously felt that they had done their duty in searching as far as they could. If they could have tapped a boundless supply in the lower greensand, it might have saved them laying the main from Hampton, which would cost them between £80,000 and £90,000; but they were entirely dependent upon the reports of learned and scientific men who were supposed to fully understand these matters. All the strata which those gentlemen told them they would go through they had gone through. The depth was now 1161 feet. Finding hard rocks, they had felt inclined to stop; but he did not readily "cave in," and against the advice of some of his friends, he quietly told the Engineer to "plunge away." This had been done to the depth of 12 feet. He thought it might be a boulder that had fallen forward on the top of the soft material. They would do everything that ought to be done; but they would not spend a shilling of the shareholders' money except in searching for water.

A vote of thanks was accorded to the Chairman; and the proceedings terminated.

THE PUBLIC LIGHTING OF PADDINGTON.—According to the report of the Paddington Vestry for the year ending March 25 last, there were in use on that day 1959 lamps, each estimated to consume 4·6 cubic feet of gas per hour. The actual consumption per hour for the year was 5252 cubic feet; each lamp burning for 3790½ hours, or an average of 10·63 hours per night. The estimated consumption per lamp per annum, at 4·6 cubic feet per hour, is 17,897 cubic feet; but the actual consumption was 17,633 cubic feet. There were at the date of the report 97 meters attached to the lamps. The price was reduced on Jan. 1 from 2s. 5d. to 2s. 2d. per 1000 feet.

SHOREHAM AND DISTRICT WATER COMPANY.—The thirty-seventh half yearly general meeting of this Company was held last Saturday week—Mr. T. Fuller, M.D. (the Chairman of the Company), presiding. The only business before the meeting was the consideration of the Directors' report for the half year ending June 30 last, and this was unanimously adopted. The amount available for distribution was not so large as at the corresponding period of last year; but the Directors recommended the following appropriation of the balance:—A dividend at the rate of 5 per cent. per annum (less income-tax) on the preference shares, £195; a dividend of 5 per cent. for the half year (free of tax) on the ordinary shares, £375; and to carry forward to the next account £145 19s.—total, £715 19s. The statement of accounts accompanying the report showed that the receipts during the past half year (including a balance brought forward from last account of £669 11s. 5d.) were £1858 3s.; the rates and meter-rents constituting £1165 3s. 10d. of this sum. The expenditure amounted to £1142 4s.; leaving the balance stated above. Resolutions were carried declaring dividends in accordance with the recommendations of the Directors.

* An abstract of one of Mr. Dinsmore's specifications was given in the JOURNAL last week (p. 784).

EDINBURGH AND LEITH GAS COMMISSION.

At the Meeting of the Edinburgh and Leith Gas Commission on Monday last week, a communication was submitted from the Manager of the Leith works (Mr. Linton), forwarding a request by the Leith workmen to be put on the same footing as the Edinburgh men in regard to wages and time. Bailie Archibald pointed out that the demand, if conceded, would involve a considerable increase of expenditure; but he moved that the retort men should be placed in the position they were in up to 1896, and that the cases of the other men should be left in the hands of the Manager. Bailie Garland seconded the motion. Bailie Roberts said the discussion at the last meeting (see *ante*, p. 769) had set the men on edge; and they thought they could come up to the Commission with every petty matter. The question should be left in the hands of the Manager. Bailie Cranston considered that the Leith men should be put on the same terms as those in Edinburgh. A conversational discussion ensued, in which the desirableness of revising the wages of both the Edinburgh and Leith men was suggested. Ultimately the whole question of wages in both works was remitted to the Works Committee. Provost Aitken said that he was not present at the former meeting when Mr. Jack was appointed Clerk; but he understood he was appointed provisionally for a period of three months. The time had now come when a permanent appointment had to be made; and he had great pleasure in moving that Mr. Jack be appointed Clerk of the Commissioners. Treasurer Boyd seconded the proposition. Bailie Archibald said he would suggest that a remit be made to the Finance Committee to report upon the duties, salary, and office of the Clerk; and that in the meantime Mr. Jack be appointed provisionally. It was eventually resolved to appoint Mr. Jack during pleasure; and the other matters were remitted to the Finance Committee. The Chairman (Lord Provost Clark) intimated the appointment to Mr. Jack, who declared that he would faithfully discharge the duties imposed upon him. Bailie Turnbull suggested that a remit should be made to a Committee to arrange for members of the Commission visiting the works periodically, in accordance with the practice of the Directors of the Companies in the past. The suggestion was adopted. On the motion of Bailie Archibald, it was agreed to have monthly returns of the quantity of gas manufactured at each works, the amount consumed, and the income and expenditure for the month. At the close of the proceedings, Lord Provost Clark said that was the last time he should have the pleasure of presiding, and he could only say he hoped they would have a very successful year, and that all the unfavourable prognostications as to the Trust would be found to be groundless. The Lord Provost was thanked for his services.

ABERDEEN CORPORATION GAS SUPPLY.

REDUCTION IN THE PRICE OF GAS.

At a Special Meeting of the Aberdeen Town Council held last Friday, the report of the Gas Committee for the year ending Sept. 30 was submitted. The Committee recommended that the price of gas should be reduced from 3s. 10d. to 3s. 6d. per 1000 cubic feet. They estimated that the revenue from the sale of gas for the coming year, at the reduced rate, would be £51,625—a decrease of £3979 7s. 1d. as compared with last year. The return from the sale of residual products was estimated at £6600—an increase of £92 17s. 11d.; and from meter-rents of £2185, being about the same as last year. The total estimated revenue for the coming year was £60,410—a decrease of £4046 9s. 9d. On the expenditure side of the account, the estimate for the manufacture of gas was £36,850—an increase of £293 over last year; the cost of distribution, £2420—an increase of £450; the cost of management, including salaries, £1280—an increase of £28; and discounts on gas and bad debts, £1650—about the same as before. For depreciation £4000 was allowed—a slight increase on last year. The total estimated expenditure for the coming year amounted in all to £22,144. But there was a surplus of £4460 carried forward from last year's account; so that with a revenue of £60,410, the Committee considered there ought to be a surplus for the coming year of £2726, notwithstanding the substantial reduction in the price of gas. From a table of statistics published with the accounts for the past year, it appeared that the present is the largest reduction made in the price since the gas undertaking was acquired by the Corporation. In 1871 the rate was 5s. per 1000 cubic feet; in 1876 it was reduced to 4s. 10d.; in the following year it fell to 4s. 7d.; and it was gradually reduced until it was brought down to 3s. 10d. in 1884. In 1886 it was raised to 4s., at which figure it remained for two years, when the price again dropped to 3s. 10d., from which figure it has now been reduced to 3s. 6d. The amount of bad debts showed a reduction, the figure for last year being only £298 10s. 11d., compared with £661 5s. 4d. in 1877.

Mr. COLLIE, in moving the adoption of the report, said that last year the account closed with a favourable balance of £1145; and after reducing the price of gas 2d. per 1000 cubic feet, it was estimated that there would be a surplus of £1307. But this year's account showed, after providing £8148 for sinking, depreciation, and contingent funds, a balance of £3315, and, with the balance of the former year, made £4460 wherewith to commence the current year. The quantity of gas made this year was 325,515,000 cubic feet; the quantity sold, 294,721,300; and the sum realized was £55,604. Last year there were 286,342,100 cubic feet sold, yielding £56,076; being 8,379,200 feet more gas, but 472 less rental this year. The residual products were estimated at £5550; and the actual sum received was £6507—being an increase of £957. The unaccounted-for gas this year was 30,793,700 cubic feet; being scarcely 9½ per cent. They would see, by a new table introduced this year, that when the Corporation acquired the gas undertaking, the loss in this way was a little over 15½ per cent. The gas-stove department had not realized much profit. It had, however, answered its purpose in bringing about a more extensive use of gas for heating and cooking. The number of stoves at present on hire was 400; and a considerable number had been sold. The actual revenue from all sources amounted to £2131 more than the estimate. The expenditure for the working of the undertaking was estimated at £39,700; the actual outlay being £38,522—a saving of £1177. The capital account showed that the amount borrowed was £69,136; leaving £10,864 of additional borrowing power. The sum of £17,131 had been repaid by sinking fund, and £2138 by depreciation; leaving the present mortgage debt £49,867. The book value of the undertaking now stood at £143,339; being an increase of £28,406 since the purchase of the undertaking, while the works were capable of producing three times the quantity of gas. The capital expenditure had been increased by £1207, of which £2103 was for railway locomotives and waggons. The railway was a source of considerable saving in reducing carriage and checking the weights. The reserve and fire insurance fund stood at £6795. For next year the estimate had been made up carefully. Reckoning upon a consumption of 295,000,000 cubic feet, it was calculated that after reducing the price of gas to 3s. 6d. per 1000 feet the surplus would be £2726.

Mr. LYON failed to see why discount should be allowed to large consumers; and he wished to know if gas could be produced at such a rate as to allow a discount of 6d. per 1000 feet.

The Lord Provost said they would observe that only one consumer had this discount, and that was the City of Aberdeen; so that it simply went into the pocket of the community, and there was no hardship in allowing

the city a liberal rate of discount. With regard to the other large consumers who obtained a discount of 1d., 2d., and 3d. per 1000 feet, the Corporation followed the custom of other places; and, moreover, it prevented a good many large consumers from making their own gas. When people found they could themselves make gas cheaper than they could buy it, they would very soon do so; and he knew that many large consumers felt that they could produce gas at a lower rate than they had it in Aberdeen.

The report was adopted.

ELECTRIC LIGHTING AT BARNET.

The subject of the electric lighting of the town was again before the Barnet Local Board at their meeting last Tuesday. The Surveyor (Mr. W. H. Mansbridge) reported that all the lamps were burning at seven o'clock on the evenings of the 24th and 26th ult., but that on the 29th one lamp was not alight. In answer to a question, the Surveyor stated emphatically that the lights were no better than they had been. The question then arose as to whether the contractor was to have notice to terminate his contract, in accordance with the resolution passed at the previous meeting (see *ante*, p. 769). Some doubt was raised as to the exact drift of the resolution; the point in dispute being as to whether the Surveyor or the Lighting Committee were to determine as to "satisfactory" progress having been made by the contractor, on which the continuance of his contract was to depend. On the Clerk referring to his notes taken at the meeting, from which the minutes were afterwards fair copied, he announced that the words were, "If by this day week the engine is not fixed and satisfactory progress made," &c. The words "to the satisfaction of the Surveyor" did not, he said, appear. The result of this omission was that a decision on the subject had to be postponed, to allow the Lighting Committee to hold a meeting and prepare a report for presentation to the Board. One member proposed that the contractor should have notice there and then. His colleagues, however, refused to support him; and his proposition fell through. The Lighting Committee will report at the meeting of the Board to-day. With regard to the effectiveness of the light and its cost, a correspondent has written to a local paper pointing out that the slight improvement now noticeable in the lights in portions of the High Street appears to have been obtained at the expense of those in the side streets. On the point of cost he says: "The lighting of the side streets is execrable. The only real attempt at lighting is in portions of the High Street; and here the cost is very great. The gas-lamps—omitting those at the junctions of streets, which were kept alight all night and charged for at a proportionate increase—cost £2184 a year inclusive. The electric lamps substituted for gas are fewer in number, and each is charged at £5 8s. a year. A comparison of the relative cost of lighting the High Street by gas and electric lamps respectively (omitting in each case the junction lamps) shows that the electric light for one street alone costs about £27 a year in excess of gas. Townfolk may judge for themselves which is the best value for money and which system of lighting has proved most effective."

THE DUBLIN CORPORATION AND ELECTRIC LIGHTING.

A Special Meeting of the Dublin Town Council was held on Monday last week—the Lord Mayor (the Rt. Hon. Thomas Sexton, M.P.) in the chair—to receive a report of the Committee of the House on the subject of the Corporation applying for electric lighting powers. The report set forth the steps which had been taken since Oct. 17, 1887, to obtain a Licence to supply electricity for public and private lighting in the city. The fact was recorded that, on the 2nd of July last, the Council received a notice from the Alliance and Dublin Consumers' Gas Company of their intention, before the 21st of December next, to apply to the Board of Trade for a Provisional Order, under the Electric Lighting Act, 1882, authorizing them to supply electricity for public and private lighting within the municipal boundary. The report concluded as follows:—"Your Committee beg to recommend that effect be given to the object of the proposed meeting, as they are strongly of opinion that electric lighting power should not be left in the hands of the Gas Company. A Committee of the House of Commons has significantly reported that 'in the control of gas companies it may be anticipated that electric lighting would be of slow development.' Public policy, as evidenced in the framing of the Electric Lighting Act, indicates that the powers should be vested in the local authorities rather than in trading companies; and it was very clearly intimated at the recent conference at the offices of the Board of Trade, that in the event of applications under the Act being made for lighting powers, both by the Corporation and the Gas Company, a preference would be given to the application of the Corporation. Your Committee are also advised that the best and most prominent electric lighting companies would be more likely to tender for the lighting of thoroughfares, and at a cheaper rate, if allowed the option of private lighting; and, under these circumstances, beg to recommend that application be made to the Board of Trade for a Provisional Order, to enable the Corporation to supply electricity for private as well as for public purposes. Your Committee are also of opinion that any further steps which should be taken in the matter should be entrusted to a Special Committee, with all necessary powers to apply for the Provisional Order, to obtain estimates, and enter into arrangements with contractors and others, and do all necessary acts, subject to the approval of the Municipal Council."

The Lord Mayor moved the adoption of the report; remarking that the motion was merely a formal one, because at their meeting on the 22nd of October the Council resolved to take the necessary steps to procure the Provisional Order.

Mr. ROBINSON seconded the motion.

Mr. DENNEY contended that until the Corporation were assured that electric lighting would pay, they ought not to touch it. The Company established in the time of the late Mr. E. D. Gray had not been successful. He (Mr. Denney) had been opposed to the project from the commencement, and still disapproved of it.

Mr. P. DOWAN said the supplying of electric light to private establishments would be 200 per cent. more costly than gas. It was all very well for private companies to try it; but a municipality should be careful about doing so. Were the staff of the Gas Company to be disemployed, and were the Corporation to be paying the rates away to some English Company? He was not opposed to the lighting by electricity of large thoroughfares, but he saw no hope of their being able to have a turbine erected at Island Bridge; and if steam power should have to be resorted to, the expense would be enormous. The 45 lamps which it was proposed to have in Dublin would cost for maintenance £1000 a year.

Mr. DAWSON said the total risk they were proposing to run was a loss of about £280, which would be less than 0.1d. in the pound on the rates, while they would get, in the area in which the electric light was to be used for public purposes, fifteen times more light than they previously had. They should, in his opinion, secure powers for private as well as public lighting.

Mr. DENNEY: It is my intention, as a ratepayer, to place the matter

in the hands of a capable lawyer, and to endeavour to make the parties who promote it personally liable for any loss.

The Lord Mayor said they would be happy to meet Mr. Dennehy and his lawyer anywhere. As regarded questions of cost, the Committee would not enter on a single stage of the matter without carefully calculating the expense. The Gas Company were about to apply for the very same powers as the Corporation; and if they thought they could apply them with profit, would not the Corporation be able to do so without loss?

The motion was then put, and carried by a large majority.

GAS CONSUMPTION IN GERMANY.

In the Presidential Address delivered by M. Albert Ellissen at the Boulogne Congress of the Société Technique du Gaz en France, an abstract of which was given in the JOURNAL for June 26 last (p. 1146), he brought forward some interesting comparative statistics of the gas consumption per head of the population, as well as that used for public lighting, in London and a number of Continental cities and towns. Recent numbers of the *Journal des Usines à Gaz* have contained figures relating to places which were not included in M. Ellissen's list; and these it may now be useful to give. At Cologne last year the average consumption all over the city was 113·3 cubic metres, or 4000 cubic feet, per head. The city consists of two portions—one comprising the wealthy and business quarters, and the other the parts in which the less affluent classes are to be found, and where there is less business transacted. The annual consumption of gas per burner varies to the extent of 50 per cent. in the two districts. This will be seen from the following figures:—In 1887, the number of burners in use (taking the meters as an indication) in one case was 32,670, with a total consumption of 4,832,962 cubic metres (170½ million cubic feet), being 147·9 cubic metres per burner per annum; whereas in the other the number of burners was 73,215, with a consumption of 7,168,695 cubic metres (253 million cubic feet), being 97·9 cubic metres per burner per annum. The work of each burner is spread over 825 or 1200 hours per annum, according to the locality in which it is situated; that is supposing it to be employed exclusively for lighting purposes. According to Dr. Schilling (*vide* his "History of Gas Lighting in Bavaria," in the *Journal für Gasbeleuchtung*), the annual consumption of gas per head is as follows (stated in cubic metres) in the several places named:—Augsburg, 49·5; Nuremberg, 50·7; Hamburg and Dresden, 59·6; Leipzig, 69·5. Taking the consumption according to the total length of mains, the number of cubic metres of gas burnt per kilometre (1094 yards) in the preceding places is as follows:—Augsburg, 39,100; Nuremberg, 44,700; Hamburg, 89,500; Leipzig, 65,600. In Berlin it is 121,350 cubic metres; in Cologne, 122,200 cubic metres; and in Munich, 50,500 cubic metres. Dr. Schilling gives some very significant figures in regard to Bavaria. In order to produce the same quantity of gas, the number of retorts has been reduced as follows:—In 1862, there were 215 employed; in 1868, 202; in 1877, 148; and in 1887, 94. This amounts to saying that the annual production per retort has doubled in a quarter of a century. The gasholder capacity, which represented about 5 per cent. of the total annual production in 1862, equalled only 0·45 per cent. in 1868, and 0·37 per cent. in 1877. Last year, however, it was 0·41 per cent. These figures speak volumes for the progress of the gas industry in Germany in the past 25 years.

THE CENTRAL ELECTRIC LIGHTING STATION AT DEPTFORD.

In the JOURNAL last week, reference was made to the large central station which is being constructed by the London Electric Supply Corporation at Deptford, with the object of providing the Metropolis with electric light. As this is the most important installation of electric lighting plant for the public service which has been undertaken, a fuller account of the station than we have already given may be interesting to our readers. For this we are indebted mainly to particulars given in the *Electrical Review*. Before describing the plant, however, it will, perhaps be well to trace the steps in the progress of central station lighting in the Metropolis which have led to its establishment.

Our readers will remember that about four years ago Sir Coutts Lindsay decided to light the Grosvenor Gallery by electricity; and when this became known, many residents in the neighbourhood requested him to enlarge his proposed installation, and supply them with the electric light. This demand went on increasing, until at length a small Company was formed, and a large central generating station, which is known as the Grosvenor station, was built and equipped. From that station the electric current is now being supplied to about 33,000 lamps; the area covered extending from Regent's Park on the north to the River Thames on the south, and from the Royal Courts of Justice eastward, to Knightsbridge westward. The whole of this area is supplied with the electric current by five separate circuits. The Company which had initiated this movement became merged in the present Corporation, which consists of a very few subscribers, who have hitherto found the necessary capital among themselves, and, it is stated, intend to find it up to £1,000,000; this being the amount authorized.

The ground occupied by the Deptford station extends to between three and four acres abutting on the river, and adjoining the Steam Navigation Company's Wharf. The river frontage has been slightly raised, to obviate the danger of flooding the works at the period of an extra high tide. The depth of water along the wall at ordinary high tide is about 12 feet, which will float vessels of considerable tonnage. A 50-ton iron derrick has been erected on the wharf, to facilitate the unshipment of heavy materials, which are all brought by water and landed, then placed on trucks and conveyed on a railway to the buildings, and unloaded at any desired point. The railway will be permanently laid to run straight through the centre of the block of buildings comprising the boiler-house and the two engine-houses now being proceeded with. The buildings together in one block occupy a space of 210 feet by 195 feet, and in height will approximate to 100 feet.

The boiler-house, 195 feet long by 70 feet broad, is constructed to contain boilers of 65,000-horse power; and of these a number are now being erected to provide steam for engines of 13,000-horse power. These boilers are arranged on two floors; the upper floor being supported on iron pillars, 30 feet high. Above this floor will be another similarly supported, on which will be placed the store of fuel; and the supply to the furnaces will be by means of vertical shoots passing through the centre of the floors of the upper boiler-room to the lower ones. At each end of the boiler-house is placed a chimney-shaft, 130 feet in height by 24 feet by 18 feet area. The interior of the shaft is divided into four flues, one of which will be apportioned to every set of six boilers. The total number of boilers on the two floors will eventually be 48. Economizers are to be provided for use if required.

The two engine-houses are in dimensions nearly the same as the boiler-house, from which they are separated by a massive brick wall, and from each other by iron pillars of immense strength; and beyond these divisions, which are destined to carry the overhead travelling cranes and the several spans of the roof, nothing will exist to prevent an unimpeded

view of the whole of the engines—it being intended that the engineer in charge shall have a comprehensive view of the whole of the machinery from an elevated gallery specially provided for him. In the first engine-house a pair of engines of 3000-horse power will be erected in the course of a few weeks; they being in readiness and waiting until the roof, now in course of erection, shall afford them the necessary protection from the weather. These engines will actuate two Ferranti dynamos, each one capable of supplying current for 25,000 lights—by far the largest electrical generators that have yet been constructed. Some 60 feet overhead there will be a steam travelling crane capable of lifting 25 tons, which will traverse the building from end to end. Besides the machinery above mentioned, this section of the building will also contain the condensing and hydraulic gear, exciting dynamos, and other apparatus.

In the second engine-house will be placed what the Corporation's Engineer (Mr. Ferranti) calls the "large" engines and dynamos, of which there will be two sets. Here the dynamos and engines are combined in such a manner that the armature being placed on the shaft is driven direct at 60 revolutions per minute, and acts as a fly-wheel to the engines. There will eventually be four of these large dynamos, each having its pair of engines of 10,000-horse power; but at present only half the engine power will be applied to each dynamo. When the time arrives for the creation of more power by the addition of the second engine of each pair, these large dynamos will each have its engines of 10,000-horse power; and all future extensions of the plant will be in machines of this type. To give some idea of the size of these machines, it may be stated that the diameter of the shafts is 36 inches in the centre; the armature being about 45 feet over all, and the weight of the dynamo about 500 tons. For the manipulation of the heavy weights in these machines, an overhead steam travelling crane will be erected similar to that in the first engine-house, but with a lifting power of 50 tons.

The system to be employed will be the same that the Corporation have worked up to now—viz., the Ferranti generator of high potential separately excited; the high potential current thus produced being converted or transformed to such as will meet the requirements of consumers with varied wants. It is proposed, however, that the tension of the current from the Deptford centre shall be some four times in excess of that furnished from the Grosvenor Gallery centre. This high-tension current is to be brought to London at several points, to be called "distributing stations." At each of these points a first conversion will ensue—the transformation lowering the initial high tension; this lower-tension current will be finally transformed to a voltage necessary to run ordinary incandescent lamps.

On the occasion of a recent visit to the station by representatives of the Press, Mr. Ferranti, in describing the many particulars and details relating to the buildings, engines, dynamos, cables, &c., called attention to the fact that the installation being constructed at Deptford was the largest centre for the supply of electrical current in the world—vastly outstripping any one of the kind even in the land of big schemes, America; and it will also appear that the tension of the current to be supplied to the trunk main to London is to "whip creation" as well, as the current will be driven through the mains at a pressure of 10,000 volts. It was suggested that there might be some slight danger to person or limb from such a pressure. The suggestion was, however, answered by the statement that there was not really much more danger from 10,000 than from 2500 volts, considering that in either case a death would be recorded, should any person be unfortunate enough to undergo a shock at that potential. Every precaution is to be taken to avoid, or reduce to a minimum, the chances of such a mishap befalling anyone, by paying every possible attention to insulation throughout the circuit, and by other means.

Speaking about the insulation of his dynamos and cables, Mr. Ferranti said he had tried an experiment which proved that there was no probability of "sparking" through this insulation. The experiment quoted was one in which he employed a 6-inch spark for the purpose of breaking through a piece of ebonite. He found that, even when the material was reduced to the utmost tenuity, there was no permeability; and from this he deduced that the thicker insulation, as used in practical work, must afford absolute immunity from dangerous breakdowns through sparking. In practice, however, insulation is breaking down continually; proving conclusively that no laboratory tests on a small scale can be accepted with any degree of confidence. Nevertheless, on the strength of Mr. Ferranti's tests, it would seem that the Railway Companies have been induced to enter into agreements with the Corporation, permitting the latter to run their cables by the side of the lines. These agreements are entered into with the South-Eastern Railway and the London, Brighton, and South Coast Railway; also with the London, Chatham, and Dover Railway, by whose bridge at Blackfriars the leads will be brought across the Thames. The Corporation have also leave to run cables on any portion of the District Railway Company's line.

The cable to be put down as the trunk line is formed of two concentric copper tubes, 2½ inches outer diameter, with a special insulating material separating the tubes; the centre portion of the cable being hollow. The sectional area of each concentric tube is to be 0·5 of a square inch. The cable is constructed in lengths of 21 feet each; the several lengths are then connected by expansion joints similar to those used for steam-pipes. The outer tube is left bare. When an Act can be obtained, another cable is to be laid underground to the various distributing stations; as the second one will afford more security to consumers against an accidental mishap or total breakdown.

As already stated, the whole of the station, both architecturally and mechanically, has been designed by Mr. Ferranti personally. The first two Ferranti patent dynamos of 1500-horse power each are nearly completed, and will shortly be erected; and two dynamos of 10,000-horse power each will be completed in about five months. Mr. Ferranti, in designing the station and its details on the above principle, has space at disposal, now covered with buildings, capable of accommodating 40,000-horse power, and remaining space of ground, easily available without crowding, for another 80,000-horse power. This brings up the capacity of the three acres of ground, after everything has been provided for, to the very high figure of 120,000-horse power. It is anticipated that before the end of the present year there will be in actual operation at Deptford machinery capable of supplying 50,000 lights, and by the spring of next year 200,000 more; making, with those already being supplied by the Corporation from their Grosvenor station, a total of 283,000 lights.

FAVERSHAM GAS COMPANY, LIMITED.—This Company has been formed to acquire the undertaking of the Faversham Gaslight and Coke Company, together with all their land and property. The capital is £26,880, in £8 shares.

HAMOR LOCKWOOD, LIMITED.—A Company under this title has lately been registered, with a capital of £60,000, in £5 shares, to adopt an agreement made between Hamor Lockwood and Edward Whitehead Marshall (as trustee for and on behalf of the Company) for the purchase of the business of a tar distiller and manufacturer of various products of coal tar, carried on by Mr. Lockwood under the style of "H. Lockwood and Co."

THE POSSIBLE EXISTENCE OF COAL UNDER LONDON.

[From *The Times*.]

At frequent intervals during the last 40 years, the question of the existence of coal in South-Eastern England has come under the consideration of geologists, and been brought before the general public. In 1846 the late Sir Henry de la Beche wrote: "From the movement of the older rocks, many a mass of coal measures may be buried beneath the oolites and cretaceous rocks, or the last, the remains of a great sheet of these accumulations, connecting the districts we have noticed [the Mendip Hills, &c.] with those of Central England and of Belgium, rolled about and partially denuded prior to the new red sandstone." Since then the subject has been frequently discussed and speculated upon by geologists; the speculations being recently much assisted by several deep borings in London and its neighbourhood. The principal of these borings have been those of Kentish Town, 1113 feet; Meux's Brewery, at the corner of Tottenham Court Road and Oxford Street, 1002 feet; at Crossness, 1008 feet; and at Richmond, 1142 feet. Besides these, there have been other borings more or less in the London neighbourhood which have greatly helped geologists to surmise the disposition of the rocks underground in Eastern and South-Eastern England. There have been borings at Harwich, at Ware, at Dover, and in the Weald of Sussex—the last to a much greater depth than any other. With the exception of the Weald boring, which was a purely scientific undertaking, all these enterprises have had for their object the discovery of underground water. After going to a certain depth and meeting with various kinds of strata, geologists were able to say whether or not water existed. If it did, there was an end to the boring; if it did not, and the character of the rocks met with contradicted water (to use a medical term), then the boring was stopped, as it was not the intention of those who undertook it to carry the enterprise further. At the same time, none of the borings referred to, as is admitted by geologists, were exactly in the position likely to lead to coal within a reasonable depth.

It is well known that the productive coal measures never occur above certain other formations of more recent age. But in all the borings referred to, these newer formations have been of such a thickness, or the accompanying conditions were of such a nature, that coal has been practically unobtainable. Still, a comparison of the various borings, taken in conjunction with what we know of the geology of Southern England, of the Channel, and of the Continental regions bordering on the Channel, pointed to a probable thinning out of those formations overlying the coal series, and that thinning out reaches its most favourable conditions just under the southern districts of London. The case was well put by that acute geologist Mr. Godwin-Austen 33 years ago. "The depression of the Thames Valley represents," he wrote, "and is physically a continuation of that which, extending from Valenciennes by Douai, Bethune, Therouanne, and thence to Calais, includes the great coal-trough of these countries." He infers "that at an early time a line of disturbed surface was produced, having a general eastern and western direction, and which, traversing a portion of the area of the coal growths, has placed all the members of that series along its course either at or near the present surface;" and that "we have strong *a priori* reasons for supposing that the course of a band of coal measures coincides with, and may some day be reached along the line of the valley of the Thames, while some of the deeper-seated coal, as well as certain overlying and limited basins, may occur along and beneath some of the longitudinal folds of the Wealden denudation." This is essentially the position taken up by the best English as well as Belgian and French geologists—a position which has been, on the whole, confirmed by borings so far as they have gone. As was announced in *The Times* of May 16, 1877, by Mr. R. Etheridge, the boring at Meux's Brewery in that year showed that in nearly the centre of London rocks older than the carboniferous occurred at a depth of less than 1100 feet.*

It is not necessary, however, to follow the geological aspect of the question through all its intricacies. The argument is summed up by Mr. W. Whitaker, of the Geological Survey, in his forthcoming work on the geology of London:—"One of our greatest coal-fields is in the South, that namely, of South Wales. Eastward of this, and continuing along the line of the great disturbance that has resulted in bringing the older rocks within touch under London, is the Bristol coal-field. Much farther east again, and along the same line, are the coal-fields of Belgium and of the North of France. What evidence we have, therefore, seems to lead to two conclusions—that coal measures are likely to occur somewhere along the line of the Thames Valley, or in the neighbouring tracts, and that these coal measures are likely to yield workable coal. It is rash to attempt to foretell the future; but it seems to me that the day will come when coal will be worked in the South-East of England." To test the truth of this prediction and of all the theoretical speculations on the subject, an unusually favourable opportunity presents itself at this moment, just at the very spot where, if coal occurs at all, it is most likely to be found—viz., at Streatham, in the South of London. The case is well put in the following communication from Mr. Whitaker:—

"At the late meeting of the British Association at Bath, I drew attention to a deep boring in London, which is the third to reach the lower Jurassic rocks beneath the cretaceous beds. There is no need here to enter into details of the formations passed through, or into the many points of interest that have already occurred; my object in writing is to prevent a great chance of acquiring further knowledge from being lost. The boring in question has been made by the Southwark and Vauxhall Water Company at Streatham, and has so far proved the presence there of the following formations:—

	Thickness. Feet.	Depth. Feet.
London clay (with soil, &c.).	163	163
Lower London tertiaries.	78½	241½
Chalk.	623	864½
Upper greensand.	29	893½
Gault.	188	1,081½
Lower Jurassic limestone, &c.	13½	1,095

"The practical result of the boring is to prove the absence of the lower greensand in the southern part of London; the gault being underlain by an oolitic limestone (forest marble). Now, the object of the work was, after tapping the chalk, to reach the lower greensand and to get water therefrom. This object having been found unattainable, the Directors of the Company are considering the advisability of abandoning the boring, the chance of getting deep-seated water being apparently small, and depending perhaps on whether water from the lower greensand, further south may (somewhere underground) reach permeable Jurassic beds, and flow into them. In view of the possibility of the boring being speedily stopped, I venture to suggest to the scientific world that, though it may be abandoned for practical purposes (if water getting), it ought to be carried on as a scientific experiment, and one, moreover, which might have important practical results.

* From what we know, the Jurassic rocks are not likely to be very thick.

* An account of this boring, with an illustration showing the strata passed through, appeared in the *Journal* for June 19, 1877 (p. 973).

At Richmond they are about 57 feet; and at Meux's, only 64 feet. It is hardly likely, therefore, that they will reach to a much greater depth at Streatham; and probably 60 feet or 70 feet further boring might pierce them, and before this is in print the boring will have been carried somewhat deeper than now. The question to be solved is: 'What underlies the Jurassic beds?' Is it Devonian rocks, as at Meux's; is it red beds of doubtful age, as at Richmond; or may we find beds that will solve the question, 'Is there coal under the London district?' While the contractor's tackle is on the spot, surely some endeavour should be made to continue the work, and to add something to our knowledge of one of the greatest problems in English geology—the character of the older rocks beneath the secondary formations of South-Eastern England, and the possibility of the occurrence of coal measures in that tract. All our knowledge on the subject has as yet been got from the work of engineers in the search for water. Surely scientific men will not let slip such a chance of extending it! There is no time to be spared; and unless measures are speedily taken, a great opportunity may be lost. As no worthier and less personal use could be made of the 'Government grant,' administered by the Royal Society, it is to be hoped that some support may be forthcoming from that quarter."

It is not necessary to urge scientific men to support Mr. Whitaker's appeal. The gain to science by a few hundred feet more boring would be great. Surely at the same time practical men must see how important are the issues which hang on the completion of the present enterprise. The question of coal under London ought to be set at rest once and for all. The expenditure required for carrying the drill to a greater depth than has been reached is comparatively small; and even if coal should not be reached, the gain to science would more than compensate for the outlay. If coal in workable quantities could be reached, it might perhaps upset the amenities of Streatham; but the gain to the resources of England would far more than counterbalance any such consideration. Possibly, then, it might be worth inquiry whether the old iron industries of Surrey, Kent, and Sussex might not be revived.

NATURAL GAS COMPANIES AND THEIR CHARGES.

An important decision has lately been given by two Judges of the American Court (Judges White and Magee) in an action brought by the citizens of Allegheny, to prevent the Allegheny Heating Company, who supply natural gas for heating purposes, from cutting off the supply from consumers who decline to pay the increased rates sought to be levied. The Company claimed the right to determine what was a reasonable price to charge for their gas, and to fix the price; but the Judges thought that if a company could secure this right, and also a monopoly of the business, they would possess the power of being very oppressive in their dealings with the public. The first company organized in America for the supply of natural gas as fuel claimed a monopoly by the old Act under which they were working. This, however, was defeated by a decision of the Supreme Court to the effect that the Act did not authorize the incorporation of a company to supply natural gas for fuel; and the Judges suggested that in any Act that might be passed for the purpose no monopoly should be allowed. Then the Legislature passed the Act of May 29, 1885, section 2 of which expressly declared that neither it nor any other Act should be so construed as to confer, authorize, or give colour to any claim of exclusive right in any corporation, howsoever formed, dealing in any way or for any purpose in natural gas. In the case immediately in question, the plaintiffs had, at considerable expense, fitted up their houses for the use of gas under the prices settled at the time, with assurances that they should not exceed the cost of coal. For some two years this was the case; and as soon as the Company, by terms made with conflicting companies, secured a monopoly, they notified to all the consumers, that they must pay from 50 to 100 per cent. more, and sign contracts to this effect, or the gas would be cut off. The coal trade had been destroyed, competing companies got out of the way, and the plaintiffs could not get gas, coal, or other fuel without delay, inconvenience, and expense. What were they to do? Must they be compelled, the Judges asked, under the press of such circumstances, to sign contracts, and be bound hand and foot. The Court avowed its inability to determine whether or not the increased prices were reasonable. There were, as usual, affidavits by the plaintiffs to the effect that the charges were not only exorbitant, but wanting in uniformity. On the other hand, there were equally strong affidavits from the Company in support of their case. The Judges considered that the "perilous position" in which the plaintiffs had been placed required relief, if the Court could give it without prejudice to the defendant Company. In the absence of satisfactory evidence of any essential change in the circumstances, of a real necessity for an increase in the price, they thought fair to assume that the figure charged by the three companies for two years was a fair and reasonable one. They considered, however, that it would be wrong to fix the price, or to limit the Company to it. Substantial justice could be done to both parties, without injury to either, until the cause was fully heard and finally decided, by enjoining the Company from cutting off the gas from the plaintiffs by their paying the same rates and in the same instalments as before, and giving bond with surety satisfactory to the Company, or approved by the Court, in a sum three times as great as their annual gas bill, to pay whatever increased price, if any, might be finally determined, with the right of the Company, if an increase was finally allowed and the arrears of increase were not paid within 30 days, to discontinue to supply the gas, and proceed on the bonds to collect the arrears. In an action brought by certain consumers residing at Sewickley, against the Ohio Natural Gas Company, to restrain them from increasing the price of gas, Judge Magee expressed a similar opinion. According to the provisions of the ordinance under which the Company entered the borough, gas was to be furnished at 20 per cent. less than the cost of coal. The learned Judge thought it was evident from the affidavits of the Company, as well as from those filed on the part of the plaintiffs, that the increase would raise the price of gas to consumers considerably above the average cost of coal. Therefore a preliminary injunction was granted; and, pending the final settlement of the case, each consumer was to give bond with surety in a sum equal to the year's gas bill. The Companies will appeal to the Supreme Court; and the final decision will, of course, be anxiously awaited.

BIDDULPH PUBLIC LIGHTING.—At the last meeting of the Biddulph Local Board, the Clerk (Mr. Wade) said he had received a letter from the Biddulph Gas Company, to the effect that from the 1st of October the price of gas had been reduced from 5s. to 4s. 6d. per 1000 cubic feet, with a discount of 5 per cent. on all accounts paid within a month. The Company's Manager (Mr. A. Shires), in forwarding the letter, had stated that if the Board could see their way to erect a few street lamps (say, 50 or 60), the Company would supply the Board and the public at 4s. per 1000 cubic feet, and allow 5 per cent. on all accounts paid within a month. The Chairman (Mr. Heath) said he thought the suggested lamps were not required; and he moved that the further consideration of the matter be adjourned *sine die*. This was agreed to.

THE BURSTING OF A WATER RESERVOIR AT VALPARAISO.

Details are given in the *Chilian Times* of the disastrous bursting of a reservoir at Valparaiso on Aug. 11 last (already briefly alluded to in the *JOURNAL*), through which a large number of lives were lost, and much damage was done to property. The reservoir was situated in a ravine at the head, or nearly so, of the ravine dividing the Bellavista and Yungai Hills, and at an elevation of about 900 feet above the level of the sea. Its capacity is estimated to have been about 64,000 cubic metres, or about 14 million gallons. The reservoir was formed in the simplest manner possible by constructing a dam across the ravine, to collect the water from a few insignificant little rivulets flowing from springs and the rain water from the natural shed formed by the hills and the slopes of the ravines in the rear of the reservoir. The dam for the retention of so large a body of water as is represented by 14 million gallons was constructed of earth only; and its dimensions are reported to have been 165 feet in length, 56 feet in height, 132 feet thick at the base, and 20 feet at the top. The reservoir was made about 15 years ago; and two or three years since the proprietor solicited and obtained permission from the authorities to add 13 feet to the height of the retaining wall—thereby largely increasing its capacity, and augmenting enormously the risk to be apprehended from the possibility of the dam giving way. Considering the nature of the material of which the dam was constructed, without, so far as is yet known, any precaution having been taken to consolidate the earth or to bind it together, its destruction was, the local paper says, merely a question of time. The catastrophe, however, appears to have been precipitated by a landslide on the side of one of the hills overhanging the reservoir. It is supposed that the enormous quantity of earth which thus fell at a blow into the surcharged reservoir, produced such a violent commotion in the water, that the wall, already weakened by filtrations, and strained to its utmost, was unable to resist the sudden tension caused by the falling earth, and gave way under the pressure. Of course, the breach once begun, the destruction of the dam was the work of a moment. Fortunately for the city, below the reservoir an embankment had been formed for a road to divert traffic from a vegetable garden owned and cultivated by the proprietor of a neighbouring brewery. Into the hollow thus formed by the embankment, and containing the garden, the water rushed, and spent a considerable portion of its force. At the expiration of about half an hour, the water in the hollow began to flow over the top of the embankment, and shortly afterwards this gave way, and the frightful work of destruction began. The pent-up water, freed at last, rushed down the ravine dividing Bellavista and Yungai Hills with resistless force, carrying everything before it—sweeping away houses and human beings, and inundating a large area of the city with a seething sea of liquid mud. The catastrophe was so sudden and so unexpected that there was no opportunity for warning of any kind; and some time elapsed before it became known to what cause the sudden irruption of water which had inundated the streets was owing. After the first rush of water had passed, the news spread that the sudden irruption was owing to the bursting of the reservoir near the brewery; and the people began to collect from all quarters, and the authorities commenced taking measures to ascertain the extent of the disaster. Their investigation revealed the fact that it had been attended by a serious destruction of life and property. Some of the incidents of the catastrophe, as well as several marvellous escapes, are recorded in the paper from which the foregoing particulars have been taken; and the perusal of them causes the mind to revert to the calamity of a similar; but more appalling nature, which befell Sheffield in 1864, when the bursting of the Dale Dyke reservoir caused the loss of about 250 lives, and of property valued at half-a-million sterling. No estimate has yet been made as to the value of the property destroyed at Valparaiso.

RICHMOND (Yorks.) GAS AND WATER SUPPLY.—At the meeting of the Richmond (Yorks.) Town Council last Wednesday, Mr. Alderman Mason read the report of the Gas and Water Committee. It stated that the gas undertaking had progressed satisfactorily during the past 20 years; the consumption of gas having increased from 3,489,509 cubic feet, at 5s. per 1000 feet, to 8,700,600 cubic feet, at 3s. 9d.; the cost in the former case being £872, and in the latter £1631. The Gas Committee, having now ample storage, proposed to abolish Sunday labour entirely. As to the water undertaking, the Council were asked to renew the pipes throughout the town, which have been down about 50 years, at a cost of £650; but this matter was deferred. The remainder of the report was adopted.

THE BLYTH GAS COMPANY AND THE COWPEN LOCAL BOARD.—An extraordinary general meeting of the shareholders of the Blyth Gas Company was held last Tuesday evening, having been convened by the Directors in compliance with a requisition recently addressed to them by several shareholders, for the purpose of considering the dispute between the Directors and the Cowpen Local Board, to which several references have been made in our columns, and of passing a resolution thereon. The Chairman of the Company (Mr. W. Thompson) presided. As the meeting was deemed to be a privileged one, as far as the remarks of the shareholders are concerned, we can only record the fact that a resolution was passed to the effect that an offer should be made to the Local Board to appoint three of their number to meet an equal number appointed by the shareholders of the Company to discuss the matters in dispute between the two bodies, with a view to adjusting all differences. This step should lead to an amicable settlement of the quarrel, and the speedy restoration of gaslight to its accustomed place in the public lamps.

DAMAGE TO THE COATBRIDGE GAS COMPANY'S PIPES BY SEWERAGE WORKS.—In the Airdrie Sheriff's Court some time ago, an action was brought against the Coatbridge Corporation by the Coatbridge Gas Company for damages for alleged loss of gas and injury to their mains in St. John Street, arising out of the sewerage works of the Corporation in that street. The amounts claimed were £14 1s. 3d., the value of 75,000 cubic feet of gas lost; £6 6s., for "time and labour" rendered necessary by the Corporation's "faulty operations;" and £69 3s. for gas lost and labour expended prior to Dec. 29, 1887. The Corporation denied their liability; averring that their operations were carried on with the assistance and under the supervision of skilled workmen employed by the Company. Sheriff Mair, in a note appended to his judgment, allowed the parties a proof as to the first two claims. The third, however, was, he said, in a different position. The Company claimed £67 10s. for 360,000 cubic feet of gas and £1 13s. for time and labour; but, in addition to denying their liability, the Corporation pleaded that the action was excluded by the provisions of section 116 of the Public Health (Scotland) Act, 1867, under which they acted, whereby claims for damages were limited to £50. His Lordship therefore held that the action would be incompetent as far as this claim was concerned. The Company had offered, with a view to having the matter settled, to restrict their claim to £50. He could not, however, see his way to sanctioning this arrangement, as the effect of agreeing to the Company's proposal would, he said, alter entirely the character of the action. Their course would be to bring separate actions—one for the first two claims, and another (a summary application) for the third.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

A strike is threatened of the workmen employed in the Leith Gas-Works; and as the position in which the parties are now placed is so decidedly due to the action of the Commissioners, I feel that it will require some space to lay it rightly before your readers. Several weeks ago the workmen at Leith petitioned the Gas Commissioners to be restored, in the matter of wages, to the same position as they were in before May, 1886. The Finance Committee, to whom the question was sent for consideration, for some reason reported only with reference to the retort men; and their recommendation was to inform the men that they must first of all approach the Engineer, Mr. Linton, on questions such as that before them. This I considered to be a sensible suggestion; and so did the majority of the Commissioners, for it was adopted by a large majority. In discussing the matter, however, a great deal of mischief was done by the remarks of several of the Commissioners; but chiefly of Bailie Cranston, who has of late shown himself more than usually solicitous to win the favour of the working-class citizens. In the Bailie's view, the Commissioners should settle all such questions themselves; and he strongly urged this view upon the members. The effect of his remarks was soon apparent. The workmen assembled, and passed a vote of thanks to him; and then they turned to the Engineer and claimed, not restoration to their former position, but to be placed on the same footing as their brethren in the Edinburgh works. This was a much more serious matter than had been left in Mr. Linton's hands to deal with; and he was justified in referring, as he did, to the Commissioners for advice. In considering the subject, the question of what was paid in the Edinburgh works naturally arose; and, on discovering that a higher rate was paid in Edinburgh than in Leith, several of the Commissioners hastily jumped to the conclusion that the Leith men ought to be advanced to the same position as those in Edinburgh. Incredible as it may seem, the Commissioners were on the eve of agreeing, without consideration, to this proposal, when the ordinary common-sense view, that the wages paid in both works should be considered together, was introduced by Mr. Kinloch Anderson, supported by Mr. J. C. Dunlop, and ultimately adopted. Meantime, it was agreed that the retort men were to receive the advance they asked for. This was the weak point in the finding of the Commission; for the men being, as Bailie Roberts expressed himself, "set on edge" by the injudicious remarks of the Commissioners, now refuse to accept the concession as it is offered. The retort men met at the breakfast hour this morning; and afterwards gave notice that, unless the advance were conceded to all the *employés* in the works, they would strike next Friday. There are about 60 retort men and 120 other *employés*. The Commissioners have thus the prospect of a strike before them in the beginning of winter, and all through their own doing. It was not to be expected that men in Leith would do the same work for less wages than were paid in Edinburgh. A question of this nature arising in a business house would have led to inquiry and calculation as to whether it could be afforded. Instead of that, the Commissioners—at least some of them—began to deliver popular speeches on the rights of the workmen; and the result has been to raise a hornets' nest about their ears, which they may have difficulty in allaying. It is not likely that the *employés* in the Edinburgh works will take meekly to a reduction, should that be proposed; and in Leith the clamour will not subside until the men are placed on the same footing with the Edinburgh men. If the "levelling up" process be adopted, that means that men who only asked for £395 a year will have been stirred up to demand, and will have obtained, £2500 instead. If the "levelling down" of the Edinburgh men be adopted, neither group of *employés* will be satisfied; and still less will this be the case if it be attempted to produce equality by reducing the one and raising the other to the same figure. Either way, the Commissioners have not a very cheery prospect before them.

At this season of municipal elections, of all seasons in the year, the "great unwashed" must realize what glorious privileges they possess under representative government; for are they not, by Act of Parliament, at this time raised to the level of, if not above, the rulers and administrators of their district? and are they not entitled to interrogate and to censure these "delegates" as to their past shortcomings, and even to instruct them as to their future policy? Gas and water supply are never-ending topics of discussion at gatherings for such purposes; and at the numerous meetings during this week they have not been forgotten. Indeed, so many have been the references, that I can only here refer to a few. The most important question in my district arises at Arbroath. I dealt with it last week, when it was before what might be called an informal meeting of the inhabitants. Since then the regular nomination meeting has been held, at which Provost Anderson gave a most lucid account of the proceedings. The meeting adopted a resolution, proposed by Mr. Michie, that nothing should be done to the gas-works, except what was actually necessary. Provost Anderson took exactly the same view as was urged in Edinburgh last year—that the community were not competent to pronounce upon such a technical matter as the necessity for extending the gas-works; and, on the other side, the obtaining of reports from gas managers was denounced, on the ground that from a sense of brotherhood they would naturally support Mr. Carlow in his efforts to get the works into better condition.

At the municipal meetings at Aberdeen, the principal question discussed has been that raised by Mr. Adam Pratt as to alleged overcharges for gas. In connection with this the Committee who, along with Mr. Pratt, are responsible for the agitation, put a series of six questions to the candidates on the subject, the answers to which were various; but the thing which should give most comfort to the Gas Committee is that although efforts were made to bring forward candidates, the agitators have not had much success, so far as has yet appeared—Mr. Pratt himself being the only person nominated by them. His nomination is a wise course, because it will furnish the true test as to whether or not the public have confidence in the gas management. The fact that they have been able to reduce the price of gas from 3s. 10d. to 3s. 6d. per 1000 cubic feet is in favour of the Gas Committee, and so it must be conceded that Mr. Pratt is fighting with long odds against him; but, apart from that, he does not seem to have much hold on the community.

At the public meetings in Dundee, a good deal of cavilling has taken place at the honorarium of £500 given to Mr. J. Watson, the Water Engineer, for extra services in connection with the new Lintrathen water supply, and that, too, in the face of the explanation that the fee to an outside engineer would have been £5000, and that Mr. Watson had done his work so carefully that scarcely £5 worth of extra work had been required.

Following up the question of the dilution of the Dundee gas with air, which I referred to the other week, a correspondent in the local papers accuses the management of using too much shale in the manufacture, and insinuates that the coal is supplied by a member of the family of one of the officials.

The latter statement has been authoritatively denied; but the accuser does not accept the denial, and replies that "it may also be true that the person hinted at has an interest in some way or other in the supply of this particular kind of coal." Whoever the individual may be, he does not seem to deal very straightforwardly with the Gas Commissioners.

At the meeting of the Arbroath Town Council on Monday, it was reported that the surplus gas profits for the year were £180 2s. 2d.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

Considering the fact that a movement was made some time ago in the Airdrie Town Council for the acquisition of the local gas-works, and that it was eventually found advisable not to prosecute it to an ultimatum, it was natural to suppose that some of the members of the Council would take an opportunity of referring to the "gas question" when rendering an "account of their stewardship" to their respective ward meetings held in view of the forthcoming municipal elections. Referring to this question before the electors of the Third Ward, Bailie Martyn said that, after fully investigating the whole matter, the Council had found that it would be advisable in the meantime not to take over the gas-works. He had no idea as to what price the Gas Company would wish; and being in a great measure in the dark, if the proposal had been gone on with it would have had to be submitted to an arbiter, and they would have been obliged to accept his decision, whether it was a large sum or a small one. Considering also that the electric light was making such rapid strides, it had been found by the Airdrie Town Council advisable to postpone the matter. Mr. McKillop was the principal speaker on this subject at the meeting referred to. When he first appeared before the electors as a candidate, he said that he promised, if returned, to bring the matter up in the Council. As they were aware, he had fulfilled his promise. Six months ago he brought forward a motion, asking for the appointment of a Committee to consider the whole question. In doing so, he had left no stone unturned in order to support the case which he then presented. He showed first of all that in the different towns in Scotland—26 in number—where the experiment of taking the management of the gas-works into the hands of the corporations had been tried, success had invariably followed; that the price of gas in those places was lower than that charged in Airdrie; and that the surplus profit went for the purpose of reducing the rates. He then explained, he said, how the same could be done in Airdrie, if they followed the example of these towns. The original capital of the Airdrie Gas Company had been between £14,000 and £15,000, and according to the best calculation, arbiters would not compel them to pay more than about £24,000; so that, by borrowing the purchase-money at 4 per cent., the interest could be paid, the works kept in good order, and yet a handsome profit realized, which could be applied either for the purpose of reducing the general rates, or lowering the price of gas. After some difficulty, a Committee was appointed, and immediately set to work. As it was evident to him that the majority of the Committee were against the proposal, he felt that it would be madness to fight it to the "bitter end," and he therefore agreed to the recommendation of the Committee, that no action be taken in the meantime. It was still, however, an open question, he remarked; and if the ratepayers generally were in favour of the scheme, they ought to speak out, and impress the matter on their representatives. So far as he himself was concerned, his opinion was the same to-day as it was a year ago. Other speakers at the ward meetings during the week dealt briefly with the matter in question. One of them (Bailie Arthur) remarked that the decision came to by Mr. McKillop's Committee was a wise one, owing to the transitional state of the question of lighting, and the vast improvement of lighting by electricity; and he pointed out that even although they had the gas-works at their present market value, and that they showed a small margin of profit, yet in a few years they might have to face a diminished revenue to meet a large capital, and then be left, to use a popular phrase, with "the baby to hold." Mr. Knox, a member of the Council, said he had a strong opinion that it would be advantageous to the town to acquire the gas-works. In many cases throughout the country, he observed, the purchase of gas-works had proved far more successful financially to corporations than that of water-works; and he was still open to consider the question at the very first opportunity.

Mr. Nicolson, one of the Greenock Town Councillors, referred to gas affairs when addressing his constituents the other night. He was pleased to be able to say that the Gas Trust had proved to be a source of profit during the past year; a sum of £3000 having been, as formerly, used to reduce the Police Board rates. After a great deal of discussion on the question of reducing the price of gas, it was resolved that the charge should be lowered by 2½d. per 1000 cubic feet. Many of the members of the Board—himself among the number—were strongly in favour of a reduction of 5d. being made. He was far from being satisfied with the manner in which the profits derived from the gas undertaking were distributed; and he would far sooner see 21. or 3d. added to the rates, as there was no doubt by the present system many obtained benefit to which they were not entitled. He expressed the hope that next year a change would be made in this system. Had the profits derived from the sale of gas been used for reducing the debt on the Gas Trust for many years back, in a very short time it would have been clear of debt. At the meeting of the electors of the Fifth Ward, Mr. D. Shankland referred to the great saving which had been effected at the gas-works by the introduction of the Klönne system of heating retorts. At the same meeting, Mr. J. Lang stated that he had been looking into the matter of handing over the balance of profits derived from the gas undertaking to the Police Board (which he entirely disapproved of); and he found that since 1872 the moneys so paid amounted to £55,000. They had also set aside as a contingent fund the sum of £4468; for sinking fund, £28,014; and for redemption of mortgages, £7400—amounting in all to upwards of £93,000, which, he thought, showed that they had paid a high price for gas during these years.

The Glasgow pig-iron warrant market has been steady during the week. Scotch warrants have fluctuated in price between 41s. 1d. per ton cash (on Tuesday) and 41s. 7½d., at which there were buyers at the close yesterday afternoon. The fluctuations in the price of Cleveland and hematite iron have been within small compass. Scotch special brands are in quiet demand; and the current quotations range from 49s. 6d. per ton (Coltness) to 47s. per ton (Gartsherrie).

A steady progress in the way of improvement is showing itself in the local coal trade. The price of house coal has risen 6d. per ton within the past few days, in addition to the 1s. advance a few weeks since. In a number of instances the miners have obtained an increase of 6d. per day on the rate of wages; and it is probable that in a week or two the advance will be very general.

The Ilkeston Local Board have recently decided to apply to the Local Government Board for power to raise £6000 for the extension of their water-works.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Nov. 3.

Sulphate of Ammonia.—Although the market is still firm, there does not to-day exist the same amount of strong feeling as a week ago. In fact, consumers are hardly as eager to secure spot parcels or forward contracts; and the same may be said of dealers and speculators. The reason for this is readily apparent when it is considered how large an amount of business has been done during the past fortnight or three weeks; and that consequently consumers will have filled a fair portion of their requirements, while dealers and speculators may feel inclined to pause before committing themselves too extensively to the present considerably enhanced values. It can, however, scarcely be said that a decline of any importance is likely to ensue. For such an advent stocks are at present too low; and even a proverbially dull November (and a consequent rapid increase of the liquor supply) may not bring about any marked change, as many producers have sold fair quantities for near delivery, and will not be obliged to bring their sulphate to market till later in the month. Of course, November is generally one of the quietest months of the year; but, like October, the present month may prove that previous experience is ineffective. Nitrate keeps firm; and its large consumption will contribute to the maintenance of values during the ensuing season. At the close quotations stand at £12 2s. 6d. to £12 5s.

LONDON, Nov. 3.

Tar Products.—Business is better in this market; and products have in some instances improved both in request and price. Pitch is, however, not buoyant; and stocks are now increasing. Anthracene is weaker; but stocks of this article are low. Prices may be taken as follows:—Tar, according to position, 17s. 6d. to 22s. 6d. per ton. Benzol, 90 per cent., 3s. 2d. per gallon; 50 per cent., 2s. 6d. Tolnol, 1s. 7d. per gallon. Solvent naphtha, 1s. 3d. per gallon. Crude naphtha, 30 per cent., 1s. 1d. per gallon. Light oil, 3d. per gallon. Creosote, 2d. per gallon. Pitch, 12s. to 15s. per ton. Carbolic acid (crude), 3s. 5d. per gallon. Cresylic acid, 10½d. per gallon. Tar salts, 15s. per ton. Anthracene, 30 per cent., "A" quality, 1s. 5d. per unit; "B" quality, 1s. 3d.

Ammonia Products.—The improvement noted last week has developed into considerable strength. The extraordinary rise in the value of nitrate has brought buyers of that article into the sulphate market. Doubtless the sudden rise is immediately due to "bulling" operators. Large business has been done at £12 to £12 3s. 9d. per ton, less discount; and makers are asking more for forward delivery. Prices of other products may be taken as follows:—Gas liquor (5° Twaddell), 7s. 6d. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 2d. per lb. Carbonate of ammonia, 3½d. per lb. Nitrate of ammonia, brown, £18 per ton; white, £27. Sal-ammoniac, £30 per ton.

[From the *Chemical Trade Journal*, Nov. 3.]

Sulphate of Ammonia.—The sulphate market has for some time past been exceedingly firm; and prices have gradually risen until £12 2s. 6d. is easily obtainable at Hull, £12 at Liverpool, and £12 1s. 3d. at Leith. Beckett sulphate has, within a very short period, been twice enhanced in price. After doing a considerable business at £12, the price was raised to £12 2s. 6d.; and within a few days to £12 5s., at which it now stands. Much of the advance at provincial ports must be attributed to sympathy with the Beckett quotations; and makers should be mindful that the act of running up the price to-day might leave them short of customers for to-morrow. There is still, however, a good inquiry for spring delivery; and the nitrate market remains in a strong position.

Tar Products.—Benzol has somewhat recovered itself; and on 'Change last Tuesday, 90's may be said to have reached 3s. 1½d., while 50 90's could be bought for 2s. 5d. to 2s. 5½d. There is still a good demand for solvent naphtha at old rates; and creosote is moving off very quickly. Crude carbolic acid 60's is reported to be a little better; and 3s. 4d. to 3s. 4½d. is the price asked. Anthracene still keeps in good demand, and at slightly improved rates. Although the "A" quality is still unchanged in price, a slight improvement has taken place in "B" quality; and to-day's value may be taken as 1s. 3d. to 1s. 3½d. Very little, however, if any, can be obtained at the former price. Alizarine is now on the move upwards, and one of the largest producing firms has raised its price to 9½d. for the remainder of this year, and 10d. for next year. How this will affect the price of anthracene remains to be seen. A fair business is doing in pitch; and 14s. 6d. to 15s. 6d. may be taken as being the price to-day. It is reported that sales have been made in London of Beckett pitch at 16s.; and some makers are still anticipating higher prices.

DORTMUND GAS COMPANY.—The Dortmund Gas Company have just declared a dividend of 1½ per cent. on the past year's working.

BATH AND THE ELECTRIC LIGHT.—At the last meeting of the Bath Town Council, the question of the lighting of a portion of the city by electricity was again discussed. Alderman Gibbs said he considered the introduction of the light was premature; and they would do well if they waited until the system had been further improved. He thought it was a fair question whether the district lighted ought not to bear the increased expense, for, in his opinion, no call for the cost of the light should be made upon the poor ratepayers, who would not derive any benefit from it. It was pointed out that such a principle could not be applied as that suggested by Mr. Gibbs. After a long discussion, it was decided that the Corporation should have the power to buy the whole of the plant at the end of seven years, at a fair valuation.

THE NORTHERN COAL TRADE.—The coal trade in the North of England has shown very great activity during the past few days, partly owing to the continued scarcity of coal, which has been greatly increased by the effects of the strike in Yorkshire. A good deal of steam coal has been despatched from Northumberland to the Humber, and even farther south; and Durham house coal has been freely sent from the Castle Eden district to Leeds and other parts. In the gas coal trade, very great scarcity has shown itself. The consumption is growing with some rapidity, as the nature of the summer prevented the users from getting stocks such as they usually do; hence their desire to stock now freely. But some of the working miners are undoubtedly restricting their output. At one large colliery the production has been about 10 per cent. less than it usually is, and naturally some of the pits are in consequence behind with their contracts. For odd cargoes of coal high prices have had to be paid. Whilst two or three months ago the price of best coal was about 6s. 6d. per ton, 7s. 6d., and in one instance even 8s. per ton was paid last week; and the tendency is towards still higher prices. It has been said that 9s. per ton will have to be given before the end of the year. Every week for two months the consumption will increase, and of course much more coal will be needed. Household coal is in rather better demand. Prices of best steam coal vary from 8s. to 9s., less a discount. A good deal of gas coke is now being made; but the demand has increased as rapidly. The price is a little higher for the manufacturers who use it in large quantities.

REDUCTION IN PRICE.—The *Cleveland Gas Company* have reduced the price of gas 9d. per 1000 cubic feet; to take effect from the 1st ult.

SKIPTON WATER SUPPLY.—At the last meeting of the Skipton Rural Sanitary Authority, the Barnoldswick water difficulty formed the subject of a rather animated discussion. A report was read from Mr. De Rance, recommending that the boring operations for water, recently discontinued at a depth of 300 feet, should be resumed. The recommendation was ultimately agreed to; and it was resolved that the engineers be instructed to obtain tenders for the work.

THE COST OF THE VYRNWY WATER-WORKS.—The quarterly return of expenditure by the Water Committee of the Liverpool Corporation, under the Liverpool Corporation Water-Works Act, 1880, has been issued. It is for the three months ending Sept. 30, during which period £45,725 10s. 3d., was expended in connection with the Vyrnwy water-works. This amount is made up as follows:—Llanwddyn embankment works, and works in connection with the reservoir, £9685 10s. 1d.; Llanwddyn quarry, £2022 17s. 7d.; aqueduct, £29,373 18s. 1d.; land and easements, £3267 7s. 8d.; and maintenance of the Vyrnwy estate, £1375 16s. 10d. The total expenditure since the commencement of the works now reaches the sum of £1,812,976.

WESTON-SUPER-MARE WATER-WORKS.—The new pumping station and extension of existing mains, which were found to be necessary in consequence of the consumption of water having increased to such an extent as to almost reach the limit of the existing water supply at Weston-super-Mare, are rapidly approaching completion, and will be ready for use in about two months. The new works have been in hand something like two years, and have been carried out from the designs of Messrs. E. Cousins and Son, of Westminster. The pumping station is about a mile outside the town, between the Worle and Bristol roads. One well has been sunk 40 feet deep, with three adits, driven in different directions into the old red sandstone; the collecting supply being the watershed of the Mendip Hills, covering an area of 60 square miles. The water is pumped into two reservoirs—one being 200 feet and the other 450 feet above the surface. The engines and pumps are capable of lifting 40,000 gallons of water per hour. They are condensing, and are in duplicate, and the pumps are of the direct-action bucket-and-plunger type. On the completion of the new works, the existing machinery will be used only as an auxiliary.

TENDRING HUNDRED WATER COMPANY.—The first annual general meeting of this Company was held last Tuesday—Capt. Parsons, Chairman of the Directors, presiding. The Chairman presented the Directors' report, with the accounts to June 30 last, and gave an outline of the progress made in carrying out the objects of the Company; congratulating the shareholders upon the completion of the mains to Dovercourt, Harwich, Thorpe, and Frinton-on-Sea. He stated that a plentiful supply of very pure water continued, and that there was a gradual increase of income, both from domestic and public supplies. Every prospect existed of a speedy completion of the whole system of works contemplated in the Company's Acts; and he predicted that financially and otherwise the future of the Company would be successful. The Directors considered that the proper course was to carry forward to the next year the balance appearing on the revenue account. The Chairman concluded by moving the adoption of the report and accounts. Mr. Field seconded the motion, and it was carried unanimously. Mr. P. S. Bruff and Mr. Newson Garrett, the Directors retiring by rotation, were re-elected; as were also the Auditors, Messrs. R. S. Barnes and C. E. Bland. The proceedings terminated with a vote of thanks to the Chairman.

WAKEFIELD WATER SUPPLY.—A special meeting of the Wakefield City Council was held on Monday last week, to consider a resolution authorizing the Corporation to promote a Bill for additional powers in relation to the new water-works, extending the time for the construction of the Green Withens reservoir, catchwater, conduit, and other works not yet executed, authorizing certain alterations, empowering the Corporation to issue various classes of stock, and directing that the expense of promoting the Bill shall be charged upon the rates, water revenue, &c. The Mayor (Mr. Alderman Henry Lee), who is Chairman of the Water Committee, explained that the period allowed to the Corporation for carrying out the construction of the Green Withens reservoir and other works will expire next year; and it was of vital importance that they should proceed with the work or obtain an extension of time. If they allowed the present opportunity to pass, it would be a most suicidal act on the part of the Corporation. When the proposed works had been carried out, the cost of the water supply in bulk to the Corporation would be about 2d. per 1000 gallons less than at present, and they would then be able to entertain applications for water which they were now receiving from places all along the line of their pipes, and the supply to Wakefield would also be increased. The Mayor also explained that the scheme as originally devised by Mr. Filitler had been somewhat varied and remodelled by Mr. Rofe, his partner; and Mr. T. Hawksley had approved of the alterations. On the motion being put, all the members present voted for it. A resolution was then passed referring the matter to the Parliamentary Committee to arrange the various preliminaries.

THE BOLTON CORPORATION GAS COAL CONTRACTS.—At a meeting of the burgesses of the North Ward, Bolton, last Tuesday, Mr. Tootill made a speech in which he said that some five weeks ago he was present at the meeting of the Gas Committee held at the Lum Street works, where a tender for the coal contract had been sent in by the Hulton Colliery Company. There were gentlemen on the Committee who were in some way or other interested in that concern. But in consequence of the tests with respect to the coal proving unsatisfactory, it was decided in his (Mr. Tootill's) presence, and he voted against the contract being accepted. On the previous Friday, however, to his surprise, when the minutes were read, it appeared that the contract had been accepted. He at once called attention to the irregular and unbusinesslike way in which the matter had been conducted. Such things, he said, could not be tolerated; and as to what took place in the interim they could judge for themselves. Mr. J. Partington, the agent of the Company, has written to the local papers denouncing Mr. Tootill's statement as a "pure falsehood." He says there is not a member of the Gas Committee either directly or indirectly interested in the Company, and that the original tender was not declined because of any test, but was left over on account of the price asked being more than the Committee felt inclined to give. "What Mr. Tootill means to insinuate," continues the writer, "by leaving his audience to judge 'as to what took place in the interim' is best known to himself; and he will either give a further explanation or not, as he thinks best. My opinion is that the members of the Gas Committee can afford to treat such cowardly insinuations with the contempt they merit." Another statement made by Mr. Tootill, as to a suggested reception of fees when he was on the Sub-Committee dealing with the question of mechanical stokers, has drawn a reply from Mr. Alderman Miles and Mr. Braughton. They repudiate the insinuation against themselves, and promise to "deal further" with the matter.

GAS-CONTAMINATED WELLS.—It is reported that, owing to the defective condition of the gas-pipes in the Clarence Victualling Yard at Gosport, the water in the wells has become so contaminated as to be useless, and the wells have consequently been ordered to be closed.

THE PROPOSED EXTENSION OF THE BURNLEY GAS-WORKS.—At a special meeting of the Burnley Town Council last Wednesday, a resolution was passed for the promotion of a Bill in Parliament to authorize the extension of the borough boundaries, and to confer further power upon the Corporation with respect to their gas-works. We have already referred in detail to the proposed extension of the gas-works, which has been necessitated by the increasing population of the town.

THE OIL LIGHTING EXPERIMENT AT ERITH.—When Messrs. Defries contracted to light the public lamps of Erith with oil at a rate which occasioned considerable comment at the time, on account of the lowness of the figure, they agreed with the Local Board to purchase old lanterns at 5s. 9d. each. They have now had to ask the Board to accept a smaller sum than the one named, as they have found it impossible to dispose of the lanterns at the price. The Board, however, have refused to accept anything less than the amount agreed upon. Altogether, the oil-lighting experiment at Erith does not seem to be a very brilliant one for the contractors.

THE METROPOLITAN BOARD OF WORKS AND THE COAL AND WINE DUES.—The *Financial News* thinks it is very kind of the Metropolitan Board of Works to go out of its way to commit the forthcoming County Council by taking steps to promote a Bill for the renewal of the Coal and Wine Dues, to which reference was made in the *JOURNAL* for the 23rd ult. Our contemporary thinks it would be better for the Board to devote the few remaining days of its life to repentance, instead of seeking to fasten upon its successor the legacy of its own blunders. The Board of Works and the dues are, it says, both doomed.

NEW GAS-WORKS AT HORWICH.—The Lancashire and Yorkshire Railway Company are now, after considerable difficulty, able to supply gas to their extensive works at Horwich, near Bolton. Their new gas-works there have been in course of construction for two or three years; but the vast quantity of water found on the site proved a great difficulty. Now, however, an iron outer shell has been fixed in connection with the gas-holder, and the process of gas manufacture is proceeding satisfactorily. The contractors for the brickwork of the new works have, it is reported lost considerably in consequence of the water difficulty.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 796.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.					£ s. d.
GAS COMPANIES.								
590,000	10	12 Oct.	10½	Alliance & Dublin 10 p. c.	10	17½-18½	..	5 13 6
100,000	10		7½	Do. 7 p. c.	10	12½-13½	..	5 11 1
300,000	100	2 July	5	Australian (Sydney) 5% Deb.	100	110-112	..	4 9 3
100,000	20	30 May	10	Bahia, Limited	20	24-25	..	8 0 0
200,000	5	11 May	7½	Bombay, Limited	5	7½-7¾	..	4 16 8
40,000	5		7½	Do. New	4	5½-5¾	..	5 4 2
380,000	Stock.	29 Aug.	11	Brentford Consolidated . .	100	223-228	..	5 3 1
125,000			8	Do. New	100	164-168	..	5 4 2
220,000	20	13 Sept.	10	Brighton & Hove, Original	20	43-45	..	4 13 4
320,000	20	28 Sept.	11	British	20	43-45	-2	5 0 0
50,000	10	13 Sept.	11	Bromley, Ordinary 10 p. c.	10	19-21	..	5 4 9
89,000	10		8	Do. 7 p. c.	10	13-14	..	5 14 3
328,750	10	30 May	8	Buenos Ayres (New) Limited	10	14½-15½	..	5 3 2
200,000	100	2 July	6	Do. 6 p. c. Deb.	100	110-112	..	5 7 1
150,000	20	10 Aug.	7	Cagliari, Limited	20	25-27	..	5 3 8
550,000	Stock.	12 Oct.	13½	Commercial, Old Stock . .	100	257-262	-1	5 4 11
180,000			10	Do. New do.	100	209-214	..	5 0 5
121,234		28 June	12	Do. 4½ p. c. Deb. do.	100	123-128	..	3 10 3
557,320	20	14 June	12	Continental Union, Limited	20	44-46	-½	5 4 4
242,680	20		12	Do. New '69 & '72	14	30-31	..	5 8 1
200,000	20		9	Do. 7 p. c. Pref.	20	36-38	..	4 14 8
75,000	Stock.	28 Sept.	10	Crystal Palace District . .	100	205-215	..	4 13 0
234,060	10	27 July	13	European, Limited	10	25½-26½	..	4 18 1
120,630	10		13	Do. New	7½	18½-19½	..	5 0 0
354,060	10		13	Do. do.	5	12½-13½	..	4 16 3
5,468,600	Stock.	29 Aug.	13	Gaslight & Coke, A, Ordinary	100	243-247	-4	5 5 3
100,000			4	Do. B, 4 p. c. max.	100	100-105	..	3 16 3
665,000			10	Do. C, D, & E, 10 p. c. Pf.	100	260-265	..	3 15 6
30,000			5	Do. F, 5 p. c. Prf.	100	125-130	..	3 16 11
60,000			7½	Do. G, 7½ p. c. do.	100	182-187	..	4 0 2
1,300,000			7	Do. H, 7 p. c. max.	100	167-172	..	4 1 4
468,000			10	Do. J, 10 p. c. Prf.	100	258-263	..	3 16 1
1,061,150		14 June	4	Do. 4 p. c. Deb. Stk.	100	120-123	..	3 5 0
294,850			4½	Do. 4½ p. c. do.	100	125-130	..	3 9 3
650,000			6	Do. 6 p. c. do.	100	175-178	..	3 7 5
3,600,000	Stock.	11 May.	10	Imperial Continental . . .	100	209-212	-1	4 14 4
75,000	5	14 June	6	Malta & Mediterranean, Ltd	5	5-5½	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	113-115	..	4 1 11
541,920	20	14 June	6	Monte Video, Limited . . .	20	20-21	..	5 14 3
150,000	5	30 May	0	Oriental, Limited	5	9-9½	..	5 5 3
60,000	5	28 Sept.	7	Ottoman, Limited	5	6-7	..	5 0 0
166,870	10	27 July	4	Pará, Limited	10	5-6	..	6 13 4
People's Gas of Chicago—								
420,000	100	2 Nov.	6	1st Mtg. Bds.	100	104-107*	..	5 12 1
500,000	100	1 June	6	2nd Do.	100	95-100	..	6 0 0
100,000	10	12 Oct.	10	San Paulo, Limited	10	16-17	..	5 17 8
500,000	Stock.	29 Aug.	15½	South Metropolitan, A Stock	100	300-310	-2½	5 0 0
1,350,000			12	Do. B do.	100	234-238	-2½	5 0 10
141,500			13	Do. C do.	100	245-255	..	5 1 11
550,000		28 June	5	Do. 5 p. c. Deb. Stk.	100	138-143	..	3 9 11
60,000	5	29 Aug.	11	Tottenham & Edm'ton, Orig.	5	11-13	..	4 4 0
* Ex div								
WATER COMPANIES.								
717,467	Stock.	28 June	9	Chelsea, Ordinary	100	260-265	..	3 7 11
1,720,560	Stock.	12 Oct.	7	East London, Ordinary . .	100	194-199	..	3 10 4
700,000	50	14 June	9	Grand Junction	50	123-127	..	3 10 10
708,000	Stock.	10 Aug.	10½	Kent	100	270-275	..	3 16 4
1,043,800	Stock.	28 Aug.	9	Lambeth, 10 p. c. max.	100	255-260	..	3 9 3
406,200	100		7½	Do. 7½ p. c. max.	100	197-202	..	3 14 3
200,000	Stock.	28 Sept.	4	Do. 4 p. c. Deb. Stk.	100	117-120	..	3 6 8
500,000	100	27 July	12½	New River, New Shares . .	100	345-350	..	3 9 3
1,000,000	Stock.		4	Do. 4 p. c. Deb. Stk.	100	123-127	..	3 3 0
902,300	Stock.	14 June	6	S'th'wk & V'h'ail, 10 p. c. max.	100	168-173	+2	3 9 4
126,500	100		6	Do. 7½ p. c. do.	100	157-162	..	3 14 1
1,155,066	Stock.	14 June	10	West Middlesex	100	265-270	..	3 14 1

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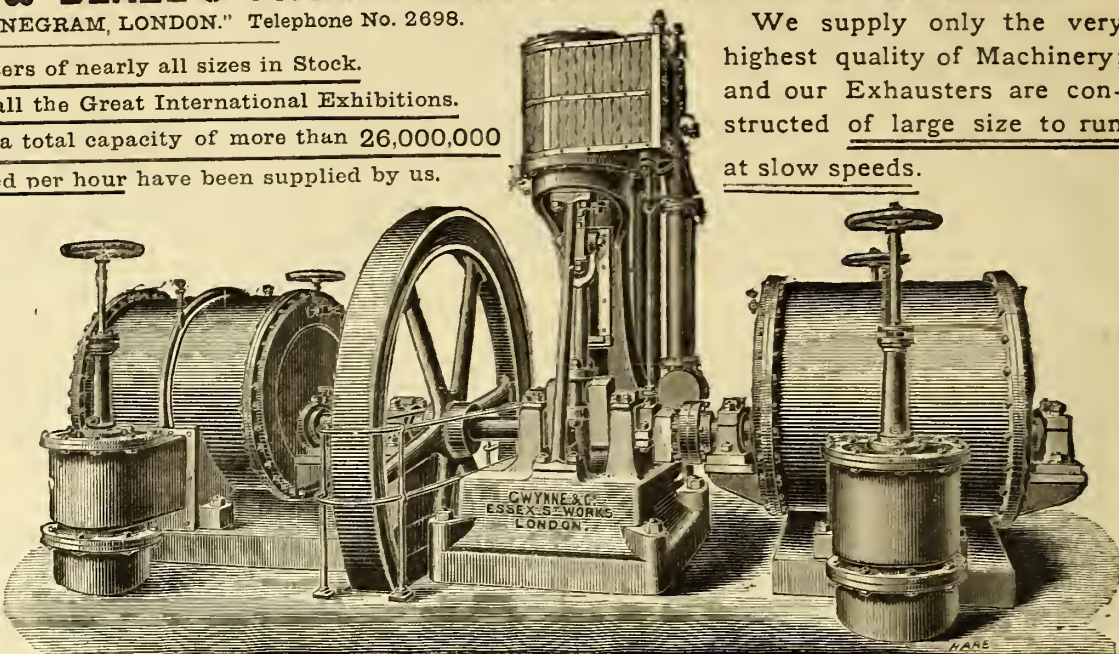
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ANDREW STEPHENSON, Agent for the GAS PURIFICATION AND CHEMICAL COMPANY, Limited, Palmerston Buildings, Old Broad Street, London, E.C.

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* * See Advertisement on Page III. of the Wrapper of this week's issue.

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* * See Advertisement p. 784 of last week's issue.
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TEST Papers and Solutions for Gas-Works prepared by R. D. Gibbs, Summersfield Crescent, Birmingham.
Analysis of Coal, Oxide, and all Gas Materials.

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FOR SALE—Experimental Coal-Testing APPARATUS (second-hand).
For particulars and price, apply to HUTCHINSON BROTHERS, BARNLEY.

GAS SHARES IN THE ENFIELD GAS COMPANY.

NEW ISSUE OF SHARES BY ORDER OF THE DIRECTORS.

MR. ALFRED RICHARDS will Sell by Auction at the George Hotel, Enfield Town, on Wednesday, Nov. 14, 1888, at Six for Seven o'clock precisely in the evening, in lots of 10 shares each, 200 £10 FULLY PAID SHARES (maximum dividend 7 per cent., now paying 6 per cent.) in the ENFIELD GAS COMPANY.
Particulars may be obtained of Mr. J. PUNDEY, ENFIELD TOWN, and of the AUCTIONEER, TOTTENHAM, and 8, NEW BROAD STREET, E.C.
(BY ORDER OF THE ROYAL COLLEGE OF SURGEONS.)

CRYSTAL PALACE DISTRICT.

SALE OF GAS SHARES.

THURGOOD & MARTIN have received instructions to Sell by Auction, at the Auction Mart, Tokenhouse Yard, E.C., on Thursday, the 6th of December, 1888, at Two o'clock precisely, in 219 lots cum dividend, £24,780 in the STOCK OF THE CRYSTAL PALACE DISTRICT GAS COMPANY, producing Dividends at the rate of 10 per cent., 7 per cent., and 6 per cent., respectively; also 375 £6 FULLY PAID 7 PERCENT. SHARES in the Capital of the same Company, which is a specially safe and easy investment for large or small sums, the dividends being secured against fluctuation by ample Reserve and Insurance Funds, and the increasingly profitable district of the Company.
Particulars and Conditions of Sale may be had of MESSRS. WILKIE, BERNER, AND MOORE, 21, COLLEGE HILL, E.C., Solicitors; at the PLACE OF SALE; and of the AUCTIONEERS, 27, CHANCERY LANE, W.C.

IRISH BOG ORE OXIDE OF IRON.

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BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased. 120 and 121, NEWGATE STREET, LONDON, E.C.

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JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID for making SULPHATE OF AMMONIA of high quality and colour.
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TENDERS FOR TAR.

THE HUYTON and Roby Gas Company are prepared to receive TENDERS for surplus TAR made at their Works at Huyton Quarry during the year ending the 31st of October, 1889.
The probable quantity will be about 120 tons, and will be delivered into the Contractors' Railway Tank-Wagons at Huyton Quarry.
Sealed tenders, addressed to the undersigned, and endorsed "Tender for Tar," to be sent in on or before the 10th of November next.
By order,
FRED. PRITCHARD,
Secretary and Manager.
Gas Offices, Huyton Quarry, Oct. 30, 1888.

THE Corporation of Middleton are pre-

pared to receive TENDERS for the Supply of about 800 yards of 3-inch, 600 yards of 4-inch, and 600 yards of 6-inch TURNED AND BORED GAS MAINS.
Full particulars and specification may be obtained on application to Mr. Hartley, Gas Manager, Middleton.
Tenders addressed to the Chairman of the Gas Committee, endorsed "Tender for Mains," to be delivered at my Office, on or before the 17th of November, 1888.
The Corporation do not bind themselves to accept the lowest or any tender.
FREDERICK ENTWISTLE, Town Clerk.
Town Clerk's Office, Middleton,
Near Manchester, Oct. 31, 1888.

BOROUGH OF BARROW-IN-FURNESS.

TAR AND AMMONIACAL LIQUOR.

THE Corporation are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR produced at their Gas-Works from the 1st of January next to the 31st of March, 1890.
Approximate quantity: Tar, 850 tons; Liquor, 1800 tons—delivered into Contractors' Tank-Wagons at the Gas-Works Siding.
Tenders for Tar to be at per ton; tenders for Liquor to be at per ton of various strengths—viz., 4½, 5, 5½, and 6 degrees of Twaddell's hydrometer when tested at a Temperature of 60° Fahr.
Any further information may be obtained on application to Mr. W. Fergusson, Manager, Gas and Water Works, Barrow-in-Furness.
Sealed tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Tar and Liquor," to be delivered at the Town Clerk's Office, on or before the 20th inst.
The highest or any tender not necessarily accepted.
By order,
C. F. PRESTON, Town Clerk.
Town Hall, Barrow-in-Furness, Nov. 1, 1888.

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TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion; but as the Advertisement sheet of the JOURNAL is sent to Press the first thing on Monday Morning, Advertisers will please bear in mind that Orders for Alterations in or Stoppages of PERMANENT Advertisements should be received Not Later than Two o'clock on SATURDAYS.

Undisplayed Advertisements—Situations Vacant or Wanted; Apparatus Wanted or for Sale; Contracts; Tenders; Public Notices, &c.—cost 3s. for the first six lines (about 42 words) or less; and 6d. for each additional line.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 13, 1888.

THE GAS INSTITUTE TRANSACTIONS FOR 1888.

THE issue of the volume containing the Transactions of The Gas Institute for 1888 is an event that calls for some comment, especially in view of the fact that the "transactions"—using the word in the ordinary meaning, as distinct from the special sense in which it is employed as the English equivalent for the French term *Compte Rendu*—of the Institute for the current year are not such as many of the members can regard with particular satisfaction. A melancholy interest attaches to the records of a moribund association, such as The Gas Institute has become since the meeting the doings at which constitute the bulk of the contents of the book before us. Before going into this part of the subject, however, it will only be fair to the authors of the published papers that notice should be taken of the volume as a contribution to the literature of the gas industry. It is commonly found that papers which are not very striking when read, look very well as afterwards printed and bound up with the appropriate

illustrations and diagrams. A mass of useful information is occasionally presented by collected communications upon technical matters, which can never have formed lively reading; while, on the other hand, the telling speech of the popular orator or humorist of the assembly, the delivery of which was marked by almost continuous applause or laughter from the delighted auditory, is often seen in all its shallowness when reduced to the cold page, and readers who well remember its effect upon themselves and others wonder how they could have been so moved. While we cannot be induced, by perusal of the contents of this volume of Transactions, to reverse the opinion formed at the time, that the papers, as a whole, fell distinctly below what might have been expected, we are free to admit that there are some among them that will be found most useful for reference by students of modern gas engineering. It is no part of our office to discriminate between these memoirs, and state our opinion respecting their comparative excellence. To do this, as the Council have to do it every year, is sometimes a rather invidious task; and we would rather that all the writers should be recompensed than that any of them should feel slighted. There is this satisfaction for the writer of a good paper that does not happen to be appreciated by its official judges—he has himself derived more good from the composition than can be conferred upon him by an outside agency. This is, after all, the great benefit of technical societies like The Gas Institute. Besides the educational value for students, of the contributions to literature which it may be the means of evoking from its members, there is the greater good done to the members themselves who prepare and discuss these communications. A man who belongs to a society of this kind, and never either prepares a paper or takes part in discussing papers prepared by his brethren in the industry, misses the greater part of the benefit of membership. We do not say that a member should be perpetually writing papers and speaking; for there are few who incline to this practice whose voice does not become hollow and lightly esteemed after a time. There is, of course, no possible laying down of rules as to how often or how much a professional man may write and speak without incurring the reproach of being more of a talker than a worker. Some men's experience is so much richer and wider than that of others, as their gifts of exposition are greater. One man may talk for an hour and only give an insight into the depth of his knowledge; another will "pump himself dry" in ten minutes. The only rule that can be regarded as generally applicable to these matters is that while no man should either take pen in hand or open his mouth in a meeting unless he has something to say, no man should refrain from expressing his opinions and giving his experience when the proper occasion arises. Reading, Lord Bacon has observed, makes a full man, writing an exact man, and reflection a wise man. It is good for a man to be in the way of becoming full, exact, and wise. Lord Beaconsfield said that the best incentive to learning all about a subject was to write a book upon it. This is only a restatement of the great Verulam's observation, and a confirmation of its truth. No man ever yet wrote a technical paper of any value without learning more about his subject than he knew before; and this is the true reward of such labour.

The volume of Gas Institute Transactions contains the two papers, by Dr. William Wallace and Mr. George Livesey respectively, which were taken as read at the meeting. All the other papers have been sufficiently discussed in the JOURNAL; but we must devote a little attention to these communications. The work of Dr. Wallace acquires additional interest as being the last production of the kind of its talented and respected author, whose recent death, noticed at greater length elsewhere, is a loss to the science of gas lighting that will not be easily made good. It deals with the effect of temperature upon the quality of gas produced from the same coal at different seasons of the year; and it shows, from an example that occurred in the author's practice as a gas analyst, that canal coal carbonized in the summer months possesses higher illuminating power than during the winter. The difference with a canal of very constant chemical composition, and yielding gas averaging 30-candle power, was as much as 2.77 candles between the monthly averages. The richer the gas, the greater would be the difference; while with gas made wholly from common coal, scarcely any such difference would be traceable. Although the author does not say so in as many words, his connection of the fall of temperature with the poverty of the gas, which he admits had to travel for a considerable distance

in the mains leading to the testing station, indicates with sufficient clearness that the illuminating power was brought down in consequence of this cold transit. To complete the paper, therefore, it would be necessary to know what was the nature and quantity of the condensation in the syphon-boxes for the different periods mentioned in the text.

Mr. George Livesey's paper on "Commissions" deals with an extremely unpleasant subject, but nevertheless one that must not be ignored. It cannot be said that the time that has elapsed since the Institute meeting has brought out anything to render this matter of less importance. In writing his paper, Mr. Livesey declares that he sought to place on record the protest of members of the Institute against the stigma that had been put upon them as a class; and it is rather a pity, if the protest was to be made at all, that it was not done in a more public way. For this, however, the author of the paper is not responsible. He did his best to state the matter clearly, and trace the evil to its source; and while recognizing the advisability of such a revision of the law as would make corruption less easy and excusable, Mr. Livesey laid stress upon the superior benefit of an elevation of moral tone which should render such offences impossible. It cannot be denied that a sharp division of opinion has prevailed respecting the policy of such papers. Certain members of the Institute thought that some such protest should be made public; while others, equally honest, regarded the evil in question as a mere manifestation of Original Sin, and as little amenable to preaching or protestation as that other evil to which the term "social" is prefixed as a special distinction. Others, again, may have wished to hush up the subject for more exclusively personal reasons. One cannot argue between all these conflicting views. As a matter of fact, the paper was not read; but here it is in the Transactions, for all to read who will.

A good deal of the volume is taken up with the record of the Bray incident, which cannot be pleasant reading, one would imagine, even to Mr. Bray himself, and is certainly a painful one for all well-wishers of the Institute. The record as it stands scarcely presents the state of affairs in such a way that they could be understood without extraneous knowledge. Thus, although in a foot-note to the record of the protest of Mr. Bray against the vote by which he was expelled from the Institute, it is remarked that the Council afterwards submitted to the injunction moved for by Mr. Bray reinstating him in his position as a member, there is no clear intimation of the other consequences of this action. An opportunity might have been found, had it been thought desirable, for stating that the bulk of the old Council resigned as the result of this proceeding; but what has been done is to print the list of those remaining in office up to the time of going to press with the book. This has rather a strange effect as it stands; for, whereas the list of officers for 1887-8 is of the usual imposing magnitude, with Vice-Presidents and Trustees in due order, the short list shows that all these dignified officials, and many more, had dropped out, without explaining how this happened—leaving this to be stated formally in next year's report of the Council. To return to the subject of the Transactions as a whole, however, one cannot help wondering whether this volume is destined to be the last of the series; or, if not, what the next will be like in point of quality. Although the contents of this one are not very striking, they might easily have been worse. It is to be hoped the future has something in store which will not cause us to regret the Transactions of 1888.

THE GAS AFFAIRS OF HALIFAX; AND MR. ELLIS LEVER'S PROCEEDINGS.

If affairs in connection with the Halifax gas scandal are not altogether stagnant, they are developing much more slowly than could be wished. When last mentioning the subject in these columns, a fortnight ago, we repeated what had been reported to us respecting the action expected to be taken by the Corporation of Halifax against Mr. E. G. Wrigley for the return of an alleged difference in value between the coal contracted for and that actually supplied by him to the Gas Department. No such action, so far as we can learn, has been entered upon up to the time of going to press. The Corporation have cancelled the contract with Mr. Wrigley, and have declined to receive any more of the canal; even ordering him, as we understand, to remove from their premises some unloaded railway waggons. This order was disregarded; and now we learn that Mr. Wrigley intends to continue to tender supplies. There must sooner or later be an end to this state of affairs; for substantial things like waggons of canal

cannot be bandied about indefinitely, like mere words and lawyers' letters. At present the impression received by an onlooker is that the parties are wasting time and imperilling reputation by all this manœuvring to escape from the responsibility of giving the first blow. With regard to the general situation, of which Mr. Wrigley's business with the Gas Department is but a portion, there is nothing satisfactory to be told. Mr. Alderman Riley does not seem to be prepared to do anything; and, from what can be gathered from the newspaper report of an important town's meeting, at which the Mayor attended, the local public are persuaded that all has not been as it should be in the administration of the gas-works. Of course, the whole matter is as yet in such an intangible shape that the facts, when they appear in the light, may well be altogether different from the imaginings of angry ratepayers. At present the townspeople firmly believe that they have been deceived in some way by those to whom they confided their interests; but how and to what extent nobody can say. There cannot be a much more uncomfortable feeling than this, either for a community or an individual. At the meeting referred to, the Mayor did not try to allay the prevalent excitement, but distinctly increased it by asserting that when the proper time comes for him to speak out he will have a monstrous tale to tell. "There has been very great wrong-doing," his Worship is reported to have said; and it is to be hoped the public mind will be pacified by a full disclosure at the earliest possible moment.

As Mr. Ellis Lever has confessed to being at the bottom of this Halifax affair, it may be convenient to refer here to his recent performances at other places, where he has essayed the same rôle of Champion of Purity and Disinterested Detective of Fraudulent Coal Contractors. He has withdrawn from the pursuit in the case of Salford, amid the painful jeers of the Town Councillors whom he has troubled for a long time past. Would it be stretching probability too far to connect his "strategic movement to the rear" with the inconvenient statements of Mr. James Ward respecting the intimate relations that formerly subsisted between Mr. Lever and Mr. Samuel Hunter? The true story of the notorious connection and parting between these two men would constitute an interesting commentary upon Mr. Lever's purity campaign. One wonders if it was from Mr. Hunter that Mr. Lever obtained that information respecting the corruptibility of gas managers and others, with the display of which he has lately been dazzling the public and getting admission to the books of Gas Committees who happened to be doing business with other coal contractors; as well as generally making famous use of it in the way of advertisement. It was in this way that Mr. Lever obtained the ear of the Leeds Gas Committee; but the result was not a success for himself. He was allowed to pick specimens of the coal supplied by the contractors to the Committee, and when these were tested by Mr. J. Paterson, F.C.S., of Warrington, and Mr. Fairley, of Leeds, the coal was found to be equal to sample. All his trouble has consequently gone to give a good repute to his trade rivals, and to diminish his own chances of getting upon the list of purveyors to the Leeds Corporation.

MEETING OF THE SOUTHERN DISTRICT GAS MANAGERS' ASSOCIATION.

The Southern District Gas Managers met on Thursday last, under the presidency of Mr. James L. Chapman, of Harrow, and had a very successful gathering. The society have changed their place of assembly from the Guildhall Tavern to the Hôtel Métropole, greatly to the satisfaction of the members, who have every reason to thank their energetic Honorary Secretary (Mr. Jas. W. Helps, of Croydon) for initiating the removal. Mr. Geo. Livesey read a paper in which he suggested a novel form of tank guide for gasholders, calculated to enable a holder to preserve its stability with only one tier of guide-rollers. The subject drew together a good audience, and several visitors known to be specially interested in it were present by invitation. Mr. Gadd, of Manchester, attended with models illustrative of his patent spiral system of guiding gasholders; and these attracted much attention. The paper itself was not very debateable; but there was a good discussion on the whole subject of the guide-framing of gasholders, which is undoubtedly one of the topics most interesting to gas engineers at the present time. Mr. W. E. Price, of Hampton Wick, also read a paper upon the obstacles that commonly stand in the way of increasing the popular use of gas, and the methods for overcoming them. It was a good paper, and served to introduce the author's very ingenious prepayment meter. All discussions

of this subject take the same line; and consequently the debate on Thursday in London might have been a continuation of that on Mr. Lewis's paper, which occupied the members of the Midland Association at their recent meeting, and a report of which appears elsewhere. With regard to the prepayment meter, it is possible, as hinted by the author, that a use may be found for this apparatus independently of that hitherto contemplated. The original purpose of these machines was to place gas at the command of the cottage class of consumers; but they may be found very useful for checking the supply of gas to cooking-stoves, which in most households are accused of making away with a good deal of gas. Servants are prone to be careless of the boiling-burners (which are large and apt to be extravagant), unless properly looked after. While the meter is silently recording the consumption without distinguishing that which is really useful from the waste, the householder has to wait until the end of the quarter before he can learn what has been going on. All this would be changed, however, if a prepayment meter were prefixed to the stove. It might then be found practicable to make the cook an allowance of money, and insist upon her paying for her own gas, which would be a long stride in the direction of economy.

THE LONDON COAL DUES AND THE METROPOLITAN BOARD OF WORKS.

THE Metropolitan Board of Works and the Corporation of the City of London have given the usual intimation of their intention to promote a Bill in Parliament next session for securing the renewal of the Coal and Wine Dues, with such modifications, limitations, and provisions as to the application of the revenue derivable from the dues as Parliament may think fit to impose. This action is, of course, the forlornest of forlorn hopes; indeed, there can be no hope about it, but the custodians of the public purse of the Metropolis probably feel called upon, as a matter of duty, to take every measure in their power to retain this money. The interest of the Metropolitan Board and of the City Corporation in the dues is not at all the same. Long before the matter can come under the consideration of Parliament, the Board will have ceased to exist, while the Corporation will be as lively as ever. The London County Council will have to deal with the taxation and expenditure of the Metropolis outside the City boundary; and it is preferable that they should start without any of that extraneous pecuniary resource that helped to render the old Board independent of, and consequently indifferent to the ratepayers. The Metropolitan Board are endeavouring to die with dignity; but they find it hard to do so amid their numerous trials. There was an unseemly dispute last Friday over the appointment of Chairman. Lord Magheramorne has held the office for seventeen years, and it has not been his fault if the latter days of the Board have come under a cloud. If only as a compliment to a veteran public servant, the re-election of his Lordship should have passed as a matter of course. It was not so, however; for a member of the Board, who did not find a seconder, took occasion to throw a good deal of "mud" at the Chairman. The performance was so gratuitous, and the justification offered so utterly insignificant, that it leaves the greater regret that it was not omitted, and so much the more peace and dignity secured for these latter days of the Board. With regard to the scandals that have come to light respecting the action of some officers and members of the body, it should be recorded that an interim report of the Royal Commission has been presented, and proceeds upon the lines long since accepted by public opinion. That some of the members and officials have acted unbecomingly, to say the least of it, is universally held to have been proved; but nobody suspects the great majority of members or officials of wrong-doing. It is possible that all the corruption that has existed in connection with Spring Gardens was not unearthed by the Royal Commission; but the work of exposure and purification has been fairly done, so far as it has gone. Nobody denies that, during the 32 years of its existence, the Board has done a vast amount of useful work; and if the cost has been heavy, there has been something to show for the money. It might have been wished that its career could have terminated without the disgrace that a few unworthy men have brought upon it; but the warning may prove worth its cost if it keeps the Board's more powerful successor from similar troubles. Having regard to the popular view of the Board at the present time, it would be wise for the retiring members to leave the County Council to other hands, by not offering themselves for election.

Water and Sanitary Affairs.

THE public have scarcely had time to appreciate the logic of the legal decision which, in effect, perpetuates the pollution of the Thames at Staines, when they are treated to another shock in connection with what is being done at Weybridge. Under the alarming head-line, "Proposal to Poison the Water 'Supply of London,'" our contemporary the *Morning Post* has published a letter from Sir Patrick Colquhoun which certainly demands attention. It is asserted that the parish authorities at Weybridge have initiated a scheme for disposing of their sewage by "collecting the raw material into 'tanks, and clarifying it by some chemical process.'" So far, well and good; but it is said that the effluent is to be poured into the river within a few hundred yards of the intakes of the five Water Companies which draw their supplies from the river for the purpose of serving the South-Western districts of the Metropolis. It seems incredible that it should be thought right for two small and comparatively obscure parishes, such as Weybridge and Shepperton, to enter upon a course so detrimental to the interests of millions of the inhabitants of London. We cannot doubt that means will be found to place a veto upon a scheme which, upon the face of it, is preposterous. In the first place, it is matter for the consideration of the Conservators, who receive an annual contribution of £5000 a year from the Water Companies, under certain guarantees for maintaining the purity of the water. It would be strange indeed if, after the activity displayed in abating the house-boat nuisance, it should be found necessary to submit to the wholesale method of pollution which the wise men of Weybridge have deliberately proposed to bring about—heedless of the peril and injury which their scheme would inflict on other people. Sir Patrick Colquhoun has done well in directing public attention to so scandalous a suggestion. There are, as he remarks, two other authorities besides the Conservators to be looked to as having some measure of responsibility in the matter—namely, the Government and the Water Companies. We cannot believe that the former will show any remissness in a matter of such vital interest and importance to the community. In regard to the Water Companies, it is certain that they will spare no effort and no expense in protecting their own interests—which, in this instance, are identical with those of their customers.

The annual report of the Local Government Board, which is unusually late this year in making its appearance, is remarkable for the amount of attention which it bestows on the subject of the Metropolitan Water Supply. The most critical part of the official record is that which relates to the extent of the resources at the command of the Companies for the purpose of supplying water to the districts they serve. This question is materially affected by the increase of the population on the outskirts of the Metropolis, and the consequent rapid addition to the customers of the Companies. The average population taking supplies last year amounted to very nearly 5,400,000 persons; and the growth goes on at a rate varying from 100,000 to 130,000 as the yearly increase of the population dependent on the Companies for their supply of water. The summer of last year (1887) was of a remarkable character, and calculated to put the existing provision to a severe test. In the week of maximum supply, the East London Company distributed on an average about 45 million gallons of water daily. Although this was the amount of the supply, the present Water Examiner, General Scott, does not consider it was the maximum demand; complaints being made that the supply was insufficient, the constant service being interfered with, and many of the houses being without cisterns for storage. Taking what he designates "the restricted maximum of 1887" as the basis of his calculation, General Scott proceeds to show that, allowing for increase of population, the East London Company would have to supply a maximum of 52 million gallons daily in 1892, presuming that year to be as dry as 1887. On this is founded another conclusion—namely, that under these circumstances the Company would require to obtain from some source or sources other than the Lea and their immense reservoirs, something like 22 million gallons per day. The other sources naturally evoked consist of the Thames and wells. If the quantity taken from the Thames is kept within the present statutory limit of 10 million gallons daily, as much as 12 million gallons will be required from the wells. The wells of the New River Company are said to yield about 14 million gallons per day; and General Scott declares that this

ought to be increased to 17 million gallons in 1892, should a drought then prevail. Adding this to the estimated requirements of the East London Company, it appears that the wells altogether must yield as much as 29 million gallons daily. We are told that it becomes "a matter for serious consideration" whether such a "supply can be obtained, and, if it is, whether the River Lea will not materially suffer by the interception of the springs which feed it." Hence we read: "On a general review of the whole circumstances, it seems evident that the question of the water supply of the North and East of London has entered a critical stage." We are further warned that an "authoritative examination" of the prospects of the population thus situated "cannot with safety be much longer delayed."

The year 1892 may not be a dry one; and the danger may thus be postponed. But if General Scott's anticipations are based on adequate data, there is reason for husbanding the present resources with the utmost care. It is to be regretted that the Southwark and Vauxhall Company have failed to find the lower greensand at Streatham. The remarks of General Scott extend to more than the East London and New River Companies. He does not appear to have any immediate anxiety as to the Thames, providing certain measures are adopted. As for the Kent wells, he thinks they should be carefully watched. The Local Government Board, in referring to the statements of General Scott, express an apprehension that it may become necessary before long to consider how the existing sources of supply in respect to at least some of the Metropolitan Companies "can be supplemented from other sources outside the watersheds of the Thames and the Lea." General Scott estimates that if 1892 proves a dry year, the maximum daily supply needed for London will then amount to 224 million gallons; reckoning for the whole of the area included in the territory of the Metropolitan Water Companies. It is certain that the demand for water in "Greater London" is growing enormously; and this circumstance is illustrated by the fact that, while the population of "London proper" has risen by less than 400,000 since 1881; that supplied by the Water Companies has risen by more than 800,000 in the same period. General Scott, desirous that the supply shall in every instance be both abundant and pure, evidently regrets the rejection of the Bill of the Grand Junction Company during the present year, and hopes for its revival, with such modifications as may render it acceptable. Satisfaction is expressed at the considerable advance made in the extension of the constant supply during 1887. Credit is given to the Companies for their voluntary action in this matter; the general rule being that neither the Local Authorities nor the inhabitants take the initiative. The action of the Companies leads to the belief that, on the whole, the constant supply is conducive to economy in the use of water. The practical value of Deacon's waste-water meters is recognized in relation to this part of the subject. As to finance, Mr. Allen Stoneham shows that the increase in the net water-rental of the Metropolitan Water Companies last year was £40,814; or more than in either of the two preceding years, and about the same as in 1881.

PRESENTATION TO MR. C. BIRD, OF ROCHESTER.—Last Friday week, Mr. C. Bird, who has been in the service of the Rochester Gas Company for a period of 48 years, was presented by the employees with his portrait (a life-size photograph), as a testimony of their esteem.

DEATH OF MR. E. THORMAN.—We regret to hear of the loss just sustained by Mr. E. H. Thorman, the Engineer and Manager of the West Ham Gas Company, in the death of his eldest son, Mr. E. Thorman, Engineer of the Malta and Mediterranean Gas Company, which occurred suddenly on Tuesday last, at Patras, Greece, where he was engaged in inspecting one of the Company's stations. The deceased was in his 48th year.

MR. ELLIS LEVER AND THE LEEDS GAS COAL CONTRACTS.—The Secretary of the Gas Department of the Leeds Corporation (Mr. James Lupton) has forwarded the following statement to the local papers:—"The Sub-Investigation Committee of the Gas Committee, along with Mr. Ellis Lever, Mr. J. Paterson (of Warrington), the Analyst appointed by him, and Mr. Fairley (of Leeds), attended, on the 7th inst., at the Meadow Lane Gas-Works, where the alleged inferior coal picked out by Mr. Lever was thoroughly tested in the presence of all the parties concerned. A joint report was drawn out by the two Analysts, showing that the coal was really equal to sample. Mr. Lever and all the gentlemen present expressed their complete satisfaction with the accuracy of the tests, and the perfect fairness with which the same had been conducted. Full reports will be published in due course, after the meeting of the Gas Committee."

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(FOR STOCK AND SHARE LIST, see p. 858.)

THE past week has been rather a dull one for the Stock Exchange. There was no incident of special importance calculated to depress the markets; but they all seemed to go heavily, and nothing would rouse them. The condition of the Money Market, with gold still going out, also helped to keep down prices. The Gas Market, however, has naturally been anything but stagnant, and was especially active in the earlier part of the week. Dealings in Gaslight "A" have been extensive. We ventured last week to express the opinion that a recovery in price was not improbable; and the expectation has already been to some extent realized. An attempt was made to run the stock down still lower on Tuesday; and it was done at 244. But from that point it at once recovered; and, getting steadily firmer, was marked on Saturday at 249—the best price of the week. The quotation has risen 1½. During this time the "H" stock has not moved at all. The 4 per cent. debentures have receded 1; but even now they stand proportionately much higher than the other debenture stocks. This movement must be wholly independent of any electric agency. South Metropolitan "A" has been steady; but the "B" has come in for some hostility. Both these stocks stand high as compared with the other two Metropolitan Companies. Commercial old has fallen 2, for no other reason that we can imagine than that some nervous proprietor will insist upon selling his goods cheap. We suppose that if there be any one of the three Metropolitan Companies which has less than the others to fear from electricity, it is the Commercial. The new stock remains steady. There is very little of it; and it is dangerous stuff to "sell a bear" of. The same may be said, to an extent, of South Metropolitan "A." In fact neither of these stocks lends itself to artificial treatment. Suburban undertakings are very quiet, and show nothing to note but the continued firmness of Brentford. Foreigners have been rather weaker; European and Continental Union having slightly receded. Pará, however, has made an advance of ½. Water has been more than usually active—especially East London, which has risen 3. A good bit has been done in New River, at average figures. Slight advances are marked in Lambeth and Southwark.

The daily operations were: Brisk business in Gas on Monday. Gaslight "A" was better, and rose 1½. Pará also rose ½. Continental Union, partly paid, fell ½. Water was very firm; and Lambeth 7½ per cents. rose 1. On Tuesday Gas was again active. The bulk of the business was in Gaslight "A," which showed a tendency to relapse at one time, but recovered by the close. Quotations remained unchanged. Water again was firm; and East London rose 1. Gas was quieter on Wednesday. Nothing moved but European new, which was done very low, and fell ½. Water was unchanged. Thursday's business in Gas was much about the same as the day before. Gaslight "A" was steady; but South Metropolitan "B" looked weaker. In Water, East London rose 2 more. On Friday, Gas was rather quieter. Gaslight "A" continued steady; but South Metropolitan "B" receded 1½. Water was active, but unchanged. On Saturday, Gaslight "A" was firmer; the 4 per cent. debenture fell 1, and Commercial old and South Metropolitan "B" fell 2 each. Water was very quiet; and the only change was a rise of 1 in Southwark ordinary.

ELECTRIC LIGHTING MEMORANDA.

THE "ELECTRIC REVIEW" ON GAS DIRECTORS AND ELECTRIC LIGHTING—THE R. E. CROMPTON COMPANY, LIMITED—ELECTRIC LIGHTING PROPOSALS FOR BIRMINGHAM.

It is not often that we have to disagree with the editorial statements and comments of the *Electric Review*, the conductors of which journal are almost invariably fair in their remarks upon subjects connected with electric lighting. Very recently, however, they made a slip in this respect, probably through thoughtlessness, which occasionally overtakes the most careful and painstaking of editors. It is contained in an article entitled "A Sign of the Times," the drift of which may be understood clearly enough from the opening sentence, which states that "the progress which is being effected by electric light companies in every part of the country becomes more marked every day. Even in the South of England, where, with a few exceptions, gas monopoly has not been seriously shaken, there are signs of a great advance in the near future." This is all very well for a text; but when our esteemed contemporary goes on to observe in explanation of the fact that electric lighting is not yet in favour everywhere, that "gas companies are generally remarkably well represented on the different public boards, and hence the unwillingness of the latter, as a rule, to entertain the question of electric lighting," it is time to utter a word of protest. The sentence that follows the words last quoted runs: "It is satisfactory to note, however, in spite of the obstacles which an old-established and thriving monopoly is always enabled to put in the way of a comparatively struggling rival, the electric lighting movement is going ahead in a manner which can leave little doubt as to what its position will be in a decade or so hence." There are several weak points in these sentences; but, before dealing with them in any other way, we would ask whether the writer was aware that in the same issue of the paper which contained these statements there would appear the report of the result of the inquiries of the Exeter Town Council respecting the lighting of the streets of the city by electricity, and comparing the electricians' estimates with the cost of gas? It is very curious that

in one page of a technical journal we should find the occult influence of gas companies cited as the only obstacle to the rapid spread of electric lighting, and learn from another page of the same publication, "having regard to the large increase of cost as compared with that of gas," a Committee of the Town Council did not see their way to recommend the adoption of electric lighting for Exeter. Seeing that the difference in this case was as between £666 and £1486 per annum, we would ask the Editor of the *Electrical Review* to state whether the underhand influence of the local Gas Company was required in this instance. So long as examples of this kind continue to appear in its own pages, it is plain that our electrical contemporary need not go far to find reasons for the unwillingness of many public bodies to adopt electric lighting. We are prepared to admit that the uncalled-for imputation upon gas directors who may also be members of local authorities is a piece of thoughtlessness; but it is not less objectionable on that account. It is, moreover, an example of the manner in which the friends of electric lighting have blinded themselves and their followers ever since the beginning of their campaign. According to their showing, their misfortunes have never been their own fault. It is always "the gas interest" that has been to blame for their light being so dear and unsatisfactory. And yet the truth is so simple! That electric lighting is again becoming a favourite with the British public—or with some classes—is undeniable. The fact that the Edison and Swan Company earned last year a profit of £25,000 out of incandescent lamps alone is sufficient proof of the existence of a demand for these articles. The most that can be made out of this piece of evidence, however, does not affect the main point, which is that the electric light is a luxury for which some people are willing to pay. As a light *de luxe* there is some business in it; as a work-a-day light it cannot compete with gas at the ordinary British prices. If our electrical contemporary will confess the truth [of this way of stating the case, we will agree to his basing any amount of expectation and prophecy upon it. We think we have sufficiently shown, however, that to seriously ascribe the slow progress of electric lighting solely to the opposition, open or secret, of gas directors, is a ridiculous attempt to mislead.

The business of Messrs. R. E. Crompton and Co., electric light engineers of Chelmsford and London, is to be converted into a limited company. This is one of those things that might have been expected; for the firm have been prominent in connection with electric lighting from the beginning of the movement. Their business has been rapidly developed during the past three or four years—in short, since the collapse of the first electric lighting companies made an opening for manufacturing houses untrammelled by the unwieldy and useless paraphernalia of joint-stock concerns of the Lombard Street type. It is no part of our office to predict anything concerning the commercial fortunes of the new undertaking. All that need be remarked upon the subject here is that the formation of the Company is an interesting evidence of the revival of confidence in electric light engineering, as providing the basis of a profitable business, and that Mr. Crompton has for years been regarded as one of the best working authorities upon electric lighting matters. He has probably had as much experience in this line as any engineer in the kingdom.

The full text of the report of the General Purposes Committee of the Birmingham Town Council upon the question of the proposed Electric Lighting Order for Birmingham has been published. It begins with a recitation of the main provisions of the Electric Lighting Act, setting forth in clear language an abstract of the positions respectively occupied by local authorities and promoters of Electric Lighting Orders under the Act. Then the report descends to particulars, rehearsing how, two days after the Act was passed, Messrs. Arthur Chamberlain and George Hookham gave notice of their intention to apply for a Provisional Order for the supply of electricity within the borough of Birmingham. Ultimately the Draft Provisional Order, to which the consent of the Corporation was asked, was submitted; and it then appeared that the promoters only proposed to lay distributing mains in a few of the principal streets within two years, and the conditions regulating the compulsory supply appeared to be onerous as regarded the consumers. This first draft was accordingly objected to; whereupon a second was prepared and submitted, in which it was proposed to lay distributing mains in a considerable area in the centre of the town within three years. After looking into these proposals as thoroughly as time permitted, the Committee came to the conclusion that there was no need for hurry in the matter, and that it would be better to withhold the Corporation sanction from any Provisional Order for the present, or until the whole subject of electric lighting under the provisions of the Act of last session can be inquired into on behalf of the town authorities. Other promoters of electric lighting schemes have also appeared upon the scene; and the result of the Committee's deliberations upon the whole matter is that the public consideration of the Birmingham Electric Light and Power Order is temporarily deferred. It is not perhaps very complimentary to electrical science that the question of electric lighting for Birmingham should be declared to be unripe for settlement; but, on the other side, the Corporation need to be as careful just now how they accept any particular scheme as at any time during the past six or seven years.

The Society of Arts programme of business so far arranged for the first part of the coming session contains an intimation of a paper to be read, on "Standards of Light," by Mr. W. J. Dibdin, on the 19th prox.

THE LATE DR. WILLIAM WALLACE.

It is with sincere regret that we announce the death of Dr. William Wallace, F.R.S.E., of Glasgow, who was for so many years most intimately identified with the chemistry and physics of gas manufacture and gas lighting, and more especially known as the Gas Examiner for the City of Glasgow. The sad event occurred on Monday of last week, after an intermittent illness for at least two years. Until about a month before his decease, however, he was able to take a general superintendence of his business affairs; but his immediate acquaintances could scarcely help concluding that his end was fast approaching. He has left many attached friends to mourn his early removal from amongst them. He has also left a widow and a son and two daughters—the former, who bears his father's name, being an advocate in Edinburgh.

The deceased gentleman, who was 56 years of age, was a native of Edinburgh, but was educated chiefly in Glasgow. He early showed a marked inclination for the study of chemistry; and eventually became a student under Dr. Fred. Penny, Professor of Chemistry in Anderson's College, Glasgow. After completing his studies, he made a sojourn in Germany, where, at the University of Giessen, he had for two years studied under Justus von Liebig, and took his degree of Doctor of Philosophy (Ph.D.). On returning to Scotland, he was assistant for a number of years in the laboratory of Dr. Penny. He at this time gave a great amount of attention to the manufacture and purification of coal gas, practical illustrations of which were obtained by visits to the local gas-works. Dr. Wallace later on started on his own account as an Analytical and Consulting Chemist, in which capacity he had an extensive practice during the long period of 30 years. For nearly two-thirds of this time—from the year 1870—he and Mr. Robert R. Tatlock and Dr. John Clark were in partnership, carrying on such an important and extensive business of its kind as had never before been known in Scotland. Dr. Wallace continued to give special attention to the study of coal gas—its analysis, its manufacture, purification, examination photometrically, economic combustion, &c.; and in this branch of technology he eventually became one of the leading authorities in the United Kingdom. His position as an expert in gas matters was early recognized by the Magistrates of Glasgow after the gas supply of the city passed into the hands of the Corporation under the provisions of the Glasgow Gas Act of 1869. In the following year they appointed him Gas Examiner for the city; and in this capacity he had to conduct weekly testings at several stations. He retained this office up till his death. Latterly he was also Gas Examiner for the burgh of Paisley; and he had likewise made professional examinations of gas in London and other English as well as Scottish towns.

MR. ELLIS LEVER AND THE SALFORD GAS UNDERTAKING.—At a meeting of the Salford Town Council on Friday last, Mr. Alderman A. L. Dickens, who was unanimously re-elected Mayor of the borough for the ensuing year, read a letter he had received from the Solicitors of Mr. Ellis Lever, withdrawing his proposal to furnish evidence of frauds in the Gas Department to a Committee of the Council, on the ground mainly that, as the Mayor had expressed his determination to have a shorthand writer present, such information as he gave might be used as the basis of further litigation against him.

GAS-CONTAMINATED WELLS AT GOSPORT.—In reference to the paragraph on this subject in last week's JOURNAL (which was based on a communication to the London papers by a local correspondent), Mr. Geo. B. Irons, the Manager of the Gosport Gas Company, writes to say that the statement as to the closing of the wells owing to contamination was erroneous; the fact being that an auxiliary supply is being laid on to the Royal Clarence Yard by the local Water Company, and the Gas Company are at the same time taking up their old mains, which have been in use for 40 years, and replacing them by larger ones.

SOCIETY OF ENGINEERS.—At a meeting of this Society, held at the Westminster Town Hall, on Monday, the 5th of November—Mr. A. T. Walmisley, the President, in the chair—a paper was read by Mr. H. Ross-Hooper on "The Practice of Foundry Work." The author first briefly compared the particular qualities and properties of pig iron, with the view of determining the varieties which are best adapted to the requirements of the different kinds of castings made; and showed how the nature of cast iron depends not only upon the amount of carbon it contains, but upon the conditions under which this carbon exists. He then proceeded to illustrate how the failing of portions of a cast-iron structure may be traced to a want of knowledge in the way the lines of crystallization flow on the cooling of the metal, and mentioning the weak points to be guarded against in the designing of cast-iron work. After explaining the operations of chill casting, malleable cast iron, and the system of moulding known as "Jobson's Blocks," whereby sand moulds of thin delicate patterns can be made by ordinary labourers, the author mentioned the different modes adopted for casting according to the forms and requirements of the various articles to be produced, and how sound results can only be obtained by careful attention to the feeding of the metal to supply the shrinkage and drawing away which must inevitably occur on the cooling of the metal. The cupola, its construction, and advantages over other types of furnaces, and the manner of charging it, together with the appliances necessary to a foundry were duly considered. The author then dealt with the examination of cast ironwork; and finally discussed the tests usually applied, and the general strength of cast iron.

A GASHOLDER DEBATE AT THE SOUTHERN DISTRICT MEETING.

THE members of the Southern District Association of Gas Engineers and Managers had a very good meeting on Thursday last, when assembling for the first time in the Whitehall Rooms of the Hôtel Métropole, they had brought under their notice two papers, either of which would have constituted sufficient *pabulum* for an ordinary gathering. The first was the contribution by Mr. George Livesey; and the second by Mr. W. E. Price, of Hampton Wick. Mr. Price's paper was very good, and his introduction of his extremely ingenious prepayment meter was particularly well received. The chief attraction, however, was Mr. Livesey's paper upon gasholders without upper guide-framing, and this not only on account of the author's eminence, but also because of the position at present occupied by the subject in the minds of gas engineers. As it appeared, moreover, the energetic Honorary Secretary (Mr. J. W. Helps, of Croydon) had taken exceptional measures for organizing a good debate upon the papers of the day. Both papers had been printed and circulated some days beforehand, in order that members attending the meeting might be well posted respecting the points likely to arouse discussion; and a full attendance of specialists who were known to be interested in the subject of Mr. Livesey's paper was arranged for. The result was the best debate upon the general question of gasholder guiding that has been recorded anywhere. Mr. Gadd, of Manchester, attended with his models of spiral tank-guided holders; showing the invention as applied to single-lift and telescopic vessels. The models were carefully, though not elaborately, constructed; but besides demonstrating the fact that holders built according to Mr. Gadd's principle are stable, they also showed that nothing like a real inference, applicable to the working of full-sized holders, can be drawn from such miniature imitations. Mr. Livesey had also intended to illustrate his ideas by means of a model, but it could not be completed in time. He had, however, provided himself with small-scale specimens of the tank guides described and illustrated in his paper, which served the purpose of showing how a holder so guided would work up and down. Photographs of the Rotherhithe holder, as enlarged by the addition of a third lift without raising the guide-framing, were also exhibited to the members at the meeting. Altogether, what with Mr. Livesey's paper and remarks, and the observations of the visitors interested in the subject—among whom, as Mr. Gadd has already been named, we must also specify Mr. H. Woodall (the President of The Gas Institute), Mr. S. Cutler, Mr. F. S. Cripps, and Mr. W. H. Y. Webber—the members of the Southern District Association must have felt that the subject of gasholder guiding was being pretty well thrashed out before them, especially as most of the speakers referred to articles and other communications published in the JOURNAL for the further exemplification of their views. The long debate was characterized by the greatest good humour; and the speakers, one and all, manifested the most praiseworthy disinclination to dogmatize respecting views held by themselves and others. To say that the discussion threw much additional light upon the subject, or either cleared away or confirmed any doubts which members of conservative tendencies may have felt after inspecting Mr. Livesey's pattern guides and Mr. Gadd's models, would be claiming too much for it. In effect, the net result of the afternoon's talk was to leave the essential points of the question of external guide-framing pretty much as they were, with this difference: The objects of the suggestion, and the most obvious objections to it, were more clearly defined; and Mr. Livesey showed how, if Mr. Gadd's principle is admissible, the same result can be attained by simpler means. It is not denied that Mr. Livesey was put upon the scent by Mr. Gadd, any more than that Mr. Gadd was directed to the study of the subject by the stress laid by Mr. Webber upon the bottom guiding of holders. Mr. Gadd has undoubtedly shown how Mr. Webber's aim may be secured; and Mr. Livesey in turn demonstrates that the effect of Mr. Gadd's long spirals, going a long way round the tank, may be gained, if it is deemed desirable, by tank guides so like these ordinarily in use that they may be fixed in the same way and adjusted by a single plumbing operation for each. Somebody else may, and probably will, come forward in due time with a scheme for doing the same thing in a different and, in his own opinion, superior way of that of either Mr. Gadd or Mr. Livesey. There is no finality in a matter of methods, such as this is. The question of the possibility of safely attempting an experiment remains untried. Mr. Livesey flatly says that, although he can see how the thing may be done, he is by no means favourably disposed to doing it; and here the matter rests for the present.

Among the points that came into prominence in the course of the discussion, one of the most important, in the practical sense, was that of the fundamental difference, in their effect in transmitting strains, between tangential and radial guide-rollers. The radial roller tends directly to cripple the curb to which it is attached; whereas the tangential form, as the name implies, brings the strain to bear tangentially to the curve of the curb—that is to say, along its line of greatest strength. The importance of this consideration appears very conspicuously in connection with a remark of Mr. Cutler. He said that he had never seen a proper bottom curb; meaning that these parts of a gasholder are never made sufficiently rigid. There is, however, a difficulty in making a bottom curb really strong, because of the absence of room for a horizontal member, of any depth, corresponding in effect to the first row of plates of the crown. By placing the bottom rollers tangentially, the crippling effect which the shallow bottom curb is

so ill-adapted to withstand is avoided, and the curb is as though doubled in strength and rigidity to resist deformation. If only this comparatively minor matter is properly attended to, the discussion of this at present theoretical subject will not have been without some practical fruit.

WATER ACTS FOR 1888.

THE following Acts relating to the supply of water by Companies were passed during the last session of Parliament.

The Frodsham Gas and Water Act enables the Frodsham (Cheshire) Gas Company to undertake water supply, with a special share capital of £25,000, and power to borrow to one-fourth of the amount called up. The water-works include a well and bore-hole and pumping station in Frodsham parish, a high and a low service reservoir, and the necessary pipe-lines. The land required is to be taken within seven years; and the works are to be completed in eight years. The rates for domestic supply range from 10 to 8 per cent. upon rental, with an extra third for the high-level service. The Helston and Porthleven Water Act incorporates a Company, with a share capital of £8000, and power to borrow £2000, for the supply of a district round the town of Helston, Cornwall. It is provided that, if any parish included in the district remains without a supply of water in accordance with the terms of the Act for seven years, the powers of the Company in respect of such parish shall cease. The authorized works comprise an impounding reservoir upon the Tregathenan stream, a service reservoir in Wendron parish, and the necessary pipe-lines. The land required compulsorily by the Company is to be acquired within three years; and the works must be executed within five years. Certain provisions are made for the protection of Baron Churston and his tenants. The supply is to be constant under pressure. The rates for a domestic supply are to be 7½ per cent. upon property above £20 annual rateable value, with extras as usual. Water supplied by meter is to be charged for at the rate of 1s. 6d. per 1000 gallons. The Limsfield and Oxted Water Act incorporates a Company formed in 1886, and at the time of the passing of the Act having a capital of £4500, and owing £1500. The capital of the incorporated Company is fixed at £14,000, whereof £10,000 is additional capital. There are borrowing powers to the extent of £1500 in respect of the original capital, inclusive of the amount already raised; and £2500 may be borrowed on the additional capital. The works are to be extended by the construction of two reservoirs and several lines of main, to be completed within five years. The land held on grant by the limited Company is to be purchased within three years. Rates for domestic supply are to range from 10 to 7½ per cent., with 9 per cent. for inns. The supply is to be constant under pressure. An agreement between Mr. G. W. G. Leveson Gower and the Company for the lease of certain land is scheduled in the Act. The South Lincolnshire Fen Water Act incorporates a Company with a capital of £50,000, and power to borrow £15,000, for the supply of a district in the fens of the parts of Kesteven and Holland, Lincolnshire, with the provision that the statutory rights are to be forfeited in the case of any parish not supplied within five years. The water-works are to comprise a well and pumping station, and the necessary auxiliary works; the land to be acquired within three years, and the works to be finished within five years. An agreement relating to the purchase on behalf of the Company of certain lands, together with a bore-hole, for a fixed sum and a rent-charge is set out as a schedule to the Act. The supply is to be constant under pressure; and the rates for domestic service vary from 7½ to 5 per cent. upon rateable value. The Uckfield Water Act incorporates a Company with a capital of £5000, and power to borrow £1250. The works include a well and pumping station in the parish of Uckfield, a service reservoir in the parish of Buxted, and the usual subsidiary works, to be completed within five years. The rates for household supplies range from 8½ to 6 per cent.

The Barnstaple Water-Works Act enables the Barnstaple Water Company to raise £18,000 under the auction clauses, with power to borrow to one-fourth of the amount called up. The limits of supply are extended; and one-fifth extra to their usual rates is permitted for supplies at high levels. New works, comprising pumps, service reservoirs, and pipe-lines are sanctioned, subject to any claims for compensation from riparian owners below the Company's intake on the River Yeo. The new works are to be completed within seven years. The Act also enables the Company to make regulations for preventing waste of water, and to sell water by meter. The Brymbo Water Act authorizes the Company to construct additional water-works, including an impounding reservoir upon the Pen Dinas stream, and an intake from a lake, the sporting rights upon which are reserved. Compensation water is to be discharged down the bed of the impounded brook, under penalty of £5 per day for default. The works are to be completed within seven years. The Company are empowered to raise £15,000 of additional capital under the auction clauses, with power to borrow £3750. The power to sell water in bulk, frame regulations for preventing waste, and other facilities are also conferred by the Act. The Bristol Water-Works Act enables the Company to raise £240,000 additional capital under the auction clauses, and to borrow £80,000 in respect of capital authorized by an Act of 1882, as well as £60,000 in respect of the new capital. The Company's works are to be enlarged by the construction of pipe-lines, intended to collect, under various restrictions, the water of certain springs, and pumps for lifting the same into the Company's existing reservoir. The works are to be completed within seven years. The

district of supply is enlarged. The Folkestone Water Act extends the Company's limits of supply, and enables them to raise £20,500 of new capital under the auction clauses, with power to borrow £19,875 in respect of their original and to one-fourth of the amount of their new capital as called up. It is provided that, from and after the passing of the Act, the Company shall allow a sufficient supply of pure water for the domestic use of the inhabitants of any house within their limits, at a pressure sufficient to reach the top storey of every house, and so that every such house shall be supplied with water for at least five hours daily; and after July, 1889, the inhabitants of a district of Folkestone which is specially defined upon a map are to have a sufficient supply of pure water constantly laid on at such a pressure as will make the water rise 130 feet above Ordnance datum. The Fylde Water-Works Act repeals parts of older Acts applying to the Company, more especially with regard to compensation water, providing for the satisfaction of certain estates. Additional land is to be acquired. The Kent Water-Works Act extends the Company's limits of supply, sanctions new works, and enables the Company to raise £100,000 by the issue of debenture stock, to be offered for public sale, and to bear interest at not exceeding $4\frac{1}{2}$ per cent. per annum. The Staffordshire Potteries Water-Works Act extends the Company's limits of supply, enables them to raise £180,000 under the auction clauses, with power to borrow to one-third of the amount as issued, and sanctions new works, comprising pumping stations and reservoirs, to be completed within ten years. The Corporation of Longton are protected by the devotion to their particular service of a special main from the Meir reservoir. The West Surrey Water Act enables the Company to raise £40,000 under the auction clauses, and to borrow to one-fourth part of the amount as issued. New works are sanctioned, including an additional intake from the River Thames, from which the Company are authorized to draw 3 million gallons per day. Water may be sold in bulk at the rate of 9d. per 1000 gallons, provided that the demand does not interfere with the domestic supply. The London Sea Water Supply Act extends to July 18, 1890, the statutory powers of the Company for executing works in certain parishes named.

MESSRS. G. W. STEVENSON AND SON, of 38, Parliament Street, have intimated to their clients that, owing to Mr. Stevenson's very serious illness necessitating his entire relinquishment of active work (to which reference has already been made in our columns), the practice will be continued by Mr. E. Herbert Stevenson, who, having been associated with his father for the past eighteen years, is intimately acquainted with all its details.

It is announced that the registered offices of the "Beck" Gas-Engine Company are about to be removed from Newcastle, to a good business centre in London. This step is being taken, it is understood, with a view to suit the convenience of the Directors. The Company have just dispatched to the Southwark and Vauxhall Water-Works Company a 12-horse power engine, to be used in connection with an electric light installation.

In financial circles, a Buenos Ayres Water-Works Loan has been spoken of for some time; and rumour has placed the amount as high as £10,000,000. This, however, seemed an exaggeration, says the *Standard*, even for the insatiable River Plate communities. But it is now reported that the issue of the capital of a Buenos Ayres Water-Works and Drainage Company is decided upon; and that it will be made at an early date by Messrs. Baring Bros. and Co., to the extent of £8,000,000.

THE Royal Commissioners appointed to inquire into the proceedings of the Metropolitan Board of Works have made an interim report, which has just been presented to Parliament. They have submitted the conclusions at which they have arrived on the evidence laid before them; leaving further inquiry to be made later on, should it be deemed expedient. In concluding their report they express an opinion that it might have a wholesome effect if it were distinctly made a criminal offence to offer to any member or official of a public body any kind of payment, fee, or reward, having any relation to the affairs of the body of which he was such member or official, and also to make the person accepting such payment, fee, or reward amenable to the criminal law. They think that the provisions of the Corrupt Practices Act would afford some very useful suggestions in the framing of such an enactment.

We have received a copy of the "American Gas Engineer and Superintendent's Handbook" from the author, Mr. W. Mooney, of New York. It may be shortly described as an American "New-bigger;" the compiler having, in the selection and arrangement of his material, followed generally the plan adopted by his English predecessor, and even gone so far as to copy him almost exactly in the outward garb in which that material is presented. Mr. Mooney admits, in his preface, that such a book as the one he has produced must, of necessity, be made up in a great measure of the writings of others; and this is fully borne out by a glance at the contents. At the same time, it is not entirely devoid of original matter. Commencing with the composition of American coals and the nature of the residual products of carbonization, the author proceeds to describe the appliances used in the manufacture, testing, storage, distribution, and consumption of gas; the test being illustrated by a number of diagrams. The remainder of the book consists of reference tables, useful rules, and other data for the guidance of gas managers; and concludes with an epitome of chemistry.

Technical Record.

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

The Quarterly Meeting of this Association was held on Thursday last, in the Whitehall Rooms of the Hôtel Métropole. The PRESIDENT (Mr. J. L. Chapman, Assoc. M. Inst. C.E.) occupied the chair; and the attendance of members and friends was larger than usual, owing to the announcement that the papers to be read were on subjects which are now receiving so much attention in gas engineering circles.

The SECRETARY (Mr. J. W. Helps, of Croydon) read the minutes of the preceding meeting, held at St. Albans in May last, and they were confirmed.

ELECTION OF OFFICE-BEARERS.

The PRESIDENT said that his term of office was closing; and, according to the *agenda*, the proposition had now to be laid before the members to elect a new President. The Committee had—he thought wisely—decided to nominate Mr. John Somerville for the position, as he had done a great deal in promoting the welfare of the Association. He hoped the proposition, which he moved, would be received in the most cordial manner.

Mr. JABEZ CHURCH (London) seconded the motion, which was carried with acclamation.

The PRESIDENT said that, according to the rules, two members of the Committee would retire at this meeting. By some error at the last general meeting, Mr. Helps having kindly taken the position of Secretary, they omitted to elect another member in his place, so that there were three gentlemen to elect on the present occasion. Those who had consented to take office at the Committee's request were Messrs. A. Mead (Chelmsford), S. Durkin (Southampton), and W. E. Price (Hampton Wick).

Mr. W. H. H. BROADBERRY (Tottenham) proposed the election of the gentlemen mentioned by the President.

Mr. C. GANDON (Lower Sydenham) seconded the motion, which was agreed to.

The other officers of the Association—the Treasurer (Mr. A. H. Wood, of Hastings), the Secretary (Mr. J. W. Helps), and the Auditors (Messrs. C. Farrand and E. Price, of London)—were all re-elected.

ELECTION OF NEW MEMBER.

Mr. John Methven, of the Nine Elms Station of The Gaslight and Coke Company, was elected a member of the Association.

CHANGE OF MEETING-PLACE.

The PRESIDENT said that, before he proceeded with the other business on the *agenda*, he should like to remark that it was through the energy of their Secretary that they were able to meet together in that room, which he thought was better than the one in which they had hitherto met. The room had been obtained on terms almost as good as those on which they had the room in the City; and he (the President) hoped the members would agree that the Secretary had done wisely in bringing the Association there. The next thing to occupy their attention would be the papers. They were very much indebted to the gentlemen who had come forward to help them; and he hoped they would have an interesting meeting in every respect. Mr. Livesey had always been their friend, at their beck and call; and they had to thank him very much for bringing before the Association the subject which, of all others, was at the present time being so much discussed by gas engineers.

READING OF PAPERS.

The two papers prepared for reading and discussion were: (1) "The Guide-Framing of Gasholders: How and How Far may it be Dispensed With?" by Mr. George Livesey; and (2) "Some Hindrances to the Sale of Gas," by Mr. W. E. Price. These appear in full elsewhere to-day; but, consequent on pressure on our space, the report of the discussions is unavoidably held over until next week.

At the conclusion of the discussion on the last-named paper, the proceedings were wound up by proposing the following

VOTES OF THANKS.

The PRESIDENT said that before the meeting separated, he thought they should pass a cordial vote of thanks to Mr. Livesey and Mr. Price for the interesting papers they had kindly contributed. They ought to include in the vote Mr. Gadd, for bringing to the meeting models of his arrangement for guiding gasholders, and also Mr. Cripps and Mr. Cutler, who had taken part in the discussion.

The proposal was heartily acquiesced in.

Mr. BROADBERRY said there was one more vote they had to pass, and that was to their retiring President for the way in which he had conducted the affairs of the Association during his year of office. He had much pleasure in making the proposition.

The motion was agreed to amid great applause.

The PRESIDENT briefly thanked the members for their hearty vote. He hoped that they would extend to his successor in the chair the same courtesy that had been shown to him.

This concluded the business of the meeting, and the members afterwards took tea together.

MIDLAND ASSOCIATION OF GAS MANAGERS.

THE DISCUSSION ON MR. LEWIS'S PAPER.

Last week we gave an account of the general proceedings at the recent meeting of the Midland Association; reserving till to-day the report of the discussion that took place on the paper presented at the previous meeting by Mr. Lewis, entitled "The Competition of Petroleum with Gas for Lighting Purposes."

THE PRESIDENT: I regret that at the Bath meeting we were obliged to take Mr. Lewis's paper as read, and to defer discussion upon it.* The delay, however, has given you the opportunity so often desired of seeing the paper in print before it was read; so that you should now be better able to discuss it. The paper went a little beyond its title, and for the purpose of discussion may be divided into two parts—First, the subject conveyed by the title; and, secondly, the policy of gas companies or gas undertakings towards their consumers.

MR. J. S. CRANMER (Stratford-upon-Avon): Our thanks are due to Mr. Lewis for bringing the subject before the meeting at Bath; and I am sorry we could not discuss the paper then, although possibly during the interval we may have had time to digest it, and to bring our experience to bear upon it. Last week, through the kindness of the Editor of the JOURNAL, a letter was inserted [see *ante*, p. 636] asking for information on this subject. The Gas Committee of my Corporation are very anxious to assist me in endeavouring to drive out what I may term our strongest competitor—petroleum oil; and they requested me to obtain all the information I could on the subject. I forwarded the letter I have mentioned to the JOURNAL; but I am sorry to find there are no replies this week. The reason why, I am unable to say. Whether it is from the lack of information, or from that natural—I would not say timidity—but modesty on the part of managers in general in regard to furnishing information, I cannot say. Mr. Lewis has very kindly given me information; and I trust I may yet gain some from other sources. It appears to me that the question of supplying gas to small consumers is one that should be taken into consideration, not only by gas managers, but by corporations and gas companies. There is a wide field open in this direction; and it is only by determining the best means of dealing with the matter, that we shall be able to drive out our competitor. In my case, we have been repeatedly asked by people who would be small consumers, if we would supply them with gas. Under our present rules, we are unable to do so. If we afforded them a supply, the difficulty at the end of three months would be to get payment. Now, I do not see any reason why we should not adopt the same plan as is carried out by those who go out selling oil in small quantities, and who collect the money weekly. One difficulty, I see, is the provision of gas-fittings for these small customers. In the majority of cases they are not in a position to pay even 20s. for fitting up a house. The owner of the property will not do it; and the result is we are losing consumers, who, I am confident, would pay us equally well as some other classes. A little more trouble might be caused to the manager; but I contend these customers would pay us equally as well as some of the larger consumers. If any plan could be adopted for providing gas-fittings and charging a small rent for them, we might be able to provide alike for the cottager and artisan at quite as cheap a rate as the oil-man does at the present time; and we should all reap a benefit by so doing. At present I have not done anything beyond making inquiries; but if these inquiries lead to satisfactory results, I shall be pleased to make them known to the Association at some future time.

MR. P. SIMPSON (Rugby): I cannot give any information on the question of petroleum *v.* gas; but I have heard it stated by other managers that the bad debts amounted to such a considerable sum for the gas consumed by small customers, that it was one great drawback to supplying them. I think, with Mr. Cranmer, that it would be a great benefit to all gas companies if they could get into the way of collecting the accounts from small consumers more frequently. I have in several instances had to cut off the supply to small consumers, because in the winter quarter it comes to rather a considerable amount, and there is not that forethought which perhaps was more prevalent in olden times of laying up for a rainy day. As a rule, the working population live from week to week; and to take the amount of a quarter's gas account out of a week's wages might sometimes cause a difficulty in the family. If we could collect the money more frequently, it would be a help in supplying small consumers. In my own case I supply 889 cottages, and 630 shops and large houses—a total of 1519. I have taken a district of two streets, which contain about 400 cottages, of which about 156 use gas; the average consumption in 1887 being 9314 cubic feet for each cottage. The cottages in these two streets are not built as many are. They are all freeholds; but there are very different classes of cottages in the same street. We have numbers of cookers in use in these streets; and there are differences of degree in the consumption, which may make the average consumption appear large. Taking the last five years, the average annual consumption of the 889 cottages was 8,389,000 cubic feet; and of the 630 shops and large houses, 26,463,000 cubic feet. This gives an annual consumption of 42,000 feet for the larger consumers. Taking the five years, I have had for these 889 cottages, on an average, bad debts amounting to £3 13s. 9d. per annum, and for the 630 shops and large houses an average of £12 0s. 6d. This gives for the cottages bad debts averaging 0·09d. per 1000 cubic

feet; and for the larger consumers, 0·11d. Now, as a compensation against this loss by bad debts, the price is 3s. 2d. per 1000 cubic feet, with 2d. discount if paid in a given time. In the past five years, the average amount received per annum from those who have lost their discount is £29 12s.; so that, after deducting from this the bad debts (£15 14s. 3d.), there was still a balance left of £13 17s. 9d. above what would be received if all had paid 3s. per 1000. I may say that a great drawback to cottagers having a supply of gas is the requirement in some instances of a deposit and a charge for laying the service-pipe. At Rugby we do not ask for a deposit; and we lay the service within the house. In my opinion, small consumers would not, as a rule, pay deposits. I have never tried to obtain them; and do not think I should be likely to succeed if I did. We collect our accounts every quarter. The accounts are made up (say) to Sept. 30. The bills are then delivered; and every customer is seen twice before the end of October. This gives them the benefit of the discount if they pay; and the second time the collector goes round, he takes a considerable amount of money. After the second month, unless the customers pay, the supply is discontinued; and they are put into Court. I have contemplated bringing before my Board the question of more frequent collections.

MR. MILLARD (Hinckley): I am strongly of opinion it does not pay to foster a consumption among small consumers, especially where, as in Mr. Simpson's case, you put in the service free, and allow the consumers to have meters without charging hire. Even if you take the interest on the outlay at the small figure of 5 per cent., there is also the cost of collection, and other matters. Mr. Simpson says that he has an average consumption in the case of his cottage consumers of more than 9000 cubic feet. In my own case at Middlesbrough, before I went to Hinckley, the consumption was about 8900 cubic feet. It really does not pay; but with the object of broadening the basis of the gas-works, we did try to foster consumption in this direction, hoping that we should also obtain increased consumption by the use of gas-cookers. We arranged in all cases where landlords would put in the internal pipes, to fix the service-pipe and meter without any charge. A good many of them did so; and it was always found that these cottages let the best. Of course, there is a residuum of population of a migratory character who it would not be worth while having as gas consumers.

THE PRESIDENT: Do you include the consumption by cookers in the figures you have given?

MR. MILLARD: Yes. There were usually two lights in the cottages I referred to. In the end, the landlords began to make recesses for the cookers; and it saved the expense of a range in the back places.

MR. HUNT: I was glad to hear Mr. Millard's remarks, because it has appeared to me that, in discussions upon this subject, it has too frequently been assumed to be the special mission of gas suppliers to oust all competitors, without any regard to cost. Gas supply ought surely to be on the same footing as any other business, in respect to which blame would attach to any one carrying it on at a loss; and the first thing to determine is whether or not the new business we are seeking to acquire is likely to prove remunerative. If it is not, it cannot matter whether oil or candles be used, or even the electric light. I remember that, in the time of the Companies, it was said in Birmingham of a certain class of consumers that it would pay to put in the service-pipe, supply and fix the meter, and then never go near the premises again—that is to say, the consumption was insufficient to cover the cost of attendance upon the meter and collection, to say nothing of depreciation and interest on cost of service-pipe and meter. Without going so far as this, it is evident from the smallness of consumption in cottage property generally, that caution is necessary in extending the business in this direction. It may be quite true that it cannot be said of any single consumer, "This one pays; and that one does not," in the sense of supporting a gas undertaking; but having regard to the class, rather than the individual, we can at once recognize the difficulty that would be experienced with a gas undertaking whose consumers were solely composed of small cottage occupiers, having say two lights apiece. It must be apparent that an average consumption of 4000 to 5000 cubic feet per annum could not be supplied at so cheap a rate as an average consumption of say 20,000 or 30,000 feet; other conditions being the same. Moreover, in the migratory character of a large portion of the smaller occupiers, especially in the larger towns, there is an element of insecurity, which can only be met by a system of very short collection, or prepayment by meter or otherwise. In this respect Mr. Simpson's plan appears to have been very successful, although he is evidently more favourably situated than are many others. As regards the extension of gas consumption generally, I feel convinced that Mr. Simpson is upon the right track. Some years ago I had occasion to make enquiries upon the subject, and procured returns from various towns—Mr. Simpson's among the number. I was greatly impressed by the proportion of consumers to population, and consumption per head of the population; for these bore a very close relation to the policy adopted towards the consumers. Where restrictions were in full force—the deposit and guarantee system in full swing, there the consumption was least. On the other hand, where a liberal policy was indicated by the information afforded by the returns, there the use of gas was proved to have widely extended limits. In this way the consumption per head of population was shown to be actually less in the case of a large manufacturing town than in that of a

* Mr. Lewis's paper was given in the JOURNAL for May 22 last (p. 913).

comparatively small town having a semi-rural population. When looking at a balance-sheet, it is too often assumed that a small amount for bad debts is an indication of good management. I am not sure that it may not sometimes be the reverse. At all events it is most probable that the growth of business would in many cases be more satisfactory if a more liberal policy were allowed to prevail.

Mr. H. TAPLAY (Stoke-upon-Trent): I can endorse Mr. Hunt's remarks. In our Potteries district, we have a population similar to his own—a migratory one. One inducement we gave to this population to use gas was to do away with meter-rents and fix meters free. This led to about 50 new consumers with a consumption of 400,000 or 500,000 cubic feet a year; but our net loss at the present time will be about £500 a year in meter-rents.

Mr. NORTH: That means you dropped your meter-rents all round?

Mr. TAPLAY: Yes.

Mr. J. A. HARRIS (Wigston): With regard to the use of petroleum for heating purposes, I may remark that at Wigston experiments are being tried at one or two shoe factories to heat irons by this means. The only drawback is that the irons are blacked. I should like to ask if there is any case where heating by petroleum is carried out successfully. With regard to the supply of gas to cottages, in my opinion we need caution. If a genuine good tenant will take gas, we ought to make it as easy as possible in the first place to start the consumption, by laying the service-pipe and fixing the meter free of cost. In the case of cottages not already fitted up, it would also be to our advantage to do the work at a small margin of profit. The start is the principal thing. If we know people are likely to be sure tenants of a cottage, and gas-fittings are not fixed in it, it might be advisable for some one from the gas-works to see the landlord. There are tenants who would be willing to pay a penny a week more if the landlords provided the gas-fittings. In a new district, where there is a population of about 2000, we have experienced more difficulty than in all the other parts of Wigston. I find one factory is worth a hundred of such consumers.

Mr. W. R. COOPER (Banbury): In our case we try to meet the small consumers as liberally as possible. We do nothing in the way of fitting up houses; and the consequence is that the tradesmen have gone more into the petroleum lamp than the gas-fitting business, as, after selling the lamps, they continue to supply the oil. I thought of suggesting to the Directors of my Company that they should try and revive the trade in gas-fittings by offering the tradesmen a premium upon all the gas-fittings they sell; so that there might be a fair competition with the lamps.

Mr. NORTH: Why not go into competition with them? You can afford to sell gas-fittings cheaper than they can.

Mr. W. WINSTANLEY (Newcastle): I should like to ask if any members present have tried the prepayment meter. I was instructed by my Committee to obtain one of these meters to experiment with. I have done so; and I find that the pence dial works backwards. It may be that this is right, to show the amount of gas paid for and the quantity to be burnt. I have tried it with a penny; but the penny will not go down. There it sticks; and still the gas goes on burning. (Laughter.) One of the members has spoken of supplying the services free. I do not find that it has increased the ratio of consumption over what it was before adopting this principle. As regards the deposit system, perhaps that may interfere with the increase of consumption. In my case, 5 per cent. is allowed upon all deposits. I find that the bad debts have decreased, while the consumption has increased, which may perhaps arise from better collection. Mr. Simpson is very favourably circumstanced in the matter of cottage consumption; but if I supplied cottages in the way he does at Rugby, I should very likely find a few hundreds increase in bad debts. The idea of adopting the prepayment meter is to increase this class of consumption, and at the same time make sure of the cash.

Mr. SIMPSON: Is not the dial of the prepayment meter meant to go backwards when you put a penny in? It goes round to the 12; and you cannot put any more pence in. Perhaps you have broken the action with your penny.

Mr. HARRIS: There is a dial registering up to twelve or each penny put in. It goes forward—one, two, or three, and so on up to twelve; and then it travels back. I have the greatest confidence in the meter.

The PRESIDENT: As to the idea of increasing cottage consumption, although I agree with previous speakers that we should not take business at a loss, yet I think our aim should be to bring into our fold all consumers who will in the long run benefit us; and that we should not stick at trifles, but remove, as far as practicable, all the old discouraging restrictions to the use of gas from all consumers—small consumers though some of them may be. On the Continent, they look at the whole question very broadly. They bring the service from the street, and take it right up through the various floors of the house free of cost. No doubt charges for fixing meters, deposits, and for one thing and another are vexatious, and form a stop-block in the way of a small consumer entertaining the idea of using gas. I notice that during the discussion nothing has been said with respect to Mr. Lewis's figures, which he had so ably prepared for us in tabular form in the paper. One advantage of delaying the discussion upon it has been, as I said before, to give us time for a full consideration of them; and, availing myself of it, I thought I would ascertain for myself what was the cost of burning ordinary petroleum oil, as compared with coal gas. I am living in the country just beyond

the limits of gas supply, and am compelled to use oil-lamps. I use Hincks's duplex lamps with petroleum oil; and the oil costs 9d. per gallon delivered. With the flames of my lamp set at right angles to the photometer bar, I obtained an illuminating power of 21·52 candles; and with the edge of the flames towards the bar, only 12·01 candles, or 56 per cent. less (which is about 4 per cent. less favourable for the edge of the flame than Mr. Lewis found). One quart of the petroleum oil lasted 14 hours 12 minutes; the cost at 9d. per gallon being 2½d. or 0·16d. per hour. Taking the mean of the illuminating power of the flames edge and full, it is equivalent to 5·23 cubic feet of gas of 16-candle power per hour. Adopting 3·2 candles per cubic foot, at 3s. per 1000 cubic feet, the cost of an equal light by gas for the same length of time would be 2·67d. against 2½d. from the oil—or 3·42d. against the 2½d. if the comparison be made with the higher lamp-power of 21·52 candles. The power recorded for the full-flame tests gives a value of 1215 candle power per gallon per hour, as compared with Mr. Lewis's 1287 to 1459; and my tests bear out his calculations that oil at 9d. per gallon is about equal to gas at 2s. per 1000 cubic feet, of an illuminating value of 3·2 candles per cubic foot. I am, however, of opinion that, notwithstanding the improvements which have taken place in gas-burners, principally in those of high power, 3·2 candles per cubic foot is too high a standard to adopt for the comparison with petroleum lamps. Such lamps as these are principally used in places where ordinary fishtail or other flat-flame burners would be used if gas were employed; and with such I think that perhaps a mean between the late Mr. Hartley's figures, mentioned by Mr. Lewis, and 3·2 candles would be fairer, if not still too high a value for the comparison—3·2 being the result obtained at present with the standard Argand burner. Reckoning therefore, the value of the gas per cubic foot in candles, at an eighth less than Mr. Lewis has done, it alters the comparative cost of gas in his duplex burner table from 15·16d. to 17·31d. as against 9d., or nearly double the cost of oil; and at 2s. per 1000 cubic feet, 11·54d., as against 9d.—or 28 per cent. dearer. I quite agree with Mr. Lewis's statement in his paper that the truth should be known; and if we do not bring it out, or in any way attempt to "scotch it," it will nevertheless come to the front. I therefore hope he will excuse me in disagreeing with his figures as to the cost of oil compared with gas. From the experiments I have made, and my general knowledge as to the cost of petroleum, I feel that, as regards expense, light against light, we shall not be able to "defy all competition," without 17-candle gas can be sold as low as 2s. per 1000 cubic feet. Anything above that figure will, if cost alone be considered, put the general adoption of gas by very small consumers out of the question if looked at apart from the matters of safety and convenience, which are so much in favour of gas. Mr. Lewis has referred to a valuable paper by Mr. Dalglish. It would be valuable information if Mr. Dalglish would at some future time kindly add to his interesting figures the price of gas in the different towns to which he refers in his paper, where he shows that the non-consumers vary from 8 to 81 per cent. It will give us an opportunity of judging more fully if it is the price of gas which adds materially to the disposition of the non-consumer to use petroleum rather than gas.

Mr. J. T. LEWIS (Wellingborough): The discussion to-day has, I think, been on the whole favourable to the views I hold. Some members seem to consider it is not advisable to push the sale of gas in cottage property, without being quite certain that it is going to pay, or more than pay, for the extra expense incurred through dealing with this class of property. In my opinion, it is necessary that we should try and get hold of this class of consumer; and therefore we must, in the first instance, treat it as an experiment, and afterwards be guided by the results, which may entirely differ in different districts according to local circumstances. No doubt, in large towns, such as Birmingham, the migrating habits of many cottage occupiers makes it very difficult to supply them with gas on the usual terms; and the endeavour to do so, on the system of quarterly payments, might add to the bad debts account. If, however, a system of weekly collections was adopted, I believe this class of people might with advantage become our customers. The frequent visit would almost, if not entirely prevent loss; and although the cost of collection is greater, I think, this is preferable to a system of monthly collection, or the use of a prepayment meter, the employment of which would necessitate at least monthly visits, when perhaps at the end of the month you might find your customer had removed, or that the meter had been tampered with. I must congratulate Mr. Simpson upon the smallness of his bad debts, and also upon the average consumption of his cottages; both being very good. Mr. Millard is under a mistake when he speaks of Mr. Simpson and myself supplying meters free. We do not do that. In my own case, we charge 1s. per quarter for 3-light meters. In reply to Mr. Harris, as to the use of petroleum to heat shoemakers' irons, gas is largely used in our district for this purpose; and although it is possible to heat these irons with petroleum oil, and some do it, I have not met with anyone who could get a supply of gas on favourable terms who did not prefer gas for the purpose—the advantages being altogether in favour of gas. During the past few months, we have laid down mains for the supply of a village of 2000 inhabitants, where scarcely anything but petroleum oil was previously used for lighting purposes. Our price for gas there is 3s. 4d. per 1000 cubic feet, with 2d. discount; and at this price, I am glad to say that many of the people have taken gas, and were only too glad to get it, in place of petroleum—clearly showing that it is not altogether a question of

cost light for light. In this place I have been fortunate enough to induce some owners of cottages to put in gas pipes and fittings; so that the occupiers can take the gas on the weekly system, without any expense, beyond that of the gas consumed and the meter-rent. I should recommend Mr. Cooper to take the supply of fittings into his own hands, instead of offering a premium to the oil-lamp sellers on the gas-fittings they could sell. He could supply the fittings at less cost, and would understand the requirements of his customers much better than the shopkeepers, besides having the control of them in his own hands. With regard to the question which the President has raised, as to the amount of light given by an ordinary burner per cubic foot of gas, I adopted the value of 3.2 candles because I did not wish to be below the mark in my comparisons; but I quite agree with him that, in the bulk of cottages where oil is used, such a high value would not be obtained. I think his figures of 2.8 candles per cubic foot are quite high enough; and I should be perfectly willing to adopt his figure, if I was going over the matter again. In a paper read by Mr. L. T. Wright, late of Nottingham, before the Society of Chemical Industry,* he compared the value of petroleum and paraffin oils with gas as supplied at Nottingham. He allows a value of 3.5 candles per cubic foot for ordinary flat-flame burners. This I consider much too high, even when used with 18½-candle gas. With this exception, I find that his results agree closely with my own experiments; and I am pleased to know that our President's tests also agree with mine. It is of the greatest importance that we should make only true statements to our customers as to the value of the light obtained from the gas used with various burners. A short time ago a pamphlet was given me on the subject of the supply of gas to consumers; and in it I found very misleading statements, such as no one connected with gas undertakings should send out, and which would certainly lead to trouble with our consumers. Our President says that gas must not be above 2s. per 1000 cubic feet to be able to compete with petroleum. This is true when comparing the light given by each illuminant; but something must be allowed for the advantages which gas undoubtedly possesses over petroleum. As an instance of this, I may mention that a few weeks ago I attended a meeting of manufacturers and others held in a village of 3000 inhabitants, to take into consideration the advisability of obtaining a supply of gas; and without any figures being given them, their own conclusion was that, if gas could be supplied at 4s. per 1000 cubic feet, they would burn it in their homes and factories instead of petroleum. Notwithstanding that petroleum is such a severe competitor, I think if we take such steps as weekly collections, and offer every facility for getting gas, we shall do a great deal to meet, if not to stop altogether, the competition which we are experiencing at the present time. Though I cannot speak definitely on the subject, it may interest some to know how we have succeeded with the weekly system since we started it in July last. During the quarter we had 16 consumers on this system—the lowest average weekly payment, 3.3d., and the highest where a cooking-stove is used, 1s. 7.6d., or an average for each of 5.94d. per week. We have now 30 customers on this system, and have orders for many more to be put on. In conclusion, I beg to thank you for having listened to me so patiently.

Mr. COOPER: With regard to the question of offering premiums to tradesmen, my idea is that in doing so we should not create a rivalry; we should not have any bad debts, and there would be no capital required for carrying out my suggestion.

The PRESIDENT: I rise to move a very hearty vote of thanks to Mr. Lewis for his paper, which has been so well discussed to-day. I hope some other members present will take a leaf out of his book, and bring before us next year papers on subjects of mutual interest.

Mr. B. W. SMITH (Smethwick) seconded the motion, which was carried with applause.

Mr. LEWIS: I thank you very much. I only felt I was doing my duty in preparing the paper. I shall be pleased at any future time to do anything I can for the Association.

METROPOLIS WATER SUPPLY.—Among the notices of motion still on the paper of the House of Commons, there is the one by Mr. Dixon-Hartland for the appointment of a Select Committee to "inquire into the whole question of the present and future water supply of the Metropolis," and that of Mr. Seager Hunt for a Bill "to consolidate the Acts relating to the water supply of London," both of which were recorded in our columns at the time the notices were given.

AWARDS AT THE BRUSSELS EXHIBITION.—In addition to the awards at the Brussels Exhibition which have already been recorded in our columns (see *ante*, p. 674), we notice that diplomas of honour were given to M. Somzée, for the "Ezmos" gas-lamp (described elsewhere to-day); to Messrs. Marsh, Greenall, and Co., of Manchester, for their gas-lamps; and to the same firm, as well as to Messrs. C. Wilson and Co., of Leeds, and M. Wybauw, of Brussels, for their gas-stoves. Mr. Jennings and Mr. Justice, of London, have received silver medals for their gas-stoves; and Herr Elster, of Berlin, a gold one for his photometers. Messrs. J. Stott and Co., of London, were awarded a special prize for their gas-regulators. For gas-meters, the General Gas-Meter Company of Brussels, MM. Bieunen and Serret, of that city, and Herr Haas, of Mayence, were all awarded gold medals.

* See JOURNAL for June 5 last, p. 1003.

THE GUIDE-FRAMING OF GASHOLDERS: HOW, AND HOW FAR, MAY IT BE DISPENSED WITH?

By GEORGE LIVESEY.

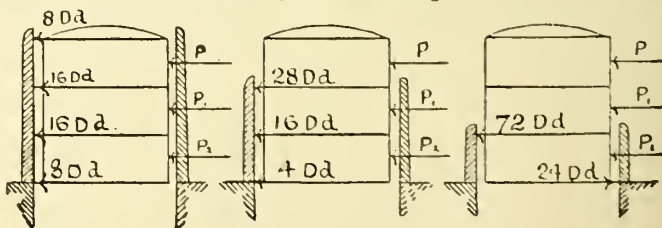
[A Paper read before the Southern District Association of Gas Engineers and Managers, Thursday, Nov. 8, 1888.]

The question has two aspects—the first is a scientific, and the second an economical problem. Supposing the first to be settled satisfactorily in the affirmative—that guide-framing can be abolished partially or entirely—the theory is not likely to be adopted in practice unless a considerable saving can be effected.

It has been proved, both theoretically and practically, that the guide-framing of telescopic holders can be safely reduced in height without appreciably increasing the strength of the holder or the remaining guide-framing. The theory is to be found in the series of able and exhaustive articles, by "Theory and Practice," that have appeared in the JOURNAL OF GAS LIGHTING (which I hope will be published separately); and the practice is to be seen at Rotherhithe. So far as the Rotherhithe holder is concerned, the idea originated in 1881, as may be seen by referring to the JOURNAL for Dec. 27, 1881, where, in a letter referring to the large holder then just completed at the Old Kent Road, I said:

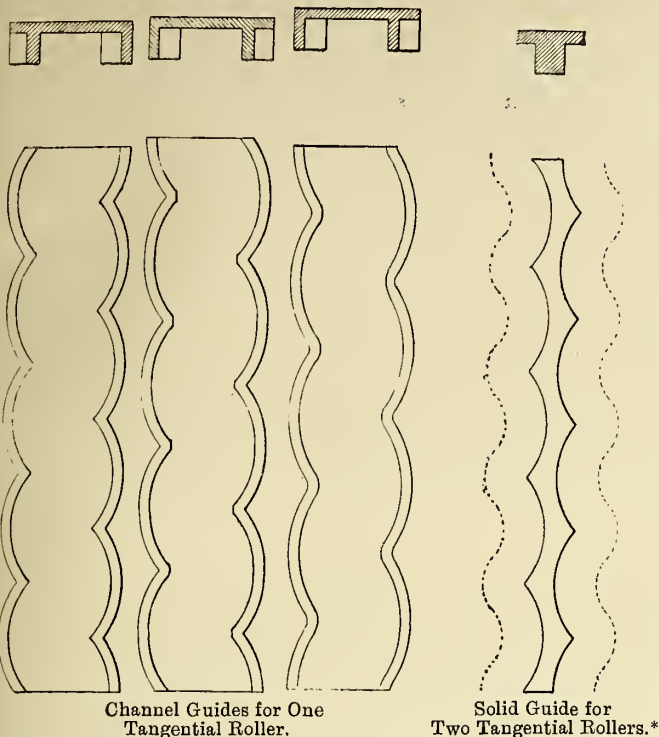
"I close this letter with an idea that has occurred to me this week, and which may some day be carried out in practice. I believe it would be quite practicable and perfectly safe to erect and work such a gasholder as this with three lifts of 53 feet each, if the guide-framing reached only high enough for one lift—say 55 feet [of this I am now doubtful] in order to guide the inner holder until the second is cupped. The process would then be repeated; the second lift being guided and kept in its place until it lifted the third, which would rise to its full height and be held firmly in position by the combined radial and tangential rollers on the grip of the outside or bottom lift with similar rollers on its curb working against guides in the tank."

The principle was tested soon after by telescoping a small holder about 8 feet diameter by 8 feet high—the inner lift having no guide-framing; and the experiment being successful, the large holder at East Greenwich, just completed, would have been built with a shortened framing, had we not been advised that the stresses on the unsupported part of the holder would be of such an entirely novel and serious nature that it would not be safe to try an experiment of this kind on so large and exposed a structure. The first attempt in this direction was, therefore, made in 1887 (but designed in 1886) on a more modest scale at Rotherhithe, where an ordinary double-lift gasholder, erected in 1867, 150 feet diameter by 25 feet deep, with sixteen cast-iron columns 50 feet high, and two tiers of girders, has been converted into a three-lift holder without increasing the height of the original framing, or strengthening it beyond what would have been necessary had it been carried up the extra height. The strengthening consists simply of diagonal bracing; and the only additional expense was replacing the channel-iron guides with H-iron to furnish paths for the combined radial and tangential rollers on the grips of the middle and outer lifts. These tangential rollers are the only addition to the holder necessitated by the shortened framing. The experiment, therefore, proves that a double-lift holder can thus be safely converted into three lifts with advantage on the score of economy, which is its justification; but it is very doubtful whether the ordinary framing can be further reduced without adding so much to the strength of both framing and holder as to prevent any further saving.



In the first place, according to the accompanying diagram (copied from an article by "Theory and Practice" in the JOURNAL of Sept. 25 last, p. 547), in a three-lift holder with framing two lifts high, the stresses on the framing are not appreciably increased; but with framing only one lift high, they become very seriously augmented—necessitating great additional strength. Secondly, there are the stresses on the bell, which are dealt with in the article on page 963 of the JOURNAL of Nov. 29, 1887, where it is said that "gasholders can be constructed safely with the inner lift unsupported by external guide-framing after it has cupped, providing the guide-framing is carried to the height of the two outer lifts." But the writer, dealing with "three-lift holders one lift supported by guide-framing," says (speaking of the side sheeting acting as the web plate of a girder) the diagonal strains tending to distort and buckle the sheeting would be so great that he comes to the conclusion "that it is not safe nor advisable to make treble-lift gasholders with guide-framing to the outer lift only." These conclusions are repeated in his article on page 677 of the JOURNAL for Oct. 16 last; and until these conclusions are proved to be erroneous, he would be a bold, if not a rash, man who ventures lightly to construct a three-lift holder with ordinary guide-framing to the height of one lift only.

But "Theory and Practice," at the close of the last article above mentioned, has a "Note on Mr. Gadd's Gasholder," which shows that, by a different form of guiding, the method of determining the strains must be different; and this points to the possibility of further reducing or abolishing the framing, and brings us back to the



article in the JOURNAL for March 29, 1887, and to Mr. Webber's paper of last year—to whom undoubtedly belongs the credit of the really original idea of constructing and working gasholders without external framing. Until he suggested the idea, it had never, so far as I know, been even thought of; and if gasholders should ever be so constructed, the merit of the suggestion rests with Mr. Webber. After this, it occurred to me that if some means could be devised whereby the bottom curb, while free to rise and fall, could be maintained perfectly level, a great step would be made in the direction indicated by Mr. Webber. I said in the JOURNAL for April 26, 1887, "if some practicable means could be devised whereby all the bottom rollers might be made to rise or fall equally, and none of them could either rise above or fall below the others, the holder would then to all intents and purposes have a solid foundation, and no columns or guide-framing of any kind would be necessary." Thus a holder rigidly level would be secured; and at the same time it would be free to move up or down with the inflow or exit of gas. For some time, however, the accomplishment of this object appeared impracticable; but Mr. Gadd's ingenious and novel invention of spiral guides seems to have solved the problem.

The important question now is whether, by Mr. Gadd's or any other plan, it is advisable or practicable to dispense entirely with guide-framing for telescopic holders, having regard to the want of strength in the side sheets to resist the distorting and buckling strains in an unsupported holder. By Mr. Gadd's invention we are enabled for the first time to hold the bottom of a holder in a horizontal position. It is not like a cylinder simply standing on a solid foundation; but is a cylinder (closed at the top) supported from the crown with the sides suspended therefrom, and the whole held firmly level by the rollers acting on the spiral guides. But I cannot see that this diminishes the distorting and buckling strains on the side sheeting of an unsupported holder. If, however, these strains can be proved to be of no great moment, then Mr. Gadd will have shown how Mr. Webber's idea of no framing can be made practicable.

Assuming that for single holders, or shallow telescopic ones, unsupported by guide-framing, the idea of holding the bottom curb to be successful, we have in the next place to find the simplest plan of effecting that object. We have Mr. Gadd's clever application of the screw or inclined guides; and I have now to introduce an upright guide to effect the same purpose. It is either made in channel form with a single tangential roller, or solid with a tangential roller working on each side. In the case of the channel guide, the roller must be carried on a stud unsupported at the outer end; but with the solid guide, the rollers work on pins supported at both ends—thus having the advantage of greater strength. The peculiarity of the guide consists, as shown, in alternate projections and hollows on the sides. The projections on one side are opposite to the hollows on the other, against which the roller or rollers work; thus compelling them to take a zig-zag course. This produces in the holder in its rising or falling a slight alternating movement on its vertical axis—turning, in fact, like a top on its centre, but only to a very small extent in one direction (say) to the right, when the action is reversed, and it moves to the same extent to the left; then again to the right; and so on. The projections may vary in size and shape; but here they are shown as equal to one-fourth the diameter of the rollers—say, 3-inch projections for 12-inch rollers—and as the zig-zag path is of exactly the same width as the rollers, there is thus 6 inches clear between the projections on the side of the guides, which may be used as a path for radial rollers if required.

The guides being fixed either to the side of the gasholder or to the tank, in exact correspondence, the closely fitting rollers must of necessity all move together in the same direction, and to the same extent. Consequently tilting is prevented; the bottom curb being held rigidly level, though perfectly free to rise and fall. The overturning force of the wind is resisted in an entirely different manner to that of ordinary framing. The rollers on the lee side hold the curb up, while those on the windward side hold it down; whereas with ordinary framing tilting is resisted by two or more series or circles of rollers at different levels bearing on the guide-framing. In one case the base is secured; in the other, the sides are supported. The difference, therefore, is radical; and it may bring Mr. Webber's idea within the range of practical engineering. Of course, the effect arrived at with the corrugated guide is the same as Mr. Gadd's spiral; and it is not my intention to disparage the latter, or to draw comparisons between them. If both accomplish the same object, it remains for impartial practical men to determine which is the more suitable for the purpose; and if any should prefer mine, they will not find that the protection it was necessary to obtain in the form of a patent will prove an obstacle to its adoption.

If either the spiral or corrugated, or both forms of guides prove effective, it will then no doubt be practicable to work single gasholders, or small and shallow telescopic ones of two or possibly three lifts, without guide-framing, as holders of this kind are proportionately much stronger than larger vessels—the sheeting being of about the same thickness in both cases. If successful, it will remove the objection to shallow holders; and in fact will make them both economical in construction and safe in working. Expense will be saved in the tank; while the holder of four, five, or possibly more lifts, with the cups at comparatively short distances apart, will be better able to resist the diagonal strains that tend to distort and buckle the sheeting if unsupported by guide-framing. For large and deep holders the utmost I expect from the new form of guiding is that, by reducing the strains on the guide-framing, it will not be necessary to increase its strength when leaving two lifts out of three or more unsupported. Beyond this, as the new guiding arrangements do not in any way affect or diminish the strains on the side sheeting of the part of the holder which is not supported by framing, the danger of distortion and buckling renders it impracticable to work the three lifts of a large and deep holder guided from the bottom curb only, without greatly increasing the strength of the side sheeting, and so adding to its weight and cost that all advantages would disappear and the balance be left on the wrong side. Let us hope that on this point there may possibly be a mistake; and that all the predictions and hopes of the enthusiasts will be satisfactorily developed in practice.

SOME HINDRANCES TO THE SALE OF GAS.

By W. E. PRICE, of Hampton.

[A Paper read before the Southern District Association of Gas Engineers and Managers, Thursday, Nov. 8, 1888.]

Given an efficient plant, and the wherewithal to work it, a gas engineer, with a sound knowledge of gas making in all its branches, is quite prepared to produce as much or more gas than may be required; but his energy is far from being less needed when he has delivered it into the gasholder. He has then to put forth his best efforts to find what most commercial men have more or less difficulty in finding—a ready and increasing market for the article which he has manufactured.

Like with most commodities or necessities, the demand for gas is regulated by its comparative cost to the public, taking into consideration its advantages and disadvantages compared with that of other illuminants; and we, as commercial men with an article to sell, ought to leave no obstacle in the way of preparing a smooth path for the use of gas. We must not forget that there are other means of obtaining artificial light—from the tallow dip to the electric arc; and if we wish to see the demand for gas increase, we must remove all real obstacles to its use. Wherever we see a supposed advantage in a rival illuminant, we must endeavour to remove our corresponding disadvantage; so that the public may not give two thoughts to another light in their necessary and wise considerations.

Let us suppose for a moment that we know nothing of the manufacture of gas, but are desirous of becoming consumers of that article. The first obstacle that "ruffles our feathers" on applying at the gas office is the demand for a deposit. On principle, we object to the prepayment of a certain sum of money as a bond of our honesty; or, even if we manage to put up with that, we think that it is only reasonable that interest should be paid on the money deposited, which, I believe, the majority of companies refuse. No! Deposits, especially when demanded in an arbitrary manner, and with much red-tapeism, cause more dissatisfaction against gas companies than any other item in their dealings. Cannot we dispense with deposits in the majority of cases? The method I have adopted for some time past is to inquire of the applicant the company who last supplied him with gas, and then to make inquiries of that company as to whether the said person may be depended upon for the due payment for the gas consumed by him—not forgetting to enclose a stamped envelope for a reply. I do not think there is a manager to be found who would object to give such information under the circumstances. If the answer to the inquiry is not satisfactory, then is the time to require a deposit or some other form of security.

The next more or less heavy expense which a consumer has to

* The dotted lines show the paths of the centres of the rollers.

bear is the whole or part cost of laying the supply-pipe from the company's main to the meter. This, in my opinion, ought to be borne by the landlord, as it is obviously to the benefit of his property and future tenants when the gas is laid on. The cost of fixing the meter is rather a different matter, and is a fair charge to make on the consumer; seeing that it is for his use only. But in this case, as also in that of services, the cost price only should be charged. A gas company should not seek to reap much or any profit from the actual connection of a house with the mains, as all charges of this class are obstructions and detrimental to the use of gas. Let a fair interest on all initial outlay be taken into consideration, when the selling price of gas is decided upon. This will probably only amount to a penny or so per 1000 cubic feet, which does not appear much in this form, especially when new consumers are reminded of the great advantage of being relieved of all primary outlay. In isolated cases, where it would be unwise to maintain the present charge per 1000 cubic feet on this account, the method now being tried by one of the London Companies in reference to internal fittings—viz., a weekly, monthly, or quarterly rental which is a fair interest on the outlay of providing a house with gas-fittings—might be extended to the external pipes.

The next item we have to consider is meter-rents. This is another source of dissatisfaction with consumers. Many have been the emphatic opinions expressed to all of us of the unfairness of this charge, especially in the case of old consumers, who have perhaps paid rent for their meters for 15 or 20 years. The reminder that even a gas-meter will not last for ever is not always convincing. The average consumer does not see, and cannot be made to understand, why he should pay rent for an instrument which he has not the least interest in having fixed at his house. All present know the prejudice of the public against gas-meters. The majority look upon them with great disfavour as one of the necessary evils of civilization—in use, only to be distrusted; out of use, nearly as bad. Unreasonable as we know this opinion to be, still we have to deal with it as it is; and our endeavour ought to be to disperse the idea in every possible manner. Experience has proved that the abolition of meter-rent will do this to a great extent. As with the application of gas to a house, a fair interest on outlay for meters could be charged on the selling price of gas.

Having laid on the gas for a new consumer without saddling him with any serious initial outlay, we find that our troubles are not over. Before long, we shall perhaps receive from him a complaint that the light is very insufficient and far from good. We call upon our friend; and, as we anticipated, we at once discern the cause of the complaint—bad fittings and worse burners. And what an extraordinary amount of reasoning will an average consumer listen to before he will believe that your accusation against his fittings is the cause of the complaint. He will not be convinced until you have found a bracket that will pass sufficient gas, and have fixed to it a burner which is suitable for the quality of gas supplied and the quantity required. Then only will he believe that the fault lies in his fittings and not in the gas. We have all been astounded at the miserable class of burner often used—some actually being new, or nearly new—which are entirely unsuited to the quality of gas supplied. These are generally fixed with the idea that their use will have the effect of reducing the gas bills; whereas we all know that the reverse is the case. To make matters worse, unscientific inventors are continually placing on the market burners of supposed remarkable economy, which, in reality, are nothing more nor less than mechanical means applied to unsuitable burners, with increase of cost and disfigurement of the flame, to secure a result obtained and generally surpassed by the use of an ordinary burner of suitable size. I am a strong advocate of governor burners. They are cheap, and burn the gas under the most favourable conditions, always giving a steady and uniform light, under the usual variations of pressure. I think the action of the gas company I have referred to is a step in the right direction—supplying and fixing suitable fittings and burners in the consumer's house at a weekly or quarterly rental; and I hope that it will be attended with success, and that their example will be followed by other companies who wish to maintain good relationships with their consumers. We shall then be able to see that consumers are supplied with pipes, fittings, and burners suitable for their requirements, and thereby give satisfaction.

We have often to listen to, and successfully combat many more or less serious objections to the employment of gas. Many people complain of the injury to plants and health; and that the atmosphere of rooms in which it is used soon becomes unbearably oppressive compared with rooms where other means of illumination are used. This is no doubt a fact in very many cases; but is it not rather a point in favour of gas than otherwise, inasmuch as it soon discovers those rooms which, through bad or complete absence of ventilation, are not fit for human habitation? Those who make this complaint, and declare that previous to the use of gas no such oppressive feeling was experienced, forget that they are now using perhaps three or four times the amount of light they were contented with when employing oil-lamps or candles, and that they are now not only illuminating the table they are sitting at, or the book they are reading, but are enjoying the pleasures of a room well-lighted from floor to ceiling. The adoption of gas has unpleasantly reminded those people that the rooms which they have been using are nothing but inverted receivers of carbonic acid and other deleterious gases given off by the occupants of and illuminating agents in the rooms, with perhaps a few outlets in the form of cracks in the doors and windows. These promiscuous outlets were sufficient to prevent any oppressive

feeling whilst an isolated light was being used; but when universal illumination is adopted, the unscientific nature of the ventilation becomes painfully apparent. To complain of the gas is as bad as a patient quarrelling with the doctor who informs him that he is suffering from a serious disease.

We cannot speak too highly of the introduction of the inverted regenerative burner; for in it we have the best and simplest means of converting the oppressiveness of an ill-ventilated room into the coolness of a conservatory if need be. I have had experience of such a room in my own house. My dining-room was built without any attempt at ventilation; and so a few years ago I inserted into the centre of the chimney-breast one of Boyle's mica flap ventilators, which was connected with the chimney. The result is that, whereas previously I noticed a difference of from 15° to 20° in the temperature between the level of the ceiling and 4 feet from the floor, it is now reduced to 10° or 12°. At this time we had two of Sugg's Christiana burners in use on brackets over the mantelpiece. Last year, however, I fixed a ventilating regenerative burner in the centre of the ceiling, communicating, through a perforated ceiling rose, with a box and 4-inch square iron tube, which was carried into the chimney. The result is that the thermometers, fixed in the same relative positions, only indicate now a difference of 2° or 3°. So much for the exit of the heated gases; but provision quite as important must be made for ingress of fresh air. This I provided by means of a 6-inch channel laid under the floor in connection with the outer air. There is an opening close to the skirting in the room regulated by an adjustable plate, and another inside the fender 6 inches square, which is covered by a perforated plate and a sliding regulator underneath. This plate takes the place of one of the hearth tiles. In this way I obtain a regular supply of air for the room, and what is quite as important to prevent draught, a good supply of air direct to the fire which has not to travel across the room, after having obtained ingress from under doors and windows, chilling the feet and ankles of the occupants. It is therefore our duty to demonstrate to the public that gas, instead of being an opponent and a hindrance to ventilation, is really its best friend and helper.

Seeing that we have so many prejudices to overcome, and many objections, though of a frivolous nature, to dissipate, is it not important that their number should not be increased by a high charge for gas? Have not nearly all of us found that the reduction in the charge per 1000 cubic feet, though perhaps made with a certain amount of fear and trembling for the next dividend, has, in most cases within six or twelve months, resulted in an increased consumption, which has been sufficient to compensate for the expected reduction in the revenue. We do not need any authority to tell us that it is a mistaken policy to maintain a comparatively high price for an article; for we all know that in 99 cases out of 100 a timely reduction means an increase in the revenue. I believe a plan of discounts given to consumers in proportion to the amount of their consumption is much appreciated, and also a general discount for prompt payments—say, within a month. I have no doubt that most of you can call to mind instances where both of these policies have shown very good results.

In spite of the great reduction in the price of gas, and the consequent increase in consumption in the last ten or fifteen years, there still remains a fairly distinct line below which the use of gas has not to any appreciable extent been adopted; and this line may be drawn at the artisan class. We have not far to search for the cause of this. We have no reason to suppose that it is through any hereditary love for the tallow dip or the paraffin-lamp. Is it not plainly evident that the cause lies in the fact that our average working man cannot purchase his gas as conveniently as he can his present means of illumination? If the British workman could purchase his weekly supply of gas as easily as his equal supply of paraffin, I doubt not that this pungent liquid would be a drug in the market. Provided that he can obtain his gas without any serious initial outlay, and procure a continuous supply in quantities within his means, there is little doubt that the artisan would universally adopt it. Methods have been suggested, and in some cases adopted, in order to secure this means of increasing revenue; but I fear that any such proposals as weekly or monthly payments, though realizing their object, would add considerably to the cost of collection.

Recognizing these difficulties, I have designed a prepayment meter, which, Sir, I hope I may be allowed to describe. This instrument, whilst allowing an easy payment, obviates the necessity of collections more often than circumstances conveniently permit. The meter (a sample of which is before you) is constructed to receive a coin, and to deliver, as many be required, its equivalent value in gas. It is of simple construction; the principle being to deal with the gas before it enters the bellows or drum of the meter, and to allow a certain amount of gas to pass, equal in value to the coin inserted; and then, by means of a valve, cutting off any further supply until another similar coin be introduced. The supply is not suddenly stopped; but warning is given for about an hour before the supply ceases, by the lowering of the lights, which instantly resume their usual proportion upon the insertion of another coin. The coin is inserted in the drawer in front, which is then pushed home, opening the valve, and admitting the gas. The small dial indicates the passage of gas to the value of one coin; so that by its inspection the consumer may know exactly the proportion of the coin expended and that to come. These meters can be made to receive a coin of any value; but I find that those to receive sixpence or a shilling are the most suitable for small consumers, whilst one for half-a-crown would be better for large

consumers. No alteration is made in the shape of the meter; and there is but little addition to its height.

There appears to me to be great advantages in the use of a meter of this description; for thereby more than one obstacle to the use of gas is removed, with consequent benefit to gas companies. In the first place, it brings gas within the reach of any person who can afford to rent a room, and to use an artificial light. And what an enormous increase to a gas company this means, perhaps though too sudden to be appreciated by all. In the second place it secures the company from bad debts; being on the cash-before-delivery principle—thereby returning a greater revenue from the sale of a given amount of gas; and consequently obviating the necessity for the demand of a deposit, which alone means the removal of a great source of annoyance and anxiety to gas companies. Besides these uses, it is well adapted to that of consumers who wish to keep a check upon extravagant consumption by servants and others—in fact, more than one consumer has expressed his wish to have one fixed. Said one: "I cannot understand your present meters with their mysterious pointers and their hundreds and thousands; but I do know what has happened when a shilling is taken out of my pocket. Now I have to wait till the end of the quarter before I know of any extravagance; but with this meter I can keep a check twenty times in the pound."

THE "DELMAS" AND "EZMOS" REGENERATIVE LAMPS.

At the congress of the Société Technique du Gaz en France, held in Boulogne last June, M. Giroud described a new horizontal-flame recuperative burner devised by M. Delmas-Azéma. The appliance, which is shown in the accompanying engraving, fig. 1, is a modification of his vertical-flame burner, of which an illustrated description appeared in the JOURNAL for Feb. 23, 1886 (p. 349); and it possesses certain features of interest. The burner consists of a heat regenerator composed of cast iron, having in the centre a chamber A for carrying off the products of combustion, surmounted by a chimney of variable length in proportion to the quantity of gas consumed. Around this chamber, where the combustion products give up the greater portion of their heat, there is

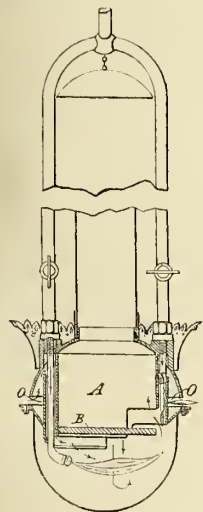


FIG. 1.

another, which is attached to the central chamber by partitions, which serve to conduct the heat, and direct the descending current of the air, which is heated by coming in contact with the sides of the chambers. The outer chamber is closed over a third of its surface and underneath, as far as the portion which faces the burner is concerned, as well as at a height of 0.5 to 0.6 inch above the enamelled reflector B, which closes the under side of the recuperator. The passage thus formed allows the products of combustion to pass into the chamber A, and thence into the chimney. The partitions on the other two-thirds of this chamber descend to the reflector, but terminate above at a certain distance from the outer casing of the lamp, so as to allow the air entering by the orifices O (which are pierced all round the lamp) to descend the annular space, and feed the flame on all sides at once. Above the burner, and extending over a quarter of the circumference on each side, there is a curved plate, by which the stream of fresh air is directed horizontally above the flame. Another stream of air is supplied to the under side of the flame, which is thus caught between two currents of hot air, which support combustion, and very considerably increase the illuminating power of the gas. The flame is slightly hollow in the centre; but the edges never impinge against the reflector, from which they are kept by the upper stratum of air. The burner, it is stated, gives almost as much light as is afforded by the one in which the flame is vertical, although the illuminating surface is very much less. The lamp may be lighted from the side by a flash-jet, as shown; or a taper may be passed down the chimney. The appliance has been in use for several months at the oil-gas works of the East of France Railway, and, up to the present, the results are stated to have been satisfactory. With a consumption of about 0.7 of a cubic foot of gas, the light of one Carcel (9.5 candles) has been obtained; while a like quantity of

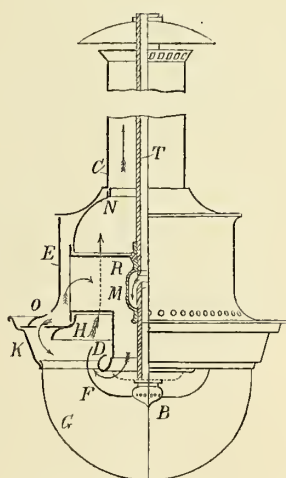


FIG. 2.

gas consumed by the same burner in free air only yielded about 6 candles. So that an increase of 50 per cent. in illuminating power is secured without additional expense. As soon as the appliance is heated, the flame becomes very steady; and the lamp may even be inclined at a considerable angle without detriment to the shape of the flame.

The lamp shown (partly in section) in fig. 2—the "Ezmos"—is not a new one; having been designed about six years ago. Though unknown in this country, it has met with a certain amount of success in Belgium; and has lately gained distinction by carrying off the highest award at the Brussels International Exhibition. Our purpose here being merely to acquaint our readers with the construction of the lamp, we shall not discuss its merits as compared with the other regenerative burners with which it competed. At the same time it may be pointed out that the extraordinary name given to the lamp is simply that of the projector and chief of the Executive Committee of the exhibition—M. Somzée—concealed under the very thin disguise of the simplest form of anagram; and in view of this fact, it is not unnatural to suppose that its performances were regarded with a certain amount of prepossession in its favour. However this may have been, the lamp took the prize. The appliance differs from its fellows mainly in the arrangements for effecting the combustion of the gas. Efficient combustion may be said to be between the two extremes of a red and smoky flame, and that condition of complete combustion which is accompanied by considerable heat. While most of the regenerative burners fail to hit the "happy medium" in this respect, the designer of the appliance under notice flatters himself that he has succeeded. He claims that, unlike other lamps of this type, the "Ezmos" is able to accommodate itself to surrounding conditions; and therefore its action is undisturbed by exterior influences. The supply of air enters the lamp in one direction only, and this has the effect of giving steadiness to the flame—an important feature in a high-power burner. An additional advantage claimed for the lamp is that it is of simple construction, and that its form favours the employment of enamelled iron, which, by resisting the action of high temperatures, prevents loss of heat, and thus facilitates regular combustion. The lamp is composed essentially of a recuperator R, against which the products of combustion strike passing into the chimney C, and which terminates in a cylindrical tube D. Upon the recuperator is fixed a plate of enamelled iron H, forming a reflector, and having around its outer edge a number of small holes O, whereby the supply of air is admitted into the lamp. The casing E, which forms a portion of the chimney, stands directly upon the plate H, being sustained by the support N, the purpose of which is to deflect the current of hot air passing into the chimney. The gas arrives by the pipe T, which is in two sections, united by the junction-piece M. The upper part of this pipe is open, as shown; and the lower ends in the burner B. The curved piece of metal projecting from the cylinder D serves to give the flame the shape shown at F in the illustration; and, by radiating a certain amount of heat, stimulates into action the entire surface of the flame. The globe G, fixed upon the outer rim of the lamp K, is sufficiently large to afford ample space beneath the flame to ensure perfect combustion.

THE LAYING OF LARGE MAINS.—This was the title of a paper read at the meeting of the Liverpool Engineering Society last week by Mr. R. S. Wyld, M. Inst. C.E. The author, after referring to the ancient aqueducts, stated that the power to construct iron to the different materials of which a main might be constructed; pipes had only been obtained within the past century. He alluded and adduced arguments in favour of cast iron—stating that the larger the main the more water was delivered relatively to the weight of the iron employed. He referred to various means of transit over rough ground, and appliances for laying large pipes in the trenches. The necessity for sluice drains in every hollow, and an air-cock at every summit, was dilated on; preference being expressed for a simple hand air-cock, with an additional aperture always open, permitting a slight leak, but preventing any accumulation of air. Drawings of some of the works on the Vyrnwy aqueduct were shown (by permission of the Engineer, Mr. G. F. Deacon, M. Inst. C.E.), to illustrate the manner in which such obstructions as rivers, railways, and canals were overcome.

THE KING OF THE BELGIANS' "PURE DRINKING WATER" PRIZE.—Further particulars are to hand of the conditions under which the next award will be made of the prize of 25,000 frs., which it will be remembered that the King of the Belgians founded in 1874 for eminent services rendered to science. The prize for 1893 is to be for the best solution of the question how large cities are to be most efficiently provided with abundant supplies of pure drinking water. In solving this question, the local conditions of Brussels are to be dealt with in the first place; but probable increases in urban populations generally are also to be taken into consideration. Works already in print will be admitted to the competition only if the new editions contain important changes and additions which, like the other prize essays, have been published during 1889 to 1892—the period fixed for the competition. The prize essays may be in Dutch, German, English, French, Italian, or Spanish, and must be sent in by Jan. 1, 1893, to the Belgian Ministry of Agriculture, Industry, and Public Works. The jury (to be appointed by the King of the Belgians) is to consist of three Belgians and four representatives of other nations.

Register of Patents.

ENRICHING AND BURNING ILLUMINATING GAS.—Porter, G., of Callum Street, London. No. 15,670; Nov. 15, 1887. [11d.]

This invention relates to gas-fittings furnished with means for enriching the gas in its passage to the burner; and it has for its main object to so construct and arrange the enriching or carburetting apparatus that it can be easily taken to pieces for the removal of the interior—for the purpose of cleaning or removing the accumulation or deposit which always takes place in carburetting apparatus. The tube conveying the gas from the supply-pipe to the vessel or receiver containing the carburetting material, and also the tube which passes the enriched or carburetted gas from the receiver to the burner, is arranged within a tube; all or some of the tubes being fitted in bodies screwed into the centre of the carburetting vessel, so that by unscrewing the bodies the tubes are removed for cleaning or for other purposes. The conductor is formed with perforations; a second or twin conductor being placed over the perforated conductor, whereby a great amount of heat from the burner is directed to the material in the carburetting vessel. In the case of pendent lights, it is sometimes advantageous to employ only the tube or tubes for conveying the gas into the carburetting vessel; the carburetted gas passing to the burners through the space between the supply-tubes and the outer tube forming the fitting. In this arrangement legs or rods are employed, which extend from the fitting into the carburetting vessel, to serve as conductors for the more equal distribution of the heat through the carburetting material. In the case of regenerative gas-lamps, the receiver or carburetting vessel is arranged around or above the chimney, which forms the conductor for heating the carburetting material. A pipe conveys the gas from the supply-cock into the carburetting vessel; the enriched gas passing from the vessel through a pipe opening into the central gas-supply pipe.

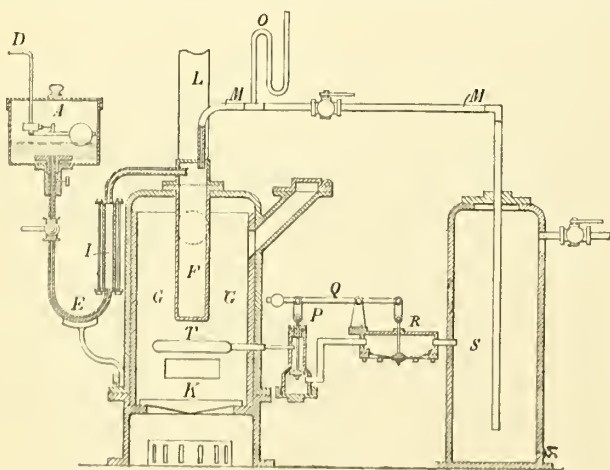
[A large number of illustrations of various forms of lamps constructed according to this patent accompany the specification.]

INJECTING LIQUIDS INTO GAS-RETORTS.—Good, R., of Carshalton. No. 16,866; Dec. 7, 1887. [8d.]

By this invention, to introduce liquids, such as crude petroleum or shale oil, into a hot gas-retort, the patentee employs a syringe or single-acting force-pump. The nozzle of the syringe or pump is provided with an india-rubber surface, which, when pressed against a cock in the retort-lid, forms a tight joint. The mouth of the cock is made to a knife edge, so as to form a tight joint on the surface; and the piston of the pump is provided with an india-rubber surface, which at the end of the stroke comes against a ring inside the barrel surrounding the opening to the nozzle. The pump is filled with the liquid it is desired to inject into the retort; and its nozzle is pressed against the cock in the retort-lid. The cock is then opened, and the liquid forced in. At the end of the stroke of the pump, the surface on the piston comes against the ring surrounding the nozzle, and makes a tight joint, so as to prevent any back flow until the cock is shut and the pump can be removed.

AUTOMATICALLY GENERATING GAS FROM LIQUID FUEL.—Brotherhood, C., of Redland, Bristol. No. 1315; Jan. 28, 1888. [8d.]

This invention consists in apparatus constructed and arranged for the production, in an automatic manner, of gas from oil and other liquid fuel.

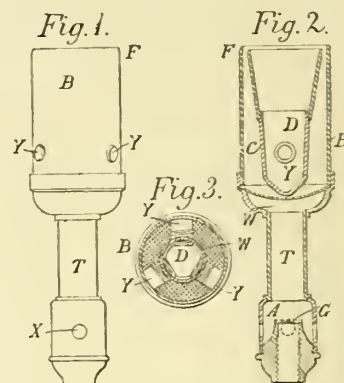


The oil for conversion into gas is supplied from a reservoir A situated at such a height as to afford a suitable head for the flow therefrom of oil to the retort, and also to afford the required pressure of gas, by means of an adjustable stuffing-box and set screw below it. Or the cistern may be fixed, and a ball-cock employed governing the flow of oil through the pipe D. By the syphon E the reservoir communicates with the retort F contained within the heating chamber G. The pipe is fitted with a cock and with a "sight-feed" appliance I for observing the flow of oil to the retort. The heating of the retort is effected either by combustion of solid fuel placed on the fire-bars K or by gaseous fuel in combustion supplied to a perforated burner T; but when solid fuel is employed, the burner is withdrawn. The products of combustion escape preferably by two chimneys L, situated at the opposite side of G. The gas generated in the retort passes out through the outlet-pipe M, by which it is conducted (either directly or through a receiver or collector) to the point of consumption. The pipe M is fitted with a safety-valve O, consisting merely of a syphon tube containing mercury. If, while the stopcock of the outlet-pipe is closed, oil be admitted to the retort and subjected therein to the action of the fire, the pressure of the gas generated will, in due time, reach a point at which the column of oil is balanced, and the flow of oil to the retort thereby suspended; but on opening the cock, the gas escapes, and the equilibrium, of course,

is destroyed. The oil then resumes its flow to the retort, and the production of gas is continued. Towards the lower end of the spindle P is a valve having an orifice extending through it. The spindle is connected at the upper end to the lever Q, towards one end thereof. At that end of the lever is a balance-weight; while at the other end it is connected to the spindle R extended into a chamber, and attached at the lower end to a flexible gas-tight web or diaphragm secured to the underside of the chamber. The chamber communicates with the receiver S, to which gas is supplied by the pipe M. As the pressure in the chamber R varies with the demand made upon the gas, the web or diaphragm is acted upon accordingly; and the valve is opened or closed through the medium of the counterweighted lever Q—the arrangement being such that a reduction in pressure in the diaphragm chamber causes a corresponding opening of the valve in P, and affords an increased supply of gas to the burner.

BUNSEN GAS-BURNERS.—Imray, O.; communicated from C. Auer von Welsbach, of Vienna. No. 5722; April 17, 1888. [6d.]

This invention relates to the construction of a Bunsen burner in such a manner as to produce a circular flame with internal as well as external air supply.



The gas, entering at the bottom, passes vertically through several small holes in a thin plate G into a cavity A, into which air enters through lateral apertures X. From the cavity the gas and air ascend a tube T, which expands at its upper end to a diameter equal to that of the desired flame. The expansion is covered by wire gauze W, which serves to mix the gas and air, and distribute the mixture uniformly through the enlarged part B of the tube. The mixture then ascends an annular passage C formed between the external tube B and an internal tube or thimble D, which is closed at its lower end, and tapers to a larger diameter at its upper end. To the lower part of the thimble there lead several inlets Y for air from outside the outer tube B; these inlets being formed by short tubes crossing the annular passage C. At F (the upper end of the tubes) the mixture of gas and air issues from the annular mouth between them; and this mixture being ignited forms a circular flame, which receives air not only from the outside, but also from the interior of the thimble D, to which the air is admitted by the inlets Y. The upper part of the tube B and of the thimble D may be of metal, as shown. It is generally, however, preferable (says the patentee) to make the parts which are next the flame of steatite or such like material.

APPLICATIONS FOR LETTERS PATENT.

- 15,652.—BROWN, B., "Improvements in gasholders." Oct. 31.
- 15,655.—WALKER, W. T., "Desulphurizing the lime used in gas purifiers, and recovering the sulphur therefrom." Oct. 30.
- 15,727.—RUSCOE, J., "Improvements in machinery for drilling and tapping, and inserting ferrule taps and plugs in gas and water mains, and fixing saddle backs on mains." Nov. 1.
- 15,735.—BEARDMORE, J., "Improvements in or relating to the gas and air flues of regenerative gas-furnaces." Nov. 1.
- 15,770.—BEARDMORE, J., "Improvements in the reversing and regulating valves of regenerative gas-furnaces for steel melting and other analogous purposes." Nov. 1.
- 15,840.—BOULT, A. J., "Improvements in or relating to gas motors." A communication from E. Capitaine. Nov. 2.
- 15,841.—BOULT, A. J., "Improvements in or relating to igniting apparatus for gas motors." A communication from E. Capitaine. Nov. 2.
- 15,845.—BOULT, A. J., "Improvements in gas motors." A communication from E. Capitaine. Nov. 2.
- 15,846.—BOULT, A. J., "An improved friction clutch or coupling specially applicable to gas motors." A communication from E. Capitaine. Nov. 2.
- 15,886.—LAYCOCK, J., "Improvements in wet gas-meters for automatically cutting off the supply when a certain quantity has been burnt." Nov. 3.
- 15,983.—LOOMIS, B., "Improved process of and apparatus for manufacturing heating or fuel gas." Nov. 5.
- 16,025.—BUNTING, S., "Improvements in automatic measuring supply and delivery of air, gas, electricity, and like force, also liquids, by the introduction of a coin or any given weight." Nov. 6.
- 16,064.—COSGREAVE, J., and MOREY, L., "An improved vent and shut-off apparatus for shutting off water from supply-pipes, and for preventing sediment and other impurities flowing from a cistern into the service-pipe." Nov. 6.
- 16,073.—WALKER, G. A., "Improvements of gas-burners." Nov. 6.
- 16,179.—CARR, I., "Improvements in or connected with the manufacture of illuminating gas." Nov. 8.
- 16,183.—SIMON, R., "An improvement in or connected with gas-engines." Nov. 8.
- 16,184.—DARWIN, S. B., "Improvements in apparatus for, and in the method of using materials for the manufacture of illuminating gas." Nov. 8.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

THE IMPERIAL CONTINENTAL GAS ASSOCIATION.

SIR,—The Directors of the Imperial Continental Gas Association, alone (so far as my observation extends) among joint-stock companies, do not send to the shareholders any balance-sheet or report of any kind. All that the shareholders get is a circular, in similar terms to the advertisement which appears to-day, containing the resolutions that a dividend at the rate of 10 per cent. be declared, and that a vote of thanks be given to the Directors and officers. The Chairman no doubt makes a statement at the meeting, giving much interesting information; but, as there must be many hundred shareholders who, like myself, are unable to be present at the meeting, it would be, I should think, a great satisfaction to them to have a report and balance-sheet from which they might see for themselves how their undertaking is progressing. It would certainly be a satisfaction to

Nov. 7, 1888.

A SHAREHOLDER.

[It may be pointed out to our correspondent that the Chairman of the Association has frequently explained at the meetings, in answer to shareholders, that there is a special reason for the non-publication of the particulars mentioned.—ED. J.G.L.]

WATER BY MEASURE.

SIR,—“Meter” has courteously responded to my inquiry in the JOURNAL for the 30th ult., by informing you (*ante*, p. 807) that he is “acquainted with three ‘low-pressure’ water-meters—viz., Parkinson’s, Cowan’s, and the Bascule.” But, as he is still “entirely opposed to a supply of water by meter for domestic purposes,” I may assume that his opposition is based on sanitary and financial reasons rather than on considerations arising out of the merits, or the defects, of any particular meter or class of meter. And yet his references to the notorious defects of most water-meters in common use are indications that he is not wholly uninfluenced by these considerations, and that if a meter free from these defects were forthcoming, he might be induced to reconsider his attitude, and to view the question somewhat differently.

“Meter” says he has found it necessary to be “constantly repairing” water-meters. But he will, in fairness, admit that it is at least possible that there may be meters which it is not necessary to be “constantly repairing;” and, further, that although “Meter” may, in his extended experience, have become “acquainted” with such meters, he may not have had the opportunity of using them, and, therefore, have had no experience regarding them. In like manner, “Meter” may have used only, or chiefly, “high-pressure” meters, which are costly to purchase and expensive and troublesome to keep in repair, and which require repairing very often. He may have had little or no chance of using meters on the “low-pressure” principle, in which these objectionable features are absent. In addition, therefore, to his being “entirely opposed to a supply of water by meter for domestic purposes,” your correspondent adduces objections to such a supply which might conceivably be overcome if the fundamental difficulty could only be removed. For the question is not whether most water-meters are costly to buy and to keep in repair, but rather whether any water-meter is obtainable which, being neither expensive nor likely to go wrong, will do what it has not hitherto been found possible to do satisfactorily and cheaply.

That “low-pressure” meters are, and that “high-pressure” meters are not suited for domestic water measurement is what I am prepared to maintain; and if “Meter” would forget—for the moment, at least—his initial objection to all meter systems, I might hope to convince him of this. Common premisses being necessary, I may fairly ask him to admit that “high-pressure” meters are, generally, incapable of measuring all the water which a cistern ball-valve may pass. Then, taking this for granted, I would ask him, “Why should water be measured at a distance from the cistern, and thereby more or less of it be allowed to pass from the ball-valve unregistered, when, by placing the meter at the cistern, you can measure with perfect accuracy all that passes?”

Your correspondent asks me to explain why a low-pressure meter “ought to be used and fixed over a cistern.” But, as he is “acquainted with three low-pressure meters,” he should be able to answer this question without my assistance. And in regard to his further question, “Why is such a meter and position superior to the present class of meters and methods of fixing?” I think I have already indicated the grounds of the superiority. I am not sure that I agree with him in calling the “new fad demanded by the medical profession, of connecting the drinking-water tap direct from the main,” a “fad;” but, whether it be so or not, the demand could be practically complied with by such a low-pressure meter as I have in view. It is otherwise in the case of “garden supply,” which must be “delivered under pressure.” But ought the fact that *this* “would require another class of meter” to be urged against the use of meters which are the best suited for the measurement of water into cisterns, whether for domestic or for other purposes?

“Meter” says it is “necessary to read water-meters once a month;” and he contends that this would be inconvenient in the case of meters “placed in the roof” of houses. It is not worth while arguing the question of convenience; but I may ask, Why should water-meters be read once a month? Is it not because the meters at present in use are so frequently going wrong that a monthly visit to them is considered necessary? But, though such a necessity may exist in the case of the high-pressure meters used by your correspondent, it would be absent in the case of such meters as I have in view.

Nov. 9, 1888.

TRUE MEASURE.

REDUCTIONS IN PRICE.—The Directors of the *Alresford Gas Company* have decided to reduce the price of gas from 5s. 10d. to 5s. per 1000 cubic feet.—The *Hindley Local Board* adopted last Thursday a joint recommendation of the Gas Committee and the Finance Committee that the price of gas should be reduced on and after Dec. 26 next to 3s. 4d. per 1000 cubic feet, with an allowance of 20 per cent. to large, and 10 per cent. to small consumers, providing the accounts are paid within a month from the end of the quarter. This will leave the net cost of the gas 2s. 8d. to large, and 3s. to small consumers.

Legal Intelligence.

HIGH COURT OF JUSTICE.—CHANCERY DIVISION.

SATURDAY, NOV. 10.

(Before Mr. Justice KAY.)

In re THE PATENT ARGAND GAS AND OIL BURNERS COMPANY, LIMITED.

This was a petition presented by Mr. A. A. Lister, Gas Engineer, of Birmingham, who claimed to be a creditor for £234 16s. 6d., asking for a compulsory winding-up order. The Company was formed to acquire certain inventions for improvements in oil and gas burners, and generally to carry on the business of gas-fitters. The nominal capital was £25,000, in 10,000 shares of £2 10s. each, of which only 362 had been issued. The petitioner was formerly in the employ of the Company, and the debt was for salary, expenses, &c. The debt was not disputed.

Mr. MARTEN, Q.C., who appeared for the petitioner, said the insolvency of the Company was admitted. An extraordinary resolution had been passed for voluntary winding up and the appointment of a liquidator. A compulsory order was asked for by the petition; but he should be content with a supervision order.

Mr. KERLY, on behalf of the Company, submitted that the petition ought to be dismissed with costs, as it had been presented after notice of the voluntary winding up. The petitioner commenced an action for the recovery of his debt, and the Company entered an appearance to the action. The petitioner was informed that the resolution to wind up voluntarily had been passed, and that an independent person had been appointed as liquidator; and he was urged, in the interest of creditors, not to go on with the action. To this he replied that it was not his intention to proceed, but he had issued a petition. Under these circumstances, he (the learned Counsel) submitted that the petitioner had acted with extreme precipitation; and as the majority of the creditors were adverse to a compulsory order, the petition ought to be dismissed.

Mr. MILLAR, Q.C., on behalf of thirteen creditors, whose debts amounted in the aggregate to £3413 2s. 7d. out of a total indebtedness of £4559, objected to a compulsory order being made.

Mr. LEVETT, who appeared for a judgment creditor for £26, asked for a supervision order.

Justice KAY said that as the majority of the creditors objected to a compulsory order, the Court was bound to have regard to their wishes, especially as the petition alleged that the Company was insolvent. As the whole of the property belonged to the creditors, the Court would regard their wishes. He greatly disapproved of what had been done, considering that the petitioner should have stated in his petition that the Company was in course of voluntary liquidation. The petition would be refused, with costs.

HIGH COURT OF JUSTICE.—QUEEN'S BENCH DIVISION.

MONDAY, OCT. 29.

(Before Baron Pollock and Mr. Justice MANISTY.)

CUTLER AND SONS v. KLONNE.

This was a motion on behalf of the plaintiffs in the action, which had been sent to the Official Referee (Mr. Ridley) to dispose of. The Referee had found that sums amounting to £764, £172 0s. 8d., and £76 1s. 5d. (being, in fact, the whole of the plaintiffs' claim, with some slight deductions) were due from the defendant; these being sums claimed under a contract by which the plaintiffs had undertaken to supply and erect a gas-holder at Leyden for the defendant, who was the contractor for the erection of large gas-works for the Corporation of that city. On the other hand, the defendant had a counterclaim for £1025 for penalties, and also for a sum of £217 12s. in respect of payment made by him by direction of the plaintiffs. The Referee had allowed the latter claim, with the exception of £10; but rejected altogether the claim for penalties. He had given the plaintiffs their costs, with the exception of the costs of the counterclaim, as to which he said the defendant was entitled to costs.

Mr. HOUGHTON, who appeared for the plaintiffs, said the entire question was whether the words which the Referee had used really carried out his intention. It appeared to his clients that the finding as it stood would give the defendant the whole costs of the counterclaim, including the portion on which he had failed, which was the substantial question in dispute, and involved great expense in sending expert witnesses to Holland. The real question in the action was whether the delay which undoubtedly took place was due to the action of the plaintiffs or defendant; the plaintiffs' contention being that it was caused first by the defendant not giving them possession of the foundations at the proper time; and, secondly, by his having turned water into the tank too soon, and so caused it to bulge, which necessitated much of the work being done over again.

After some discussion, it was arranged that the Referee should state to the Court the view he had really taken as to the costs, in order to see whether any verbal alterations were required; and the matter was accordingly adjourned for that purpose.

Mr. SPOKES appeared for the defendant, who had presented a cross-motion of appeal, which was abandoned at the bar.

WEDNESDAY, NOV. 7.

To-day, the Official Referee was in attendance, and was asked by the Court, with the consent of the parties, to state his view of how the costs should be dealt with.

Mr. RIDLEY said the counterclaim was divisible into two parts—the most important one being the claim for penalties, and the less important one the claim for work done. Upon the latter claim the defendant succeeded, but failed upon the first. In finding as he had done, he did not intend that the defendant should get the costs of that part of the counterclaim on which he had failed; in fact, it was not present to his mind at the moment that there would be so important a difference with respect to the costs; and he found generally for the counterclaim, because, as the defendant had succeeded on one portion, he (Mr. Ridley) considered there was a right to put the counterclaim on the record. It was not present to his mind that he was finding that the defendant was entitled to the costs of the issue on which he had failed. It would more clearly have expressed his view if he had said that the defendant should have the costs of the issue on the counterclaim on which he had succeeded.

Their Lordships directed that the matter should go back to the Official Referee, in order that he might amend his finding.

BAHIA GAS COMPANY, LIMITED.—The accounts of this Company for the half year ending June 30 last, to be presented at the meeting of shareholders on the 22nd inst., show that the receipts during the six months amounted to £20,155, and the expenditure to £11,949—leaving a balance of £8205. After placing £1000 to the reserve fund, a profit remains of £7205, which, added to the balance brought forward from the last accounts, makes the sum of £8196. The Directors recommend the usual dividends on the preference shares; and a dividend at the rate of 10 per cent. per annum (free of income-tax) on the ordinary shares, which will absorb £7250, and leave a balance of £946 to carry forward.

Miscellaneous News.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Half-Yearly General Meeting of this Association was held last Tuesday, at the Cannon Street Hotel—Sir JULIAN GOLDSMID, Bart., M.P., in the chair.

The SECRETARY (Mr. R. S. Gardiner) read the notice convening the meeting, and also the following report of the Directors:—

The present half-yearly ordinary general meeting of the proprietors has been convened in conformity with the Association's Acts of Parliament for the purpose of receiving a report from the Directors upon the affairs of the Company, and of declaring a dividend for the half year ended June 30, 1888.

The following summary shows the results of the Association's operations during that period:—

	Cubic Feet.
The quantity of gas made in the half year ended June 30 last was	3,673,000,000
The quantity made in the corresponding half year of 1887 was	3,670,000,000
Being an increase of	3,000,000

Or at the rate of 0·07 per cent.; but in the corresponding half year of 1887, the Association's former works at Rotterdam and Delfshaven were still in action, and produced 131 million cubic feet.

The quantity of gas sold in the half year under consideration was 3397 million cubic feet—an increase of 51 millions, or at the rate of 1·52 per cent.

The total number of lights on June 30 last amounted to 1,713,121; there being at that date 123,186 consumers on the books of the Association. At the close of the corresponding half year of 1887, the number of lights was 1,678,554. These figures give an increase of 34,567, or at the rate of 2·06 per cent.

The entire length of mains laid on June 30 last was 1339 miles. The length of mains laid on June 30, 1887, was 1461 miles; showing a decrease of 22 miles, which is due to the closing of the works at Rotterdam and Delfshaven, which on June 30, 1887, served together a system of mains 59 miles 203 yards in length.

A comparison of the cost of the coal employed during the half year with that of the coal used in the corresponding period of 1887, exhibits a decrease of 311d. per ton.

There was a slight decrease in the value of coke; but there was a further recovery in that of tar, and the revenue derived from the sale or treatment of ammoniacal liquor also exhibited improvement.

Notwithstanding the loss of the Rotterdam and Delfshaven stations, there was a slight increase both in the rental and in the profit of the half year under review.

The plant and mains at all the stations were maintained in a due state of efficiency. The extensions on the Association's Gitschinerstrasse works at Berlin made further progress, and land was purchased for the extension of the Association's Schoeneberg works at the same station, which has also become necessary. A piece of land was purchased at Schonweide, in the neighbourhood of Berlin, upon which apparatus will be erected for the treatment of the whole of the Ammoniacal Liquor produced on the Association's works at Berlin.

The contract with the Municipality of Aix-la-Chapelle was extended for a period of two and a half years; and an exclusive privilege of the gas supply was obtained for the 21 years which the concession has now to run.

The contract with the Municipality of Hanover was extended for a period of 25 years; and a similar privilege obtained for the remaining 37 years of that concession.

An arrangement was entered into with the Municipality of Antwerp, by which the private consumers have been conceded an important reduction in price, and the onerous conditions upon which the public lighting is supplied have been slightly improved.

The Association's contract with the Commune of Bockenheim—a suburb of Frankfurt—has been extended for a term of 30 years.

Advantage was taken of opportunities which arose of purchasing a small plot of land adjoining the Association's Erberg works at Vienna, and a house adjoining the Association's Central Electric Lighting Station there.

A small property which adjoined the Association's works at Hanover was also purchased.

The Directors desire, in conclusion, to draw the attention of the proprietors to the accounts for the half year ended the 30th of June last. These have been duly audited; and, from them, the Directors have, in accordance with the provisions of the Companies' Clauses Consolidation Act, prepared a scheme showing the profit of the Association for the half year, and the portion thereof applicable for the purposes of dividend, which they recommend now to be declared—viz., a dividend of 5 per cent. for the half year ended June 30 last, payable free of income-tax, on and after the 1st day of December next.

The CHAIRMAN: I have to move that the report be adopted; and perhaps, as far as we are concerned, it might be sufficient if I were simply to do that, because the course of our business has been singularly even, steady, and satisfactory during the six months now under review. Several of us in the course of last winter were abroad upon the business of the Association; and I think every possible attention has been given to it by the Directors, the Agents, and the Engineers, who are all interested in the Association. I can honestly and fairly say that I believe it is in as flourishing and satisfactory a condition as that of any gas company of which I have any knowledge in this country or out of it. We have been fortunate in extending contracts, and in improving our position in several of the towns with which we are connected from a business point of view. Of course, our great desire always is, where we have not a perpetual right, to extend our contracts for as great a length of time as we possibly can. I am afraid that people abroad are rather bitten with the idea which prevails among so many people at home—that corporations can manage gas-works better than companies. Recent scandals, however, of which many of us have read and heard in this country have shown that it is not always the most satisfactory method that can be pursued on behalf of the public, and may, I think, lead some people to pause before they endeavour to push forward this method of absorbing so many important businesses in municipal hands. My opinion is that all municipal bodies can much better look after the serious matters of government with which they have to deal, and leave trading to traders who are accustomed to it, who understand it, and who, when they are looking after their own interests, also consider the interests of the public. As far as our business is concerned, you will see there is a steady improvement, to which I have referred on previous occasions; and I think this improvement is likely to continue, because you will all have noted the more satisfactory condition of trade not only in England, but throughout Europe. The result, of course, is that business men, who were formerly careful of every halfpenny, are obliged to keep their offices and works open longer, and so use more gas; and this, I trust, will improve our business. On the whole, as far as I know, as I said just now, the condition of our business is as satisfactory as you could desire it; and I think there is nothing to be said on the other side of the picture. The only matter to which perhaps I should refer, though it happened since these accounts closed, is that, as many of you are aware, we have completed the electric light installation at the Burg Theatre in Vienna, which is the great new theatre that was opened the other day by the Emperor, about which you have read in the newspapers. We have been complimented on our success by both the Government and the scientific authorities in Vienna. Practically, therefore, you may say that the electric lighting arrangements there are completed; and I believe they give the utmost satisfaction, and do credit to the engineers who have carried them out. This matter, which created a great deal of excitement some months ago, but which has now settled down into the ordinary course of the business, will no longer attract an undue share of attention, because, though eminently successful, it is, as I have said at

previous meetings, a business which we entered into for reasons peculiar to the city of Vienna, and one which was necessary, in order to maintain our position there. Having said so much, I do not think it is essential for me to refer to anything else as to the business in the past half year. I have always, however, made it a practice to say something about any point that may have occurred concerning our affairs since the date of closing the accounts; and to-day I would especially do so, as we have to deplore the loss of several most valuable members of this Association. Only the other day, one of our Auditors, Mr. T. Rowland Hill, after having audited the accounts with his usual care and attention, in conjunction with Mr. Sebag Montefiore, went down to his home at Tunbridge Wells; and within a few days was no more. Though only an Auditor for four or five years, we appreciated his honesty, his straightforwardness, and his desire to promote the interests of the Association. As his death was so recent, I would advise the proprietors not to fill up the vacancy to-day, seeing that a chance has not been given to those who wish to have the opportunity of offering themselves. I would, therefore, advise you to elect a new Auditor on the next occasion, and would suggest that any gentleman who desires to be a candidate should send in his name to the Secretary, in order that due announcement may be made with regard to it. This is eminently a shareholder's post; and therefore I venture to make this suggestion, and I think you will appreciate the spirit in which I do it. Then I have to refer to the death of men long connected with our Association, and who have done us great service for a long time. In the first place, I would refer to one of our late Engineers, Mr. Miltner, who was head of our engineering staff at Amsterdam for many years, and who showed much zeal in the service in which he had grown up, and to which his heart was devoted. In the second place, I would refer to a younger man—Mr. Pazzani—who was also at Amsterdam, and previously at Vienna, and who showed signal energy and ability in the service of the Association. He was taken away from us a few days ago at the age of 47, in the prime of life, and in the fulness of his energy and ability; and I cannot too strongly express the regret we all feel at his premature loss. Well, gentlemen, after all I am happy to say, though we grieve over the departure of men who have done such good service, and to whom many of us were sincerely attached, that we have still able officers well capable of fulfilling any duties that may devolve on them in consequence of their having to replace men who have gone before; and I certainly believe that our service will not suffer, though we have these losses to deplore. Perhaps there is only one other matter I need refer to. I have alluded to the opening of the Burg Theatre on Oct. 14, which was after the closing of this report. I may tell you that we have maintained at Vienna for many years that, whether or not we undertook the public lighting, we had a right, under the Imperial authority which was given to us, to continue for all time to light any private person from the streets of Vienna. Now that proposition has sometimes been disputed; but I think the dispute has never been seriously entertained, because I believe the best Austrian lawyers saw that it would be impossible to do so. But the town authorities some three years ago thought they would try it, and initiated proceedings which involved the discussion of our right to continue permanently to furnish light to the inhabitants of Vienna, even though we did not undertake the public lighting. Our legal advisers—and they were the very best that could be had—told us that, certain as they were our case was an excellent one, they were not always certain that in the lowest courts the decision would be absolutely satisfactory to us, and consequently you can understand how pleased they were the other day when the matter came before the first tribunal for decision, which was absolutely upon every point in favour of the contention we had always held. The matter may no doubt be re-heard on appeal; but I and all those who advise us have no fear as to the result, which, if anything, will tend to strengthen the position we occupy in this most important capital. I may say that, when I was in Vienna last December, I was satisfied, not only that our service was good, but also that our able Engineer, Mr. H. Drory, was prepared to meet every reasonable requirement of the public; and I think we may say that the city is a model to many other cities in different parts of Europe. That is the position of affairs now. I have nothing further to add, except that I am ready to answer any question which may be put to me as far as the interests of the Company will allow it; and I have now to ask you to adopt the report which has been read by the Secretary.

Mr. Wood seconded the resolution.

Mr. GROVER complimented the Chairman and Directors on the very satisfactory report which had been presented to the proprietors. Having regard to the loss of such an important station as Rotterdam and Delfshaven, he considered that the increase of 1·52 per cent. in the quantity of gas sold in the half year was fairly satisfactory. He thought, however, that it was hardly possible for anyone who had shares in gas companies to help feeling that considerable progress was being made at the present time in electric lighting, not only on the Continent but in London. The matter was brought forcibly to his notice a few days ago at his club, where they happened to have some members of the St. Stephen's Club, who had lately decided on expending over £1000 in placing the electric light in their building. At his (the speaker's) club, instead of putting in the electric light, they had improved the gas supply; and some of the members of the Committee of St. Stephen's Club said that if they had only known what could be done with gas, they would not have gone to the expense of installing the electric light. He frequently found that this was the case—that people really did not know what could be accomplished with gas, and what he suggested was that some members of the Board, possibly assisted by some shareholder who had the matter at heart, should endeavour to try and find out some method of popularizing gas by showing the public in the towns which they lighted what gas was able to do in the way of illumination. In most houses bad burners were used; and this caused people to say that it would be a good thing when the electric light did supersede gas. Could not the Directors, he asked, appoint a small Committee, with power, if thought advisable, to offer a reward for the best form of lighting by gas? By doing this, he believed much would be done to popularize the use of gas. No doubt gas companies paid good dividends; but he thought they did not in all respects march with the times.

The CHAIRMAN: If no other shareholder has anything to say, I will reply to Mr. Grover's remarks. We have for years past abroad, where the conditions somewhat differ from what they are in England, done our best to popularize gas. We have, in towns where we considered it would be useful, opened show-rooms of appliances of any value, which are exhibited by our representatives to manufacturers and others; and we have canvassers going about explaining the advantages of gas lighting and all those things which Mr. Grover and we know so well, but which, he says, the public is not so conversant with. We take every possible step we can in this way to increase the business of the Association. In fact, it has never been our practice to adopt the motto of which we have heard in political life—"Rest and be thankful." We are always thankful, but never restful. We are ever endeavouring to increase the volume of our business by every means in our power; and I can assure Mr. Grover and the shareholders that nothing will be wanting in future, as nothing has been wanting in

the past, in our endeavours in this direction. There is, as you know, to be an exhibition in Paris next year; and the gas department of the Exhibition will be an interesting and important one. We are taking our part in it. I think, if Mr. Grover had been aware of all this, he would have said that the Board have not been remiss in these matters, but that, on the contrary, they have done their best to introduce gas among the inhabitants in the towns supplied by the Association.

The motion was carried unanimously.

The CHAIRMAN next proposed the following resolution:—"That a dividend of 5 per cent. for the half year which ended on the 30th of June be now declared on the £3,800,000, stock of this Association; and the same be payable, free of income-tax, on and after Dec. 1 next."

Mr. WOOD seconded the motion, which was unanimously agreed to.

Mr. SEBAG MONTEFIORE proposed a vote of thanks to the Directors, for the careful manner in which they had managed the affairs of the Association during the half year. In doing so, he thanked the Chairman for the kind and graceful way in which he had alluded to the lamented death of his (Mr. Montefiore's) late colleague and co-Auditor, Mr. Hill. He thought the remarks of the Chairman would be very agreeable to the family of the deceased gentleman. He might say that Mr. Hill died almost in the execution of his duty; for, as the Secretary could testify, Mr. Hill was extremely ill on the day on which he audited the accounts. Reverting to his resolution, the speaker said that, having a very large stake in the Company, he had listened, as they all must have done, with great satisfaction to the way in which the Chairman had addressed them regarding the affairs of the Association. He thought all the shareholders might go away from the meeting with increased satisfaction with the position which they had been told by so eminent an authority the Company now occupied.

Mr. A. COOPER seconded the motion, which was carried unanimously.

The CHAIRMAN: I have to thank Mr. Sebag Montefiore for the kind words he has used with respect to myself and the Directors. I can honestly say that, as far as I know, there is no Board every member of which is more prepared to devote what talent and ability he has to the service of his Company than is this Board. I believe that four or five of us have during the last year been on the Continent on the affairs of the Association; and though some of the older ones are not prepared to do this, they are always ready to give us their advice in matters of difficulty or importance that come before us. Nothing encourages us so much as the constant support and confidence which the shareholders show in us; and we are very much obliged to you. I have now to ask you to pass the usual vote of thanks, which is by no means a formality, to our staff abroad, headed by Mr. Drory and Mr. Lindon, and to our staff in London headed by Mr. Gardiner.

Mr. WOOD seconded the motion, observing that he could do so with all sincerity, being acquainted with most of the gentlemen who worked for the Association.

The motion was carried unanimously; and the proceedings then terminated.

BOMBAY GAS COMPANY, LIMITED.

The Half-Yearly General Meeting of this Company was held last Wednesday, at the London Offices, 6, Drapers' Gardens, Throgmorton Avenue—Mr. R. DAVIDSON in the chair.

The SECRETARY (Mr. J. H. Perrins) read the notice convening the meeting, and the Directors' report and accounts for the half year ending June 30 last, which were referred to in the JOURNAL for the 30th ult. (p. 768), were taken as read.

The CHAIRMAN said the accounts spoke very much for themselves; but he would make one or two remarks upon them. The shareholders would see from the report that the revenue from the sale of gas and the rent of meters showed a satisfactory increase of £1102 over the corresponding period of 1887. The receipts from coke, tar, and fittings were also better by £956. The interest account was less, owing to a smaller sum being in Bombay; the money having been remitted to this side by means of bills of exchange. Looking at the debtor side of the profit and loss account, the consumption of coal was 212 tons more (owing to the larger quantity of gas made), which coupled with the fact that higher rates of freight had to be paid, accounted for the increase of £958 in the cost of carbonizing, as compared with the expenditure in the same period of last year. The cost of the coal into the works averaged £1 9s. 5d. per ton, against £1 6s. 10d.—an advance of 2s. 7d. per ton. For many years past the coal had been shipped at a very low price; but it could not be expected that freights would always remain so low, and it would seem probable that in the near future, the coal supplies would stand at an advanced figure. The report also mentioned that on the money brought home during the year there was a loss of £14,974. The rate of exchange was 1s. 4½d.—being the lowest at which the Company had ever had money remitted from Bombay. The declared profits for the year ending June 30 last were £18,960. The shareholders would see that the loss on exchange was equal to 74 per cent. of this amount. He thought there was some little reason for thinking that the money would come home from Bombay during the ensuing year at a slightly better exchange. It was with great regret that the Directors had to announce the resignation, through indisposition, of one of the auditors—Mr. G. A. Northover. He had held the position for the last six years; and the shareholders, he (the Chairman) was sure, would join in the sympathy and regret of the Directors at his enforced retirement. As stated in the report, the Board had elected Mr. E. A. Flinders to fill the vacancy until the next ordinary meeting, when the shareholders would be asked to confirm the appointment. With the exception of the purifiers, the works and plant of the Company were reported to be in good condition at the end of the June half year. Since then four new purifiers, having all the latest improvements, had been sent out, to take the place of the old ones which had been in use since the starting of the Company, and were consequently very antiquated, and almost worn out. The new purifiers would be paid for during the current half year; and this item would therefore appear in the next accounts. In conclusion, he moved the adoption of the report and the statement of accounts.

Mr. W. B. M. LYSLEY seconded the motion.

Mr. BLUNDELL remarked that he did not know that there was much to be said on the shareholders' side of the table. Of course, they all endorsed the observations of the Chairman in regard to Mr. Northover's retirement; and they much regretted the reason which compelled him to resign. He would like to ask what would be the cost of the purifiers that were being sent out. He presumed the Directors would be able to dispose of the old purifiers for some consideration, which would go towards the cost of the new ones.

Mr. HOUGHTON said that he had been a shareholder for nearly 20 years; and he did not find that they had improved very much. The shareholders had always had 7½ per cent. dividend; and he saw that the Company did not make much progress as regards earnings. He had looked over a few of the half-yearly reports; and the money the Company took seemed to increase but very little. Some years ago there was a great scare about the electric light; and much fuss was made in that room, and at other gas

companies' meetings, as to the increased consumption which they would obtain by the use of stoves for cooking and heating. Instead of an advance, however, they seemed to be stationary. The state of exchange, he considered, was rather bogus; and he suggested that they should charge more for the gas in Bombay. They could only judge what the earnings really were by the number of rupees they took; and he would like to know whether the Company had progressed during the past ten years.

Mr. CUFF said, as the Chairman had remarked, the accounts spoke for themselves. On the whole, he thought they were very favourable—especially as regards the bad debts, which he was glad to see, formed so small an item in their accounts. The gentleman who had just spoken alluded to the very slow progress of the Company. He (Mr. Cuff) did not see that they could progress very fast while they were unable to extend their mains. If they were in a position to take in a larger area, then they might expect the receipts to increase faster. However, they were making steady progress. The income was gradually increasing; and if it were not for the wretched exchange, the Board would be able to pay the shareholders a much higher dividend. They seemed now to have settled down, and this loss on exchange was a sort of fixed charge. But, fortunately, the Directors were able to maintain the dividend, notwithstanding this great drawback. There was one question he wished to ask, and that was with reference to the cash in Bombay—whether they reduced this to sterling value when they took it into the accounts. He expressed his regret at Mr. Northover's retirement.

The CHAIRMAN, in reply, said that the loss on exchange was very real; it was not a bogus amount. Ten years ago, in bringing home their money, they lost £2500; while this year the loss amounted to £15,000—and this without having to reduce the dividend. During the year an amount equal to 79 per cent. of the declared profit disappeared in the shape of exchange. The price of gas in Bombay was 6 rupees per 1000 cubic feet. If they were to try to put up the price, the consumption would immediately be seriously affected.

A SHAREHOLDER: Have the earnings in rupees increased in the last ten years?

The CHAIRMAN: Unquestionably, very largely.

Mr. ALFRED PENNY, replying to the inquiry with regard to the purifiers, said that, in a district where there were other gas companies, there were two means of making money out of old purifiers—one was to sell them to another company, and the other to dispose of them for old iron. As there were no other Gas Companies in Bombay, and it would not do to ship the purifiers to England, they had to sell them for old iron, which produced something. Considering the purifiers had been in existence since the formation of the Company, and the consumption of gas had been constantly increasing, it was very remarkable that they had lasted so long. As to the outlay, the new purifiers, including a new roof to cover them, would cost perhaps £1500. The shareholders saw that concurrently with the increase in business there was the diminution in the money received for the rupee. This was their great drawback. He might perhaps say that, supposing the value of the rupee had continued at 2s., they would long before this have been obliged to reduce the price of gas, which they would have been very pleased to have done, to increase the consumption. Owing to the loss they sustained every year, they could not do this. The increase in the business, however, enabled them to keep up the dividend. They obtained a fair profit out of the sale of gas; and the more gas they could sell, the less it would cost to make. But the business did not increase so fast as to beat the enemy they had in this low rate of exchange. They were, however, constantly watching every point to economize the working; and he was very glad that they had succeeded so far—notwithstanding that they lost more money by the remittances to England than they had done in any former year—in keeping up the dividend by the constant increase in business, which had been remarkable in the last three years.

The CHAIRMAN observed that in 1876 the gas sold for private lighting was 20,384,000 cubic feet; and last year it amounted to 32,720,000 feet. This showed their progress; but the loss on exchange came in, and took it away. Replying to one of Mr. Cuff's questions, he said that the cash was brought home to a point every year; and they did not leave money in Bombay. It only remained there for a time to catch the rate of exchange; and as soon as they thought it was favourable, the money came home.

The motion was then carried unanimously.

On the proposition of Mr. R. KING, seconded by Mr. CUFF, a vote of thanks was accorded to the Chairman and Directors, for their attention to the Company's business during the half year.

The CHAIRMAN having replied, the proceedings terminated.

GEORGETOWN (BRITISH GUIANA) GAS COMPANY, LIMITED.

The Ordinary Half-Yearly Meeting of this Company was held last Tuesday, at the London Offices, 30, Gracechurch Street—Mr. ALFRED WILLIAMS in the chair.

The SECRETARY (Mr. Alfred Lass, F.C.A.) read the notice convening the meeting; and it was agreed to take as read the report and accounts, which were summarized in the JOURNAL for the 30th ult. (p. 765).

The CHAIRMAN said that the report and accounts had been sent to all the shareholders; and he would be glad to answer any questions which they chose to put to him in regard to them. To his mind, they were very satisfactory; and he would, without further remark, move—"That the report and accounts be received and adopted, and entered on the minutes."

Mr. C. GANDON seconded the motion, which was at once unanimously agreed to.

The CHAIRMAN then moved the declaration of a dividend for the half year ended June 30 last on the preference share capital at the rate of 8 per cent. per annum; and on the ordinary share capital at the rate of 7 per cent. per annum, both less income-tax (except upon those dividends to which the local shareholders are entitled), payable on Dec. 1 next.

Mr. C. NEWTON seconded the motion, which was carried.

The CHAIRMAN proposed a vote of thanks to the Local Committee in Georgetown, the Secretary (Mr. A. Lass), the Local Secretary (Mr. F. A. Conyers), the Engineer and Manager (Mr. T. B. Younger), the Auditors (Messrs. R. King and C. Newton), and the Solicitor (Mr. E. K. Blyth), for their services during the past half year. He expressed the hope that these gentlemen would continue to merit and receive the thanks of the shareholders at many future half-yearly meetings.

Mr. GANDON seconded the proposal, which was heartily approved.

Mr. R. KING briefly acknowledged the vote on behalf of all mentioned in the resolution.

Mr. BLYTH said they ought to return the compliment by passing a vote of thanks to those who kept the Company such a steady dividend-paying concern.

Mr. KING seconded the motion, and it was agreed to.

The CHAIRMAN, on behalf of himself and his colleagues, thanked the shareholders for their appreciation of the services of the Directors. If they enjoyed health and the confidence of the shareholders, they would do their utmost to keep the Company a "dividend-paying concern."

WEST MIDDLESEX WATER-WORKS COMPANY.

The Half-Yearly General Assembly of the proprietors in this Company was held last Tuesday, at the Offices, 19, Marylebone Road—Sir W. H. WYATT in the chair.

The SECRETARY (Mr. G. B. Hall) read the notice convening the meeting; and the report of the Directors, the chief features of which will be found in the Chairman's remarks in moving its adoption, having been taken as read, he read the report of the Auditors (Messrs. Cumberlege, Mackinnon, and Selby), which stated that the gross rental for the half year ended at Michaelmas last was £109,525; being an increase, as compared with the corresponding period of last year, of £741. The balance to the credit of the dividend and interest account was £134,279.

The CHAIRMAN, in moving the adoption of the report, said he was afraid it would not be in his power to enlighten the proprietors much beyond what they found in the report and the accounts. He would, however, just make a few remarks; and then, if any gentleman wished for further information, the Directors would, as far as they were able, furnish it. In the first place, he was glad to inform them that the new works which were reported upon at their meeting last May were now completed; and they had every reason to hope that the new Worthington engine erected at Molesey would prove a success. It was thought that it would give them greatly increased pumping power, and at a less cost for fuel, than the old ones had ever done before. It would therefore be advantageous in all ways. In the second paragraph of the report, the Directors mentioned that they had bought a piece of land, 4 acres in extent, at Willesden. This ground had cost £1000 an acre, which seemed a high price; and no doubt it was higher than in the ordinary course of things it would be worth. It was, however, just the level which the Company wanted; and they could not get the land for less. They therefore felt bound to acquire it. This would be a large part of the outlay they would make on the reservoir, which would cost possibly £25,000. They would not get any direct return from it—no extra water-rates. But it would enable them to supply the new district with much greater ease and facility; and they thought it best to give the public all the convenience they could. This outlay, therefore, was a serious one; and not only was it serious in the immediate cost, but, unfortunately, the moment they carried out any works of this kind, they were rated at such an extraordinary amount that it entailed on the Company a large annual expenditure. Still, he hoped the proprietors would agree with the Board that it was the best thing for them to do. They were very careful now about spending capital, as they were getting near the end of it. They had only £50,000 left, besides what they had in hand; but they had enough in hand to finish all the works he had mentioned. Still, they had not very much; and they did not wish to go to Parliament for more before they were obliged to do so. Parliament now put such onerous terms on water companies that there was no inducement to apply to it unless they were compelled. He was sorry to say that during the last six months death had been busy among them. They had lost an old and valued Director—Mr. Ware—who had been a member of the Board for 27 years, and who had always done his best for the Company's interests. They had also lost their valued friend and Solicitor Mr. Bailey, who was taken away very suddenly after only a few days' illness; and he (the Chairman) was sure the Directors felt it was only right for him to bear testimony on their behalf to the kindness and care with which Mr. Bailey had always espoused the Company's interests. They very much regretted his removal. Last half year he had to announce a very sad loss for them—the death of their excellent Engineer, Mr. Thomas Hack. They told the proprietors then that they were trying to make arrangements to supply this gentleman's place, and that it was a matter of serious anxiety to them. They had appointed Mr. Matthew W. Hervey, who was for nine years Mr. Hack's assistant; and they had every reason to believe that this would be a very satisfactory appointment. He did not for a moment mean to say that Mr. Hack's death would not be a great loss to the Company, as he had a long and intimate knowledge of their affairs—an advantage which could only be replaced by his successor having a similarly long acquaintance with them. They had associated with Mr. Hervey, as Consultant Engineer, the late Mr. Hack's brother, who was Engineer of the Chelsea Water Company. It was thought by so doing they would have someone else to resort to in case of difficulty; and they had appointed two gentlemen who were in the Company's service to be Assistant Engineers, upon both of whom they could thoroughly rely. He hoped the proprietors would approve and confirm all that the Directors had done in these matters. Then they came to the difficulty as to passing the accounts last time. They still thought they were right in what they did in making the agreement with the Thames Conservators; but Mr. Stonham, the Official Auditor, would not give way, and they had had to go to the cost of a reference. They selected as Arbitrator Sir Henry James, who heard the case on the previous Saturday, but had not yet given his decision. He (the Chairman) could not, of course, say what this would be; but it would not make much difference to the Company. If it was decided that they were not to pay the sum in question, he supposed they would not pay it for some time. But no doubt the Conservators would go to Parliament, and get the Company to pay it; and they did not wish to be released from paying it. On the contrary, they had done everything they could to have the agreement they had entered into, and to which they were bound in honour, confirmed. He concluded by moving—"That the report of the Directors, with the half-yearly accounts, and the report of the Company's Auditors thereon, be severally received, confirmed, and entered on the minutes."

The DEPUTY-CHAIRMAN (Mr. J. Meyer) seconded the motion, which was carried unanimously.

On the motion of the CHAIRMAN, seconded by the DEPUTY-CHAIRMAN, a resolution was passed declaring a dividend for the half year at the rate of 10 per cent. per annum on the consolidated stock.

Votes of thanks were then accorded to the Auditors, for their careful examination of the Company's accounts; as well as to the Directors, for their attention to the affairs of the Company during the half year.

The meeting was then made special for the election of a Director in the place of Mr. Ware.

The SECRETARY read a report of the Directors on the subject, in which they said that notices had been received from Mr. Edward Cumberlege, Mr. Ebenezer Homan, and Mr. Harry Bodkin Poland, three duly qualified proprietors, signifying their intention to be put in nomination for the vacant office. Subsequently Mr. Poland and Mr. Homan withdrew their names, and Mr. Cumberlege was the only proprietor eligible for election.

The Rev. S. P. CUMBERLEGE proposed, and Mr. Homan seconded, a resolution appointing Mr. Cumberlege to the vacant office; and the motion was carried unanimously.

Mr. CUMBERLEGE briefly acknowledged his election; assuring the proprietors that he would use his utmost endeavour to promote the welfare of the Company.

THE PRICE OF COKE.—The demand for gas coke is now growing so rapidly, that some of the northern gas companies who have large sales with cement makers, &c., have advanced their figures. At Stockton the price has been increased to 10s. per ton.

STRIKE AT THE LEITH GAS-WORKS.

The strike of workmen at the Leith Gas-Works, threatened last week, has unfortunately begun. As soon as it was intimated to the Gas Commissioners that this act was contemplated, they issued advertisements warning consumers of their Leith gas that, owing to the conduct of the workmen there, irregularity of supply might possibly arise for a few days. The advertisement continued: "These men demanded certain concessions as to working hours and wages. The Works Committee of the Commissioners, at a meeting on Friday last (the 2nd inst.), agreed to recommend the increase of wages asked for by the retort-house men, and to call a further meeting to consider carefully the claims of the other classes of workmen. This was at once communicated to the men, who, including the retort-house men, have nevertheless banded themselves together, and have given notice that they will leave work on Friday first (9th inst.), unless their demands are immediately conceded. This is intended to concuss the Commissioners into granting demands which they have had no opportunity properly to consider, by the threat of putting a stop to the supply of gas to the public. The Commissioners are resolved to withstand to the utmost such unreasonable and arbitrary conduct, and to dispense with the services of men so acting; and they confidently appeal to the consumers of gas for their forbearance and assistance in meeting any temporary difficulty which may arise." To this the men, speaking through "A Gas Employé," made the following reply through the local press: "In answer to an advertisement in the papers from the Gas Commissioners' Clerk of an entirely misleading character, will you allow me a few lines to correct the glaring misstatements? It says these men demanded certain concessions as to working hours and wages, and that the Works Committee agreed to recommend the increase asked by the retort-men, and that this was at once communicated to the men. But this notice of the rise to the retort-men was not communicated till after they had all given in their notice to drop work at the end of eight days, unless they were put on an equal footing with the Edinburgh men; and after they got the Commissioners' increase on the Friday night, they only continued their agreement with their fellow-workmen to stand by their petition as intimated to the Commissioners. Now what is concussing the Commissioners into granting demands they have had no opportunity properly to consider? It is now about nine weeks since the men petitioned the Commissioners to get their grievances rectified. Surely that was time enough for consideration before the strike was threatened. And the workmen's 'unreasonable and arbitrary conduct,' it seems, is asking to be put on the same footing as the gasmen in Edinburgh, and to get back what was taken off their pay about two years ago." The petition of the retort-men was, they say, to have their wages raised from 6d. to 6½d. per hour. They also state, further, that barrow-men in Leith are paid 23s. 4d. a week of 56 hours, while the Edinburgh men receive 25s. 8d. The men employed on the streets in Leith receive 4d. per hour, and their Edinburgh brethren 5d.; the former working ten hours and the latter nine. At Leith the yardmen get 4d. per hour, while in Edinburgh 5d. is paid; and those employed at the purifiers receive 4d. an hour in Leith and 5½d. in Edinburgh. This statement having been published, an individual Commissioner communicated the following to a press representative on Thursday: "The first petition from the men asking back the reduction that was taken from them two years ago meant a total sum of £395. The Commissioners hold that they offered to give effect to that petition. The second petition, however, requests that all the men should be put on an equality of wage and time with the men in the Edinburgh works. This means something like a sum of £2500 in hours and wages. The Commissioners hold that the men were content to work for the private Company at their present wage, that they ought to have applied to them for an increase, and that there is no change in the circumstances to warrant the demand being made now. Moreover, if they had received the increase, involving £2500, from the private Company, the Commissioners would have had to pay £2500 less of profits to the Company. The Commissioners resolved also to employ workmen from the Edinburgh works as far as possible." The Leith workmen held a meeting last Thursday night, and unanimously resolved to keep to their resolution to strike unless their demands were granted.

On Friday the struggle began. In the forenoon a reporter was informed by the men that that morning the coal-breakers were offered an increase of 3d. per hour on a nine hours' day; and the engine-men a day of eight hours; the question of wages to be considered. These offers were not accepted. At that time the men were confident of success. The workmen, they stated, who had been engaged to succeed them consisted of tailors, joiners, and men of no trade at all, all of whom knew nothing of the labour in gas-works. The men said they had never presented two petitions; that what was called the second petition was merely more detailed information which the Commissioners expressed a desire to have. They repudiated any idea of trying to force the Commissioners to grant their request. At two o'clock in the afternoon the retort-men, who number about 70, stopped work. The shift which should have gone on at that time were waiting outside to see their fellow-workmen come out; but there was no demonstration of any kind—the men preserving a very quiet demeanour. According to their statement, the Commission had not been able to get a sufficient number of men to succeed them; and, instead of keeping 24 settings of retorts going, they said it would take them all their time to keep four at work. At six o'clock all the workmen received their pay; and the remainder of the men—making the number up to nearly 200—then struck. The mechanics have not come out; but they sympathize with their fellow-workmen. On Friday night a picket of the workmen on strike paraded in the vicinity of the works, with the intention of explaining their position to anyone who might appear at the works seeking employment. One of their number, named John McCabe, while under the influence of liquor, approached one of the men (Alexander Walker) who had gone into the works, while he was going for supper, seized him, and warned him not to go back to the works. A charge was made against McCabe, and he was arrested. At the Leith Police Court on Saturday morning—Baillie Archibald, one of the Commissioners, on the bench—he was charged with assaulting Walker. He at first pleaded guilty; but afterwards withdrew it. Evidence having been given, McCabe was fined 15s., with the alternative of ten days' imprisonment. A meeting of the men was held later on, when a resolution was unanimously adopted to the effect that any man resorting to intimidation would do so at his own risk, and that the body of the men condemned such action. The meeting also expressed the hope that the Edinburgh men would keep away during the strike, "and show their manliness towards their fellow-workmen."

CHECKING THE WASTE OF WATER AT BATH.—At the annual meeting of the Bath Corporation Water Committee last Thursday, the Engineer (Mr. Gilby) reported that when the Deacon waste-water meters were first applied the average daily consumption per head was 42.3 gallons; by September last it was reduced to 22.9 gallons; and in October it was 21.8 gallons. This was due to the reduction of the quantity of water wasted, and not to any fluctuation in the consumption.

[THE PURIFICATION OF GAS AT THE DUNDEE GAS-WORKS.]

Our readers will probably remember that references have lately been made by our Edinburgh Correspondent to complaints which have appeared in the Dundee papers as to the quality of the gas supplied by the Corporation. The matter was specially reported upon by the Gas Engineer and Manager (Mr. John McCrae) at the meeting of the Works Committee of the Gas Commissioners on Monday last week. He first explained that in the year 1882 he received instructions that the illuminating power of the gas should be maintained as nearly as possible at 26 candles; and that since that time the instructions had been most carefully and rigidly carried out. The testing apparatus had been kept in perfect order; and those who manipulated it had had large experience in this department. The tests at the works had also been verified by others made in the Sanitary Inspector's office. He then proceeded to deal with the statement that "air is being pumped into the gas at the works." In doing so he traced the steps which led to the adoption of Professor Wanklyn's system of purification at Tunbridge Wells, and subsequently at the Dundee Gas-Works, where it has been in use for the past two and a half years. He next described the process as follows:—"A 2-inch pipe is connected to a meter and to the gas-pipe immediately after it leaves the hydraulic main. At this point the product from the coal is not one gas, but a mixture of many gases, and these at a high temperature. Some of these gases and vapours are condensable, and very rapidly assume the liquid form, as tar and ammoniacal liquor. Contained amongst these tarry vapours is a valuable proportion of rich or light-giving hydrocarbons, and which by the old process were allowed to condense—pass away with the tar, thereby enriching the naphtha, which was later on to be distilled from it. By the admission of this 1 per cent. of air at the point indicated, a good percentage of these hydrocarbons is picked up, carried forward, and becomes a permanent gas; thereby having no depreciating effect on the illuminating power." He then went on to say: "Of course, it will be apparent from what I have said that the quality of the naphtha must be reduced; and that is exactly what we have experienced. But this is of little or no importance, bearing in mind the very low price this product has reached. In a word, we have removed a valuable ingredient from the naphtha, for which we are receiving little or nothing, and converted it into an illuminating gas of good quality, which I consider should be our primary object. Our secondary products, being such, deserve only secondary consideration. Perhaps the most valuable virtue exerted by this 1 per cent. of air lies in the effect on the purification of the gas, for by its introduction the revivifying of the oxide of iron is accomplished *in situ*; thereby rendering the frequent removing of that material from the purifiers unnecessary—a fact which is most interesting and valuable, as will be seen later. I have now described somewhat in detail the process as applied in your works. It is simple, economical, satisfactory, and can be stopped in one minute. Before this air process was introduced, during the summer months there would be a purifier changed at least once a week, and sometimes oftener. During the past summer there was not a purifier opened from the month of April till the month of August; and the gas was thoroughly purified all the time. I think the importance of this point cannot be over-estimated; for, although it may not be a statutory obligation, it is none the less our duty to disturb or annoy as little as possible those outside our works by the processes employed or carried on inside the works." With regard to the personal remarks made in the correspondence above referred to, Mr. McCrae said he would not deign to notice them. He said he had been nearly eight years in charge of the works, and could safely say that, during this period, whatever had been done was to the best of his knowledge for the improvement and modernizing of the plant, the production of good and cheap gas, and the satisfaction alike of the Corporation and the gas consumers of Dundee.

At the Monthly Meeting of the Gas Commissioners on Thursday, reference was made to Mr. McCrae's report. Mr. Lindsay pointed out that the introduction of air was not to dilute the gas—it was to assist in its purification, and to save the money of the Commissioners. It did not bring down the illuminating power of the gas by the fraction of a candle; and Mr. McCrae was quite willing to explain the process. Bailie Macdonald thought the public should be led to clearly understand that the Gas Engineer and the Commission could have no possible motive in diluting the gas. Mr. McCrae had adopted the new plan because he was convinced, by his experience, that it was the best way of purifying the gas. Bailie Gentle remarked that no one had any doubt as to Mr. McCrae's ability as a gas engineer, and that he was doing his utmost to produce the highest quality of gas at the lowest possible cost. He was satisfied with the tests made at the gas-works as well as at the Sanitary Office, which showed that the quality of the gas was kept up to a good standard. It was eventually resolved that the Clerk should communicate with the Local Authorities of certain towns, with the view of obtaining information as to the process.

THE FINANCES OF THE SALFORD CORPORATION GAS DEPARTMENT.

THE BOROUGH AUDITOR ON THE DEPRECIATION AND REDEMPTION FUNDS. An abstract of the Treasurer's accounts of the borough of Salford for the year ending March 25 last has lately been issued. Accompanying it is a letter from the Borough Auditor (Mr. W. J. Popplewell), in which he makes some remarks on the subject of the depreciation and redemption funds of the gas undertaking. The gross profits of the gas fund—£61,525 2s. 9d.—he says, show an increase on the previous year of £5459 10s. 6d. This is augmented by a reduction in the amount of interest paid of £503 6s. 10d.; making altogether £5962 17s. 4d. From this amount has to be deducted a large increase in the sum transferred to the depreciation fund of £4992 5s. 8d., and £168 0s. 1d. increase in the contribution to the redemption fund—together £5160 5s. 9d.—leaving the amount of net profit divisible between the three districts of Salford, Broughton, and Pendleton, only £802 11s. 7d. in excess of the amount divided last year. The first thing which calls for serious notice in this fund, he goes on to remark, is the condition of the depreciation account—a matter recently raised in the public press. As some misapprehension appears to exist on the subject, the Auditor points out the distinction between a depreciation fund and a sinking fund. The putting aside of an annual contribution to a sinking fund for redemption of debt, he says, is a compliance with the conditions imposed when the loans for capital expenditure are authorized, and cannot be evaded, and is intended to provide for the gradual and ultimate extinction of the debt. It does not in any way contribute to the object for which a depreciation fund is formed, which is to provide a fund out of which may be made the replacements and repairs necessary to maintain in efficient condition the works upon which the money borrowed had been expended. While it is certainly incumbent to provide a depreciation fund, it is, on the other hand, equally incumbent that no more shall be taken out of the profits for such purpose than is actually required. And it is quite evident there is no intention that large accumulations shall be made out of profits to provide for future extensions or the erection of new works. There is, however, at the present time, at Salford, an accumulation on account of

nearly £78,000, which is increasing at the rate of £9000 per annum, after fully providing for the objects named in the Corporations' Improvement Act of 1862. This large accumulation has arisen partly through an excessive percentage having been set aside in the past, and partly through the wrongful addition to the fund of the interest earned upon it, which ought rightly to have been credited to the general profit and loss account instead. He gives the following figures to show how largely in excess of the legitimate needs of the fund is the amount set aside:—In the year ending March 31, 1888, the amount set aside for depreciation on works and plant, at 3 per cent., was £14,575 4s.; the interest on the fund for the year was £1935 2s. 10d.—making a total addition of £16,510 6s. 10d.; the average annual expenditure for the past ten years has been £7233 15s. 4d.; or an amount in excess of £9276 11s. 6d. The actual expenditure for the year was only £3771 2s. 3d. Mr. Popplewell does not wish to be understood as objecting to a reasonable surplus over estimated requirements being set aside, or to the retention of even the present large balance in hand, although it is a question whether the sum of the accumulated interest should not be restored to the general fund, and divided between the districts. At any rate, the interest should no longer be added to the depreciation fund; and he recommends most strongly that for the future a reduction of at least 1 per cent. be made on the percentage set aside. The same remarks will apply to the hired meters depreciation fund, in a greater degree perhaps as to the accumulation, but in a lesser degree as to the annual percentage. In this way the saving on the year's figures would be as follows:—General depreciation, 1 per cent., £4858 8s.; interest, £1935 2s. 10d.; hired meters depreciation, at 1 per cent., £383 5s. 9d.; interest, £259 2s. 8d.—making altogether a sum of £7435 18s. 3d. to add to the balance of profit at the disposal of the Committee. In considering this matter, Mr. Popplewell says it should not be overlooked that in addition to the amount set aside for depreciation, a sum of more than £11,000 has been expended on repairs, and charged to revenue account, or over 2 per cent. on the capital invested in works, plant, mains, and services; and he is not sure whether a strict rendering of the Act would not require a large part of this expenditure to be taken out of the depreciation fund, which is limited, as already stated, to 3 per cent. The alterations he recommends in the depreciation accounts are, he thinks, desirable, not only in the interests of those entitled to the benefits of and increase in the profits divisible, but also for the purpose of discouraging extravagant expenditure in extensions under cover of this fund.

As to the revenue account, Mr. Popplewell considers it would be advisable in future that fuller details of some of the items of expenditure should be given; as, for instance, under the heading "manufacture of gas," the amounts paid respectively for coal and cannel, wages, &c.; the present arrangement of the account being retained, as that is desired for tabulation and comparison with the gas accounts published by other corporations and gas companies.

On the subject of the book-keeping of the Gas Department, he says that, although the portion relating to wages, stock, &c., and the checking of invoices, seems to be done in a most thorough and painstaking manner, there is one point which appears to be eminently unsatisfactory, and to which he called attention in his report of last year to the Gas Investigation Committee. The coal and cannel stock book is carefully entered up, so far as the quantities received are concerned, and a balance-sheet prepared; but the result is of little value, for although elaborately prepared figures of the quantities of coal and cannel carbonized are given, there is a large discrepancy between these figures and the total quantity of coal and cannel apparently carbonized, as shown by the measured stocks in hand at the end of the year. The discrepancy this year at one of the stations is 2821 tons, or 5.65 per cent. on the figures in the carbonization book. This means either that those figures are altogether unreliable, or that this quantity of coal and cannel has been disposed of in some other way. The Auditor is inclined to attribute it to the first-named cause; for the figures in the books, although ostensibly received from the different foremen, are, he says, evidently mere estimates; and he suggests, that if it is worth while to employ clerks to prepare elaborate figures of the quantity of material carbonized, it would be a simple and easy matter—if the actual weights cannot be given in every case—to test the estimated quantity at frequent intervals, and so prove satisfactorily that the coal, &c., is really accounted for, or otherwise. The plan adopted, so far as the principal books of the Corporation are concerned, although capable of improvement in some minor points, is, Mr. Popplewell says, well calculated to secure an accurate record of the financial transactions of the Corporation, and, on the whole, works well.

GAS AND THE "RESURRECTION" OF ELECTRIC LIGHTING.

[From *Money*, Nov. 7.]

It is now seven years since the electric light "boom" first excited the alarm of gas shareholders; and during all these years the new illuminant has been passing through the experimental stage, and nothing more. When the "boom" began, we alone amongst financial journals did our best to reassure the terrified gas shareholders; and events have proved how completely we were justified in all that we said. Gas stocks are now higher and safer and pay bigger dividends than ever; and we feel convinced they will continue so for many years to come, notwithstanding that the electric light is at last emerging from the experimental stage, after having impoverished so many hundreds of investors and enriched so many company promoters. We have never desired to depreciate any promising venture. When we wrote down electricity, we did so because we knew that, whatever might be the case in the future, the time of the electric light was not yet, and also because the companies that were formed were all, or nearly all, essentially of the "bubble" order, and not intended to become commercially successful. And now, when there appears to be a fair prospect of success for the new illuminant, we should be the last to attempt to discount that prospect. We have therefore made it our business to inquire into the position of the London Electric Supply Corporation, Limited, of which a good deal has recently been written; and we have come to the conclusion that if ever the electric light is to be a commercial success, it should be so in the hands of this concern. This is not the place to give the history of the Corporation, which is the outcome of Sir Coutts Lindsay's experiment of four years back in lighting the Grosvenor Gallery by electricity; but it may be remarked that the demands made upon the Grosvenor station, which was then installed, have increased so steadily that the present Corporation has been formed, with an authorized capital of £1,000,000, to erect and equip the new central station at Deptford, from which the Directors expect eventually to be in a position to supply the necessary current for 2 million lamps, while they have already invited orders for the supply of electric current for execution early next year.

Let us now consider how the success of this Corporation will affect the very large community of gas shareholders. It has, as usual under like circumstances, been pretty freely stated that if the Corporation is a complete success, gas is doomed; and it is pretty certain that the installation at Deptford will be made a peg upon which to hang "bear" attacks upon

gas stocks. We ourselves, with a full knowledge of the whole position, must counsel holders of gas to fear nothing. If they should allow themselves to be terrified into parting with their stocks, they will certainly have cause to repent doing so. It has been, and still is in some quarters, the fashion to speak of gas and electricity as rivals. They are in reality nothing of the kind. Even if the London Electric Supply Corporation prove to be all the success that its Directors anticipate, we believe that gas will in no way suffer commercially on that account. In the first place, electricity will not, under any circumstances, generally supersede gas as a popular illuminant for some time to come. It is still expensive compared to gas; the proposed charge being 7½d. per Board of Trade unit, which is equal to gas at about 4s. 2d. per 1000 cubic feet. This is a very high rate compared to the present cost of gas; and it is to be noted that The Gaslight and Coke Company have resolved to reduce their rate to 2s. 6d. per 1000 feet for ordinary gas from the beginning of the new year, which reduction will certainly increase their receipts in spite of all competition. But this is not all. The Electric Supply Corporation requires a *guaranteed minimum rental* of £20 per annum in all cases. This requirement alone—necessary as it is—will prevent competition with gas in the case of many thousands of householders whose gas-rate does not reach more than £10 or £15 per annum. Again, the Corporation will charge 20s. a year for rent of meter, against about 8s. charged by the gas companies; and there will be extras for transformers, switches, and extra lamps. So much for the comparison between the "rivals" on the score of cost.

This is a large order, and some particulars of the Corporation and its position will be found interesting. Of the nominal capital of £1,000,000, in £5 shares, rather more than half is at present subscribed; the precise figures being £535,000. The Company is by no means a public company in the full sense of the word, for more than four-fifths of the capital subscribed has been found by an inner ring of eight-and-twenty financiers. These are headed by Lord Wantage, who alone holds not far short of a quarter of a million's worth of these shares. After him come seven holders who have subscribed for 21,752 shares; then fifteen who have taken 23,833 shares; and, finally, five others who hold amongst them 2766 shares. Besides Lord Wantage's £220,000, therefore, no less than £241,755 have been found by twenty-seven other holders. There are in all fifty shareholders, about twenty of whom have subscribed the balance of about £78,000 amongst them. And it is this small but rich syndicate which proposes, taking the requirements of London to be equivalent to 7 million 10-candle power lamps, to light more than a quarter of the Metropolis. Whether or not the Deptford station will be found able to accomplish it, we do not pretend to predict; but it is, we think, pretty clear that this latest and biggest departure in electric lighting will be either a huge success or else a gigantic failure. The Corporation believe the former, as is shown by the sums its handful of members have staked; and if it is a success, they will reap the reward of their courage. If it is a failure, the loss will also be theirs; and in no case will the public share either in the loss or in the profit, unless there should be by-and-by a Stock Exchange "rig" in these shares, as there was in Father Brush and the other old companies. This is generally the way. The public money has already been lost by hundreds of thousands. Now the enterprising financiers step in and reap what profit may be earned.

But the main facts upon which we base our opinion that gas will continue its successful career are very different from the above. The most experienced authorities in the gas world—those who know best and who have the best knowledge of the facts—are agreed that the consumption of gas is not only not likely to decrease generally, but is certain to increase. It is a fact that in almost every place where electricity has been utilized as an illuminant—such as railway stations, factories, shops, &c.—the consumption of gas has not diminished. This is apparently paradoxical; but it is a fact proved by experience. The gas companies may lose the custom of the theatres, hotels, and clubs; but their loss is generally counterbalanced by a very satisfactory increase of consumption in other ways. This is due to the fact that gas may be, and is, daily more and more utilized for many purposes—such as cooking, heating, driving gas-engines, &c.—for which electricity is totally inapplicable. And the uses for gas are increasing far more rapidly than the general use of the electric light is likely to come about; and with the promised reduction in the price of gas, this fact cannot fail to become more and more evident. And here we would remind gas shareholders that the disturbance in the coal trade cannot affect their stock, since the gas companies are well ahead with their contracts, made when coal was at its lowest, as far as the summer of 1890. The rise in the price of coal, so far from being a disadvantage to the gas companies, is actually a source of profit to them; for it is enabling them to get better prices for coke which they have to dispose of.

There yet remains to be considered the important question of residuals. Not long ago the bye-products of a gas company were not only not profitable, but were an actual expense to get rid of as waste. Now they are all utilized. Tar and sulphate of ammonia are now both saleable products; and their prices are steadily rising in the market. And it must be remembered that the quantities of these bye-products are so enormous that a very small rise in price per ton means a very considerable increase in income to the companies. On the whole question, it is hardly stating too much to say that a well-managed gas company can now almost pay its way by the sale of residuals; its income from consumers being therefore almost entirely clear profit.

Thus, so far, then, from anticipating loss, shareholders in The Gaslight and Coke Company may safely anticipate an increase in the capital value of their holdings during next year. For by their statutory sliding scale the Company will be enabled, by its reduction in the price of gas, to pay higher dividends. The 3d. per 1000 cubic feet which is to be deducted from the cost next January will allow an additional ¾ per cent. dividend to be paid on the stock, if it be earned, as no doubt it will be. The Company have a very large balance to draw upon for temporary purposes; and there is, in addition to all this, some prospect of the early abolition of the coal dues, which would mean a saving of something like £90,000 per annum to this Company alone. For all which reasons it is clear that gas shareholders should be of good cheer, in spite of all that electric light "bulls" and gas "bears" may say or do to the contrary.

RETFORD CORPORATION GAS SUPPLY.—The annual report of the Retford Corporation Gas Committee shows that there was an addition to the capital account in the first half of the present year of £402 4s. 8d., principally for new works, which leaves the capital account over-expended by the sum of £2694 2s. 2d. This is provided for by the reserve fund, standing in the books of the undertaking at £3000. The sale of gas during the year has realized £5294 13s. 11d., as against £5298 7s. 1d. in the preceding year; while the quantity made has been 38,730,000 feet, against 38,248,000 feet. After paying interest on debentures, adding to the sinking fund, and paying bank interest and commission, the net profit for the year has been £366 6s. 4d. The expenditure for lighting the public lamps is greater than the amount paid.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

The whirl of the municipal elections is over; and a few reflections upon them may not be uninteresting. Beginning nearest home, the first thing which I notice is that Mr. Colston, who took the lead in the negotiations for the purchase of the Edinburgh and Leith gas undertakings, was proposed for the office of Lord Provost of Edinburgh at a private meeting of the Town Council yesterday, but was not elected; his support only numbering 19 votes, as against 21 for his opponent, Mr. Treasurer Boyd. The loss of the office must be a great disappointment to Mr. Colston; this being the fourth time he had entered into a contest for the honour. The strongest arrow in his quiver on this occasion was the part he took in bringing about the transfer of the Gas Companies' property. The proceedings being in private, it is impossible to say what may have been the reasons which the majority of the Council had for rejecting Mr. Colston; but outside observations point to a certain diplomatic subtlety in his actions, which makes it often difficult to say "where" he is on a question. Everybody has not subscribed to the dictum which was laid down by the promoters of the gas transfer themselves, that it was "so successfully" carried through; and it may be that that which Mr. Colston relied upon as his strongest support was, as a matter of fact, his weakest.

In Arbroath the electors have returned five out of six men who are pledged to oppose a large expenditure upon the gas-works. Bailie Keith, who was one of the chief supporters of the extension movement, was defeated. Only a week ago the Provost was arguing that the community were not sufficiently informed to give a vote in a *plébiscite* upon the question of whether or not the works should be extended. He was probably right. This foreign administrative monstrosity is not well adapted to a case of this kind; and it is altogether unnecessary, because the electors have it in their power to give their opinion at the polling-booth if they wish. The community have expressed their wish in this matter. They want the gas-works to remain where they are; and if it is necessary to expend money upon them, let it be a moderate sum to keep them going—particularly let all improvement schemes be dropped which would involve the expenditure of a large sum of money in the expectation of a small annual saving. The decision may in the end be wrong. The public are easily frightened upon questions connected with large outlays; and this appears to have been the case here. Before any moderately extensive scheme can be carried, the Gas Commissioners will probably find it requisite to give more information, and tie themselves down to something reasonably definite. The vote, at the worst, means delay, and if the time be usefully employed, there need be no reason why the Commissioners should not be able to carry through at the next election the scheme they may resolve upon. They will very shortly have the benefit of Mr. Foulis's advice on the subject; and probably, all things considered, it is just as well that decision upon the question, even by the community, is delayed until after his report has been received.

Mr. Adam Pratt, the author of the gas agitation in Aberdeen, has, contrary to my expectation, been returned to the Town Council. This success is attributed to the adroit use of "means." It looked as if Mr. Pratt must succumb before the reduction of 4d. in the price of gas announced by the Gas Commissioners a week before the election, when, lo! he suddenly turned that circumstance to his own credit; and with its aid went in by a swinging majority. When the electors rose on the morning of the election, they found the walls of the city placarded with posters inviting them to vote for Mr. Pratt who had been "the means of reducing the price of gas by 4d. per 1000 cubic feet." This is understood to have turned the scale in his favour. It is to be hoped that the Council will, in justice to Mr. Pratt, seeing that he has been returned on account of his discontent with the gas management, put him on the Gas Committee; and if nothing has been wrong in that department—which I take to be the case—the wind would then be taken out of his sails, and the victory would lie with the Committee.

The quiet academic city of St. Andrews has just carried through that which was such a bugbear in Edinburgh last year, and in Arbroath this year—a *plébiscite* on gas affairs. A proposal by the Provost to adopt the Burghs Gas Supply (Scotland) Act, 1876, was carried in the Town Council in September by twelve votes to nine. The opposition here was not in respect to the price which the Provost suggested would be sufficient, but that it was certain to be more than the figure he mentioned, and that if the Town Council committed themselves to the adoption of the Act, they would be obliged to go on with the purchase, even although it might come to be compulsory; and they might, at the end of arbitration, require to pay a premium of 100 per cent. on the value of the undertaking. The Provost's figure was £13,250, and was based on the principle of offering £31 5s. for each £25 share. On the other hand, the opposition were convinced that the price would be at least £20,000. There were eleven vacancies in the Council, and each side nominated eleven candidates. Along with the election, arrangements were made for taking the opinion of the electors by means of a *plébiscite*. The result has been a complete victory for the Provost. In the election, ten out of the eleven candidates in favour of acquiring the Gas Company's undertaking were returned; and in the *plébiscite* the numbers were: For, 3861; against, 3013.

The strike at the Leith Gas-Works, to which I referred last week, has unfortunately begun; and there seems as yet no appearance of an ending of it. Indeed it is difficult to see how it can end, except by the Commissioners giving way. If they send men down from Edinburgh, they must pay them the Edinburgh wage; and they may as well pay this to the men on strike as to their substitutes. If they get men to start in Leith at the lower rate of wages which has been current there, these men will either be inferior workmen, or, if they are not, as soon as they have learnt the work, they will be found applying for the rise which has been refused to the men who are out. I confess it is to me amusing to see the Commissioners pleading that this rise was not asked from the Company before the transfer. The workmen most probably did not know what was being earned in Edinburgh; and very likely would not have known except for the Commissioners telling it themselves. But over and above that, the men were the employees of the Leith Company only, whereas they are now co-employees with the Edinburgh men of the Commissioners; and they reason—and I think rightly—that when they do the same work they ought to have the same wage.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

Bailie Mackenzie, a leading member of the Paisley Town Council, in addressing his constituents recently, referred to the affairs of the Gas Trust. He said that there had been a difference of opinion amongst the members this year. Ought they, he asked, to levy (say) £5000 from the gas consumers more than was required to pay their expenses? They already had an improvement rate of 5d. per £1 of rental, which must be paid between landlord and tenant; and the sum he mentioned would come almost to another 5d. in the pound. He was one of the minority who

opposed charging such a high price for the gas in order that a surplus might be obtained. Returns from the important burghs of Scotland showed that Paisley was the most highly taxed town in Scotland, with the exception of Perth; and he thought they should consider carefully how they endeavoured to raise surpluses in connection with any Trust, because such surpluses were simply a tax upon the public. One of Baillie Mackenzie's colleagues—Baillie Andrews—traces much of the prosperity of the town, as a manufacturing community, to the excellence of the gas supply and the cheapness of the commodity. Indeed, he does not hesitate to tell his constituents that the Paisley gas, having an illuminating power of 26 to 27 standard candles, is, at 3s. per 1000 cubic feet, without doubt, the cheapest gas in Scotland. He says that during last year, after deducting all necessary charges, the Gas Trust had a clear surplus of £5413, which they appropriated for improvements; and his opinion is that if they had no surplus they would require either to stop improvements or put a tax on the ratepayers of 4d. or 5d. per £1 on the rental. If it is the cheapest gas in Scotland at 3s. per 1000 cubic feet, what must it be now, seeing that the price has been reduced to 2s. 10d. per 1000 cubic feet? Baillie Andrews seems to rejoice in the extent of the gas surplus, and in the mode of raising and spending it. He says that there are a few who think, or at least say, that to use the gas surplus for local improvements is a tax on the inhabitants; and he asks how in reason or common sense it can be called a tax, if the gas be sold as a marketable commodity, and sold at a lower price than that charged by any other gas company in Scotland. This has long been a vexed question in Paisley, as well as in other towns in Scotland, where the gas supply is in the hands of the municipal authorities; and it seems likely to remain in *questio vexata* for some time to come. But there are other members of the Paisley Town Council who hold that the method of raising and disposing of a surplus from the gas is wrong in principle; but Baillie Gaudie does not seem to be one of them, for he tells his constituents that the gas undertaking is "the goose that lays the golden eggs," and that, if it were not for the yearly surpluses from the gas, most of the town's improvements would not have taken place, as they had obviated the necessity of increased taxation. He also tells them, however, that within a period of four years, the price of gas had been reduced 11d. per 1000 cubic feet, and that the cheap purchase of coals, combined with careful and judicious management, had brought about that happy state of matters. The gas-works were originally purchased for £40,000; and the cost for the extension of the works was £38,000—making the total cost £78,000. The present estimated value is £102,000.

Some interesting statements regarding the Kilmarnock gas undertaking have lately been made to the ratepayers of the town. The works were acquired from the old Gas Company in 1872; the purchase-money being £43,450. At that time some necessary alterations and additions were made which involved an expenditure of £1500—making a total cost of £44,950. The price of gas was then 5s. per 1000 cubic feet. This was in June of that year; and in the following September it was necessary to raise the price of gas to 5s. 10d. per 1000 cubic feet. Since that time there has been paid off in the shape of mortgage bonds the sum of £11,925; and there has also been about £8000 paid upon the profits for the maintenance of the works. Altogether there has been £20,000 of profits used or been received from the gas-works for those two purposes. The mortgage bonds at present existing amount to £33,025.

On Monday of the present week, the shares of the Partick, Hillhead, and Maryhill Gas Company were offered for sale at 80s. per share; being 5s. under the price wanted by sellers on the preceding Saturday. Buyers tendered 75s., which was also 5s. down; but no business was reported. On the following day 77s. 6d. and 75s. per share were accepted by holders. Sellers again asked 80s. per share on Thursday; but they did not fall in with any purchasers, who were willing to go to 77s. 6d. per share.

At Kilmarnock on Thursday, 17 £10 shares of the Kilmarnock Water Company were disposed of by auction. They were 4 per cent. preference shares, participating in dividend up to 10 per cent. The upset price was £16 10s. per share; and they realized £20 3s. per share. Ten £10 shares of the same Company, 4½ per cent. preference, participating up to 6 per cent. dividend, were exposed at £13 each, and were sold for £15 16s. per share. Some interest is being taken in the stock of the Kilmarnock Water Company, as the Town Council may by-and-by make an endeavour to take over the water supply of the town, in the hope that it may prove to be equally successful with the gas supply undertaking. During the past few years some bitterness of feeling has been shown between the Water Company and the Town Council; alleged delinquencies on the part of the former body having been readily taken hold of by the late Provost of the burgh and his immediate supporters in the Town Council.

The Glasgow pig-iron warrant market has again been very quiet this week. There is a prospect of further curtailment in the production, as another blast-furnace has been blown out at the Eglinton Iron-Works. Yesterday afternoon the prices of Scotch warrants were but slightly over 41s. per ton; Cleveland iron was quoted at 33s. 9d.; and hematite iron at 41s. 3d. per ton.

A somewhat demoralized condition is now showing itself in the coal trade, as the miners who have not obtained the advance of 10 per cent. on their rate of wages are likely to make their influence felt amongst the dissentient coal-masters. The shipping department is feeling the influence already, as the men are not working full time, knowing that there is a large demand. Prices are advancing all round.

CHARGE OF EMBEZZLEMENT BY A COLLECTOR OF THE NEW RIVER COMPANY.—Last Wednesday, curiosity was excited in Islington by the statement that one of the collectors of the New River Water Company—Arthur Brookes—had absconded with (as the Solicitor to the Company states) about £400. Brookes was apprehended on Wednesday night, in a public-house in the City, and on the following day was charged with the offence at the Clerkenwell Police Court. He was remanded.

THE THIRLMERE WATER SCHEME.—A special meeting of the Manchester City Council was held on the 31st ult., to consider a Bill which the Corporation intend promoting next session with the object of obtaining further powers in connection with their Thirlmere scheme. The Deputy Town Clerk read a statement to the effect that it was proposed to raise the level of Thirlmere Lake to the extent of 20 feet only at present, which would give 10 million gallons of water per day. This supply was estimated to be sufficient for some years to come. This course would avoid the submerging of a considerable extent of good pasture land at Thirlmere, and render unnecessary for a long period the construction of extensive roads and other works. The proposal had the sanction of the societies for the preservation of the lakes and others interested. The Bill was mainly intended for water-works purposes, and was to be promoted at the cost of the water-works funds. It was not intended to ask for additional borrowing powers. It was also proposed to defer the commencement of the sinking fund for a further period, to be determined by the Local Government Board. Some engineering and other matters in regard to the works are dealt with by the Bill. A resolution in accordance with this statement was adopted.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Nov. 10.

Sulphate of Ammonia.—In spite of the further enhanced values of nitrate of soda, the sulphate market appears to have lost a great deal of its buoyancy. This is somewhat strange, seeing that the present advance in sulphate was mainly due to the improvement in nitrate. Judging by Continental reports, consumers evidently do not believe much in a higher register of sulphate. Hence they abstain from augmenting the quantities already contracted for, although it may be assumed that a moderate decline would tempt them again to operate. The principal business during the week has been done at £12 2s. 6d., f.o.b. Hull and Liverpool; but some business is reported, f.o.b. Leith, at a slightly higher figure. It is stated that December delivery, f.o.b. Hull, can be bought at £12 3s. 9d.; but makers generally prefer to look on, or are quoting higher rates than mentioned. Nitrate on spot is to-day quoted at 10s. 6d.; Spring delivery, 10s. 9d. A cargo Oct.-Nov. sailing is reported to have been done at 10s. 10½d. The higher figures appear to be provoking re-sales. As a matter of fact, second-hand sellers—who are realizing good profits on their cheap contracts—are appearing on the scene, and naturally interfere with business from first hands.

LONDON, Nov. 10.

Tar Products.—The better feeling reported in these products last week is still maintained. Benzols have improved; but it remains to be seen whether the advance is a permanent one. Napthas and tar oil are also strong. Anthracene maintains its value, and a further advance is not improbable. Pitch is better, and more enquired after. Carbolic acid steadily rises, and business has been done at 3s. 9d. per gallon. Prices may be taken as follows:—Tar, according to position, 17s. 6d. to 22s. 6d. per ton. Benzol, 90 per cent., 3s. 2d. per gallon; 50 per cent., 2s. 6d. Toluol, 1s. 7d. per gallon. Solvent naphtha, 1s. 3d. per gallon. Crude naphtha, 30 per cent., 1s. 1d. per gallon. Light oil, 3d. per gallon. Creosote, 2d. per gallon. Pitch, 12s. to 15s. per ton. Carbolic acid (crude), 3s. 9d. per gallon. Cresylic acid, 10½d. per gallon. Tar salts, 15s. per ton. Anthracene, 90 per cent., "A" quality, 1s. 6d. per unit; "B," 1s. 3d.

Ammonia Products are scarcely so strong, although £12 2s. 6d. to £12 3s. 9d. is still the value of sulphate. Prices of other products may be taken as follows:—Gas liquor (5° Twaddell), 7s. 6d. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 2d. per lb. Carbonate of ammonia, 3½d. per lb. Muriate of ammonia, brown, £18 per ton; white, £27. Sal-ammoniac, £30 per ton.

[From the *Chemical Trade Journal*, Nov. 10.]

Sulphate of Ammonia.—There is not as much "go" in the sulphate market as there was this time last week; but prices keep very steady, although it is stated that £12 2s. 6d. is the highest buyers will pay for this month's delivery at Hull. Makers are asking, however, £12 5s. very generally; but buyers cannot be induced to pay this figure. At Leith, £12 5s. is quoted for prompt delivery; and it is reported that £12 10s. has been paid for November to March by a certain speculator. Beckett still keeps firm of £12 5s.; and a similar price is ruling for London outside makes. The nitrate market keeps firm; and dealers are quoting 3d. advance for spring delivery.

Tar Products.—The market remains in much the same state as given in our report last week. If anything, prices are ½d. back for 90's benzol—making the current price for that commodity 3s. 1d., and 2s. 5d. for 50/90's. Solvent naphtha is very firm; and creosote is still in good demand at old rates, while a change seems to have taken place in the position of crude carbolic acid—one firm of users having set themselves to work to buy up as much as it is possible for them to get hold of. For a time this may keep prices moderately high; but the producers must look after themselves. Anthracene remains unchanged. It is quite as strong as ever; and there are some makers who believe in a further hardening of prices. The pitch market is now in a good and healthy condition; and the prices quoted for last week may serve equally for to-day. The stiffness of prices for most of the finished tar products being well maintained has not been without its influence on the tar market; and the tar distillers are beginning to complain bitterly of the high prices they are obliged to pay for this article.

BURSTING OF A RESERVOIR NEAR GENEVA.—Last Tuesday, the water reservoir at Montreux, used for the service of the electric railway, burst. Several houses were swept away by the rush of escaping water; and ten people are reported to have perished by the catastrophe. The villages of Sonzier, Pertit, and Vuarrennes have been devastated.

CHESHUNT WATER SUPPLY.—In consequence of the great dearth of water experienced in the district of the Cheshunt Local Board, this body has decided to proceed immediately with the construction of water-works of their own. Land for the purpose of sinking a well has been purchased at Cuffley; and, as the result of a trial boring, it is anticipated that an abundant supply will be obtained. A scheme has been prepared, which has been approved by the Local Government Board. The estimated cost of the work is £25,000.

GAS EXHIBITION AT RAMSGATE.—On Monday, the 29th ult., an exhibition of gas appliances was opened, under the auspices of the Ramsgate Corporation Gas Department, in St. George's Hall in that town, and continued during the week. In the absence of the Mayor, the opening ceremony was performed by Mr. Alderman Turpin. After a few preliminary remarks, he introduced Miss Cameron, who proceeded to give the first of a series of lectures on high-class and plain cookery, with illustrations. The gas-stove exhibits were mainly supplied by Messrs. T. Fletcher and Co., of Warrington. There was a special stand, fitted up by the Gas Department, showing lamps and burners of different designs, for the guidance and instruction of consumers, as also glass-cased wet and dry meters. A large number of Messrs. W. Sugg and Co.'s lamps, burners, and governors were also on view. The exhibition was under the superintendence of Mr. W. A. Valon, Assoc. M. Inst. C.E., the Gas and Water Engineer of the Corporation.

INCREASED STORAGE AT THE COLNEY HATCH GAS-WORKS.—On Monday afternoon last week, a large and important addition to the works of the Colney Hatch Gas Company was brought into use by the inflation with gas of a new holder, constructed from the designs of Mr. Jabez Church, M. Inst. C.E., the Company's Consulting Engineer. The holder is arranged to be telescoped in a short time and with little trouble when required; the whole of the guide-framing having been completed. The latter is composed of 14 wrought-iron lattice T-shaped standards, with lattice girders and "Paddon" ties, and is a light, strong, and by no means inelegant structure. When completed the holder will be capable of containing 450,000 cubic feet of gas. Messrs. John Aird and Sons constructed the tank, retaining walls, and other works; Messrs. T. Cutler and Sons, of Millwall, being entrusted with the holder. Mr. W. F. Broadberry, the Company's Manager, filled the position of Resident Engineer during the construction of the works.

THE NORTHERN COAL TRADE.—The demand for coal continues large, and the prices firm; but the extreme briskness generated by the Yorkshire coal strike is passing away. The inquiry for steam coal is still brisk, at about 8s. 6d. per ton for best qualities; but the small coal is produced so largely that the market is glutted, and the price is lower. For gas coal there is a pressing demand, and the price is more than maintained. Some of the chief collieries are far behind with deliveries; and therefore the amount of coal for sale at present high prices is very small. Thus the price of 8s. per ton which is spoken of, and which has, it is believed, been paid in one or two instances, is for a very limited quantity. The demand is now nearly at its maximum for gas coal, but it will remain at its present height for probably six weeks; after this a fall may be anticipated. The cost of the freight of coal seems to be tending upwards, however; and thus, though the contracts for coal may have been placed at low prices, it will be a little dearer to some buyers.

END OF THE GAS-SUPPLY DIFFICULTY AT TONG.—Our readers may remember that a contest as to the right of gas supply in the Tong and Dudley Hill neighbourhood of the Drighlington Gas Company's area has been going on for a considerable time between Mr. Matthew Hillas, of Dudley Hill, and that Company. Mr. Hillas, whose mill premises are partly in the Bradford borough and partly in the Drighlington Company's district, has for years obtained gas from the Bradford Corporation, and passed it through his meter in the borough into the district of the Company. This caused a great deal of litigation, which ended last year in Mr. Hillas and his supporters (including the Tong Local Board) defeating the Company before a Committee of the House of Lords. The Drighlington Company then reduced the price of their gas from 3s. 9d. to 2s. 6d. per 1000 cubic feet. Having established the principle that no private person can be prohibited from supplying gas in any district in which a company have, under their Private Acts, a right of supply, Mr. Hillas has now sold his plant to the Gas Company.

THE NEATH CORPORATION AND THE WATER SUPPLY.—At the meeting of the Neath Town Council on Monday last week, Mr. Cuthbertson complained of the quality of the water supply in the town, and moved—"That the Town Clerk be instructed to apply to the Neath Water Company for terms for the purchase of their rights—firstly, for the Neath water undertaking; secondly, for the Briton Ferry undertaking; and, thirdly, for the joint undertakings—and for a return showing the annual income and expenditure." Mr. Markham seconded the motion. Alderman Charles thought there was another way of dealing with the Company; and rather than go in for purchasing their works, he would apply for power to construct works of their own. He moved, as an amendment—"That the Town Clerk be instructed to have Counsel's opinion as to what steps (if any) should be taken to obtain a continuous supply of water, either under sections 35 and 36 of the Water-Works Clauses Act or the Company's Act of 1885, or in the alternative to construct their own works." After some conversation, Mr. Cuthbertson withdrew his motion, and the amendment was unanimously agreed to.

THE PROSPECTS OF THE ELECTRIC LIGHT AT BRISTOL.—In reply to a question put to the Chairman of the Bristol Sanitary Authority (Mr. Naish), at the meeting of that body last week, as to whether the time had not arrived for the adoption of the electric light in Bristol, he said that a Committee had been appointed, and probably during the next twelve months the matter would be advanced. They had already had an offer from a gentleman who had succeeded in placing the electric light at Bath and Taunton. They had given him the cost of gas throughout the main streets which it was suggested should be lighted in Bristol, and it was pointed out to him that the Committee would probably agree to adopt the electric light if it could be supplied at the same cost as the gas. He (Mr. Naish) did not think that at present it could be done at the same cost; but the system had been adopted in other towns, and he thought the time was arriving when it should receive the consideration of the Bristol Corporation. Mr. Lockley (Vice-Chairman of the Committee) pointed out that the question had lately been under consideration at Exeter; and he observed that the Council of that city decided not to accept any of the tenders for electric lighting, on the ground of the increased cost as compared with gas. The subject then dropped.

THE LIABILITY FOR DAMAGE TO PUBLIC LAMPS.—In reference to the application in the Queen's Bench Division by the Chester Gas Company for a special case against the Justices of Chester, in the matter of an information against John Challinor for breaking and damaging a public lamp (see ante, p. 808), *The Times* of Wednesday last contained a report of a case which is almost identical with that at Chester. It came before Mr. Justice Field and Mr. Justice Wills, and raised a question as to whether, when a driver has accidentally injured a street lamp in the Metropolis, his employer is liable for the damage under the provisions of the Metropolis Management Act. The complaint was preferred by Mr. E. C. Harding, Clerk to the parish of St. Mary Abbots, Kensington, against Messrs W. A. and W. Barker, market gardeners, under section 207 of the above-named Act, for having, on June 11, 1887, carelessly or accidentally broken "a certain lantern and the fittings thereof opposite the Town Hall, Kensington High Street," for which they claimed damages to the extent of £8 17s. 6d. On Nov. 1, 1887, the Justices dismissed the complaint. A case was, however, stated and argued before the Queen's Bench Division on April 11, 1888, when it was remitted for the Justices to find whether the act complained of was a careless or an accidental one, and for them to rehear the case for that purpose. The Justices decided that it was an accident, and the Court confirmed their decision; thus absolving the master from liability.

DEFRAUDING A GAS COMPANY.—At the Accrington Police Court last Wednesday, a potato dealer named Solomon Williamson, who carries on business in Grange Street in that town, was charged with fraudulently using the gas of the Accrington Gas and Water Company at his storehouse in St. James's Street. There were three summonses issued against the defendant; and the Company claimed £5. The Town Clerk (Mr. Aitken) represented the Company, and Mr. McKeand, barrister, appeared for the defendant. From the evidence adduced for the prosecution it appears that the defendant occupied the lower portion of the premises in question, one part being used as a stable, and the other as a warehouse. There was formerly a gas-meter in the cellar; but this was disconnected by the Company some time ago and removed, though a short pipe remained. On the 7th and 8th of October, constables saw a large blaze of gas in the warehouse, and defendant was informed of the matter. He replied that it would be all right; but the constables insisted on his accompanying them to the place, and this he did. It was then discovered that he had been using the gas from the short pipe left by the Company—the pipe having been flattened at the end. Mr. Aitken explained that there was evidence that the defendant had been abstracting gas for a considerable time. The Magistrates considered the cases proved, and inflicted fines of 40s. and costs in each instance. The question of damages was then heard; and, after some discussion, Mr. McKeand agreed to pay 40s., which was accepted by the Company.

SUNDAY LABOUR AT THE WEST BROMWICH GAS-WORKS.—At the meeting of the West Bromwich Town Council last Friday, the Gas Committee reported that, having received a memorial from the stokers and coal wheelers requesting that extra remuneration should be granted to them in respect of Sunday labour, they had instructed the Manager to dispense with Sunday labour as far as possible; but when this was found impracticable, the stokers were to receive a bonus of 1s. 6d. per man, and the coal wheelers 1s. per man in addition to their day's wages.

PUBLIC LIGHTING AT THE EAST-END.—At the meeting of the Vestry of Mile End Old Town last Wednesday, the Chairman of the Highways Committee (Mr. Loftus), in answer to a question, stated that the general review of the lighting of the hamlet was under consideration, and the conclusions arrived at would be duly submitted to the Vestry for approval. In the course of an irregular discussion, it was generally urged that there were many dark places and alleys which needed lamps. In the end, it was ordered that three lamps should be set up in places recommended by the Committee.

LIGHTING OF LLANDAFF WITH GAS.—The smallest city in the United Kingdom has followed others in the run of civilization, and at last has its streets lighted with gas. This change took place a few evenings since; and the inhabitants were so rejoiced at the event that they turned out *en masse*, as if the place had been illuminated for some special occasion. Llandaff has hitherto been behind other places—the old oil-lamps remaining there until recently; and the late Bishop frequently carried a lamp to light the way from the Palace to the Cathedral during the winter evenings. The gas is supplied by the Cardiff Gas Company; and the street lamps are the same in every respect as those used at Cardiff.

SINGAPORE GAS COMPANY, LIMITED.—At the half-yearly meeting of this Company to be held to-day will be submitted the Directors' report and the statement of accounts for the six months ending June 30 last. The accounts showed that the gas and meter rental produced £7518 16s.; and products, profit on fittings, and sundries, £2688 18s. 6d. These two sums, together with the balance brought forward (£349), make the receipts for the half year £10,557. The expenditure amounted to £7931 13s.; leaving a balance for appropriation of £2625 7s. Out of this sum the Directors recommend the declaration of a dividend at the rate of 7½ per cent. per annum, less income-tax. During the half year the buildings, plant, machinery, and pipes have been maintained in a good condition; repairs and renewals having been executed where necessary, including the re-instatement of the coal-stores. Two new purifiers and 48 extra public lamps have been erected, new mains laid, and a large amount of excavation for the new gasholder tank has been carried out. The collections, the Directors state, have been very satisfactory.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST. (For Stock Market Intelligence, see ante, p. 840.)

Issue.	Share	When ex-Dividend.	Dividend of Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.					£ s. d.
GAS COMPANIES.								
590,000	10	12 Oct.	10½	Alliance & Dublin 10 p.c.	10	17½-18½	..	5 13 1
100,000	10	"	7½	Do. 7 p.c.	10	12½-13½	..	5 11 1
300,000	100	2 July	5	Anstralian (Sydney) 5% Deb.	100	110-112	..	4 9 3
100,000	20	30 May	10	Bahia, Limited	20	24-25	..	8 0 0
200,000	5	11 May	7½	Bombay, Limited	5	7½-7¾	..	4 16 8
40,000	5	"	7½	Do. New	4	5½-5¾	..	5 4 2
380,000	Stock.	29 Aug.	11	Brentford Consolidated . .	100	22½-23½	..	5 3 1
125,000	"	"	8½	Do. New	100	164-168	..	5 4 2
220,000	20	13 Sept.	10½	Brighton & Hove, Original .	20	43-45	..	4 13 4
320,000	20	28 Sept.	11	British	20	43-45	..	5 0 0
50,000	10	13 Sept.	11	Bromley, Ordinary 10 p.c.	10	19-21	..	5 4 9
39,000	10	"	8	Do. 7 p.c.	10	13-14	..	5 14 3
324,750	10	30 May	8	Buenos Ayres (New) Limited	10	14½-15½	..	5 3 2
200,000	100	2 July	6	Do. 6 p.c. Deb.	100	110-112	..	5 7 1
150,000	20	10 Aug.	7	Cagliari, Limited	20	25-27	..	5 3 8
550,000	Stock.	12 Oct.	13½	Commercial, Old Stock . .	100	255-260	-2	5 5 9
130,000	"	"	10½	Do. New do.	100	209-214	..	5 0 5
121,234	"	28 June	4½	Do. 4½ p.c. Deb. do.	100	123-128	..	3 10 3
557,320	20	14 June	12	Continental Union, Limited	20	44-46	..	5 4 4
242,680	20	"	12	Do. New '69 & '72	14	294-304	..	5 10 2
200,000	20	"	9	Do. 7 p.c. Pref.	20	36-38	..	4 14 8
75,000	Stock.	28 Sept.	10	Crystal Palace District . .	100	205-215	..	4 13 0
234,060	10	27 July	13	European, Limited	10	254-264	..	4 18 1
120,000	10	"	13	Do. New	7½	15-19	..	5 2 7
354,060	10	"	13	Do. do.	5	12-13	..	5 0 0
5,468,600	Stock.	29 Aug.	13	Gaslight & Coke, A, Ordinary	100	244-249	+1½	5 4 5
100,000	"	"	4	Do. B, 4 p.c. max.	100	100-105	..	3 16 8
665,000	"	"	10	Do. C, D, & E, 10 p.c. Pf.	100	260-265	..	3 15 6
30,000	"	"	5	Do. F, 5 p.c. Prf.	100	125-130	..	3 16 11
60,000	"	"	7½	Do. G, 7½ p.c. do.	100	182-187	..	4 0 2
1,900,000	"	"	7	Do. H, 7 p.c. max.	100	167-172	..	4 1 4
463,000	"	"	10	Do. J, 10 p.c. Prf.	100	258-263	..	3 16 1
1,061,150	"	14 June	4	Do. 4 p.c. Deb. Stk.	100	119-122	-1	3 5 7
294,850	"	"	4½	Do. 4½ p.c. do.	100	125-130	..	3 9 3
650,000	"	"	6	Do. 6 p.c. do.	100	175-178	..	3 7 5
3,600,000	Stock.	11 May.	10	Imperial Continental . . .	100	209-212	..	4 14 4
75,000	5	14 June	6	Malta & Mediterranean, Ltd	5	5-5½	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p.c. Deb.	100	113-115	..	4 6 11
541,920	20	11 June	6	Monte Video, Limited . .	20	20-21	..	5 14 3
150,000	5	30 May	10	Oriental, Limited	5	9-9½	..	5 5 3
60,000	5	28 Sept.	7	Ottoman, Limited	5	6-7	..	5 0 0
166,870	10	27 July	4	Pará, Limited	10	54-64	+½	6 3 1
People's Gas of Chicago—								
420,000	100	2 Nov.	6	1st Mtg. Bds.	100	104-107	..	5 12 1
500,000	100	1 June	6	2nd Do.	100	95-100	..	6 0 0
100,000	10	12 Oct.	10	San Paulo, Limited	10	16-17	..	5 17 8
500,000	Stock.	29 Aug.	15½	South Metropolitan, A Stock	100	300-310	..	5 0 0
1,350,000	"	"	12	Do. B do.	100	230-235	-3½	5 2 1
141,500	"	"	13	Do. C do.	100	248-255	..	5 1 11
550,000	"	28 June	5	Do. 5 p.c. Deb. Stk..	100	138-143	..	3 9 11
60,000	5	29 Aug.	11	Tottenham & Edw'm'tn, Orig.	5	11-13	..	4 4 0
WATER COMPANIES.								
717,467	Stock.	28 June	9	Chelsea, Ordinary	100	260-262	..	3 7 11
1,720,560	Stock.	12 Oct.	7	East London, Ordinary . .	100	197-202	+3	3 9 9
700,000	50	11 June	9	Grand Junction	50	123-127	..	3 10 10
708,000	Stock.	10 Aug.	10½	Kent	100	270-275	..	3 16 4
1,043,800	100	28 June	9	Lambeth, 10 p.c. max.	100	255-260	..	3 9 3
406,200	100	"	7½	Do. 7½ p.c. max.	100	198-203	+1	3 13 10
200,000	Stock.	28 Sept.	4	Do. 4 p.c. Deb. Stk.	100	117-120	..	3 6 8
500,000	100	27 July	12½	New River, New Shares . .	100	345-350	..	3 9 3
1,000,000	Stock.	"	4	Do. 4 p.c. Deb. Stk.	100	123-127	..	3 3 0
902,300	Stock.	14 June	6	S'hwk & V'hall, 10 p.c. max.	100	169-174	+1	3 9 0
126,500	100	"	6	Do. 7½ p.c. do.	100	157-163	..	3 11 1
1,155,066	Stock.	14 June	10	West Middlesex	100	265-270	..	3 14 1

THE GAS SCANDAL AT HALIFAX.—At a meeting of the ratepayers of Halifax held last Thursday, a resolution was passed thanking the Mayor (Mr. Alderman J. Booth) and the other members of the Special Committee appointed to deal with the charges lately made in connection with the Corporation Gas-Works, and expressing the sympathy of the meeting with them in their efforts to thoroughly investigate the matter. The Mayor, in responding, said that he and his colleagues had resolved that, come what might, whatever time, labour, and trouble it might bring, if it was possible to get at the bottom of the scandal they would root it out. It was high time that the question should be gone into, for he "could a tale unfold" that would, he thought, astonish them—exceedingly astonish them. But, as the matter was being sifted, and had to be wormed out, so to speak, bit by bit, it was better that he should not for the present say more. There would be a time, however, when he could open his mouth, and tell them a great deal that had been going on, and which had not yet been made known to the public.

ELECTRIC LIGHTING AT BARNET.—At the meeting of the Barnet Local Board last Tuesday, the Lighting Committee reported that the electric lighting contractor (Mr. Joel) had been in communication with them on the subject of the complaints made in regard to the lighting, and had stated that he had every reason to believe that everything would be in proper working order by the 20th inst. The Committee had inspected a 32-candle power lamp; and the contractor had undertaken that all the lamps should be worked to a similar standard, with the addition of reflectors and improved appliances. The report having been received, Mr. James said that; taking into account the time which had elapsed since the first attempt to light the town by electricity, he thought the Board should take some decisive action. They had had a good many

promises, but none of them had been carried out. He proposed that notice should be given to the contractor to terminate his contract; expressing the opinion that by so acting the Board could not be accused of undue haste, or want of consideration. Mr. Samuels pleaded for the contractor; saying that he considered the Board would do a very unwise thing if they gave the notice. He moved, as an amendment, that the recommendation of the Lighting Committee as to the notice be not acted upon; and this was adopted.

SOUTHAMPTON GAS COMPANY.—The half-yearly general meeting of this Company was held last Wednesday—Mr. R. C. Hankinson in the chair. The Directors' report stated that the profit and loss account showed that the amount available for division was £7577 1s. 4d. The Directors recommended the payment of maximum dividends amounting to £7004 1s. 10d. for the half year on all classes of shares, less income-tax; leaving a balance of £572 19s. 6d. to be carried forward. The Chairman, in moving the adoption of the report, said that during the six months to which it referred, the Company had sold more gas, there had been a little improvement in the price of residuals, and the price of coals was low. Mr. R. R. Oke having seconded the motion, Mr. J. B. Paddon (the Company's Consulting Engineer) said it was his intention to have brought the new gasholder into operation the last day of October, but unavoidable circumstances had caused delay; though all the difficulties—none serious in themselves—had now been successfully overcome. The report was adopted, and maximum dividends declared. On the motion of the Chairman, seconded by Mr. H. Lashmore, a recommendation from the Directors that the salary of the Secretary (Mr. C. Crowther Smith) be increased by £50 per annum was adopted. Votes of thanks to the Auditors, the Manager (Mr. S. W. Durkin) and staff, Directors, and Chairman closed the proceedings.

THE QUALITY OF THE LONDON GAS SUPPLY
DURING THE FOUR WEEKS ENDED NOV. 6.

[From returns to the Metropolitan Board of Works by Mr. W. J. DIBDIN, F.I.C., F.C.S.]

COMPANIES—DISTRICTS.	ILLUMINATING POWER. (In Standard Sperm Candles.)						SULPHUR. (Grains in 100 Cubic Feet of Gas.)						AMMONIA. (Grains in 100 Cubic Feet of Gas.)					
	Maxi- mum.	Mini- mum.	Means.				Maxi- mum.	Mini- mum.	Means.				Maxi- mum.	Mini- mum.	Means.			
			Oct. 16	Oct. 23	Oct. 30	Nov. 6			Oct. 16	Oct. 23	Oct. 30	Nov. 6			Oct. 16	Oct. 23	Oct. 30	Nov. 6
The Gaslight and Coke Company—																		
Notting Hill*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Camden Town	17.5	15.8	16.3	16.7	16.7	17.1	19.4	10.4	12.5	14.0	14.9	15.2	0.2	0.0	0.0	0.0	0.0	0.1
Dalston	16.8	16.1	16.6	16.5	16.6	16.5	18.0	12.0	12.5	13.5	14.5	16.1	0.1	0.0	0.0	0.0	0.0	0.0
Bow	17.3	16.1	16.7	16.5	16.7	16.8	8.9	5.4	7.1	6.2	7.7	7.9	0.4	0.0	0.0	0.0	0.1	0.0
Chelsea (Fulham)	17.0	16.2	16.7	16.4	16.3	16.4	13.2	8.2	10.7	12.0	10.9	10.7	0.5	0.0	0.2	0.3	0.2	0.2
Do. (Nine Elms)	16.5	16.1	16.1	16.2	16.4	16.4	11.7	7.9	9.3	9.1	9.7	11.5	0.5	0.1	0.1	0.3	0.2	0.4
Kingsland Road	17.2	16.2	16.5	16.8	17.1	16.8	14.1	8.7	11.1	10.7	10.5	11.4	0.3	0.0	0.1	0.1	0.0	0.0
Charing Cross (48-inch main)	17.1	16.0	16.4	16.3	16.8	16.6	12.1	8.7	10.9	9.7	10.0	9.6	0.4	0.1	0.3	0.2	0.2	0.2
Do. (district main)	17.0	15.9	16.6	16.3	16.3	16.8	11.9	8.1	10.0	9.6	10.2	10.7	0.3	0.1	0.2	0.2	0.2	0.2
St. John's Wood	17.0	15.5	16.7	16.2	16.7	16.2	11.6	8.6	9.2	9.9	10.8	10.6	0.6	0.2	0.4	0.3	0.4	0.4
Lambeth Road	17.3	16.2	17.2	16.5	16.5	16.5	13.9	9.7	10.9	11.2	12.3	11.2	0.5	0.0	0.3	0.3	0.3	0.4
Holloway	17.2	15.3	16.1	16.0	16.6	16.7	12.6	9.5	10.6	10.9	11.4	11.3	0.6	0.1	0.3	0.2	0.3	0.3
Westminster (cannel gas)	21.0	20.2	20.7	20.6	20.6	20.5	11.9	8.2	10.9	9.4	10.7	10.8	1.4	0.2	0.3	0.5	0.8	0.5
South Metropolitan Gas Company—																		
Peckham	16.8	16.1	16.6	16.3	16.5	16.6	13.9	9.3	11.4	11.0	11.0	10.8	0.3	0.0	0.1	0.0	0.1	0.1
Tooley Street	16.7	16.3	16.6	16.6	16.7	16.6	17.8	9.3	10.0	11.7	10.1	10.4	0.4	0.0	0.2	0.1	0.1	0.0
Clapham	17.0	16.0	16.4	16.5	16.1	16.4	21.0	8.6	9.8	9.9	9.6	14.2	0.8	0.0	0.2	0.1	0.0	0.2
Lewisham	16.7	16.0	16.4	16.2	16.4	16.5	17.0	6.1	7.6	9.9	8.9	7.0	0.0	0.0	0.0	0.0	0.0	0.0
Blackfriars Road	16.8	15.9	16.2	16.1	16.4	16.2	13.6	8.1	11.2	9.2	9.5	12.1	0.5	0.0	0.2	0.1	0.2	0.2
Commercial Gas Company—																		
Old Ford	17.6	15.7	16.5	16.3	16.4	16.8	10.6	6.4	8.7	8.7	9.0	8.5	0.3	0.0	0.0	0.0	0.1	0.1
St. George's-in-the-East	16.8	16.0	16.5	16.4	16.4	16.6	16.2	7.0	10.3	12.4	8.1	9.1	0.6	0.2	0.3	0.4	0.3	0.4

SULPHURETTED HYDROGEN.—None on any occasion. PRESSURE.—In excess on all occasions.
Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 22 grains in 100 cubic feet of gas; ammonia not to exceed 4 grains in 100 cubic feet of gas. Pressure between sunset and midnight to be equal to a column of 1 inch of water; between midnight and sunset, 6-10ths of an inch.

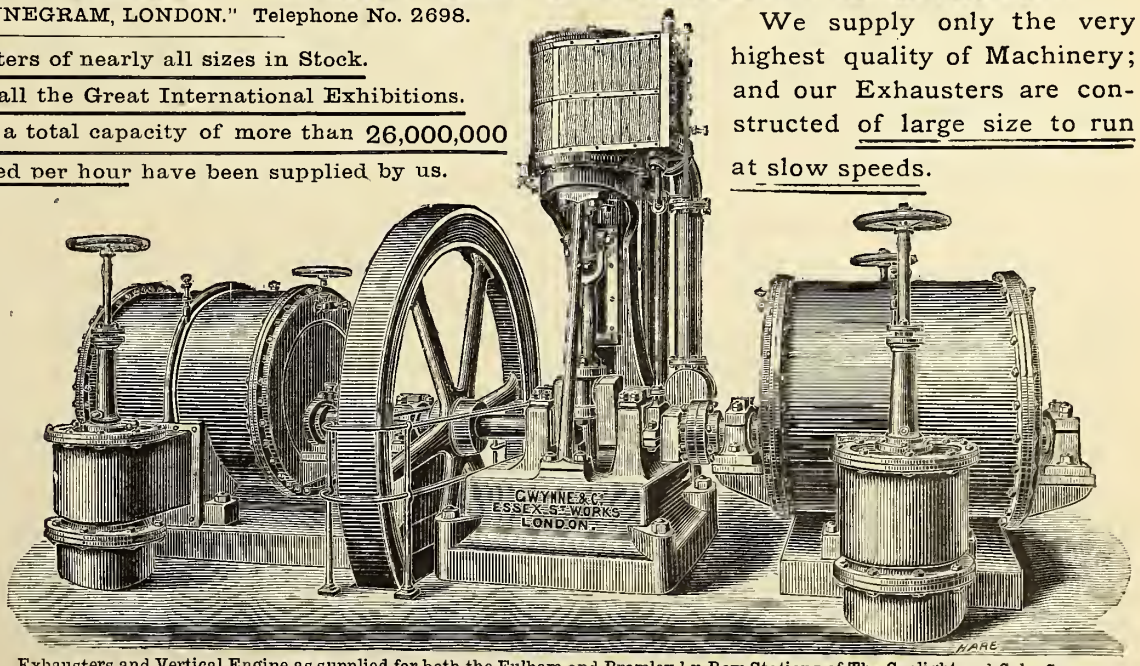
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(BY ORDER OF THE ROYAL COLLEGE OF SURGEONS.)
CRYSTAL PALACE DISTRICT.

SALE OF GAS SHARES.

THURGOOD AND MARTIN have received instructions to Sell by Auction, at the Auction Mart, Tokenhouse Yard, E.C., on Thursday, the 6th of December, 1888, at Two o'clock precisely, in 219 lots *cum* dividend, £24,780 in the STOCK OF THE CRYSTAL PALACE DISTRICT GAS COMPANY, producing Dividends at the rate of 10 per cent., 7 per cent., and 6 per cent. respectively; also 375 £6 FULLY PAID 7 PER CENT. SHARES in the Capital of the same Company, which is a specially safe and easy investment for large or small sums, the dividends being secured against fluctuation by ample Reserve and Insurance Funds, and the increasingly profitable district of the Company.

Particulars and Conditions of Sale may be had of Messrs. WILDE, BERGER, and MOORE, 21, COLLEGE HILL, E.C., Solicitors; at the PLACE OF SALE; and of the AUCTIONEERS, 27, CHANCERY LANE, W.O.

TO GASHOLDER MAKERS.

THE Gas Committee of the Corporation of Blackpool are prepared to receive TENDERS for the FITTING of the LOWER LIFT to a GAS-HOLDER 130 feet diameter by 32 feet deep.

Drawings and Specification may be seen at the Office of the undersigned.

Tenders, endorsed outside, to be addressed to the Chairman of the Gas Committee, and sent in by Saturday, the 24th of November.

By order,

JOHN CREW, Gas Engineer.
Gas-Works, Blackpool, Nov. 12, 1888.

BOROUGH OF BARROW-IN-FURNESS.

TAR AND AMMONIACAL LIQUOR.

THE Corporation are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR produced at their Gas-Works from the 1st of January next to the 31st of March, 1890.

Approximate quantity: Tar, 850 tons; Lignor, 1800 tons—delivered into Contractors' Tank-Wagons at the Gas-Works Siding.

Tenders for Tar to be at per ton; tenders for Lignor to be at per ton of various strengths—viz., 4½, 5, 5½, and 6 degrees of Twaddell's Hydrometer when tested at a Temperature of 60° Fahr.

Any further information may be obtained on application to Mr. W. FERGUSON, Manager, Gas and Water Works, Barrow-in-Furness.

Sent tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Tar and Lignor," to be delivered at the Town Clerk's Office on or before the 20th inst.

The highest or any tender not necessarily accepted.

By order,

C. P. PRESTON, Town Clerk.
Town Hall, Barrow-in-Furness, Nov. 1, 1888.

TIMMIS & CO., of STOURBRIDGE

Make only the best quality of FIRE-CLAY RETORTS, BRICKS, TILES, & LUMPS. Also SPECIAL SILICA BRICKS, to stand great heats. All descriptions kept in Stock.

For Prices apply to JAMES LAWRIE AND CO., 63, Old Broad Street, E.C., Sole Agents for London and District. Telegraphic Address: "EIRWAL, LONDON."

ALEX. WRIGHT & Co., 55, 55a, and 56,

MILLBANK STREET, LONDON, S.W.
[Telegraphic Address: "PRECISION LONDON."] Makers of Wet and Dry Gas-Meters, Station Meters and Governors, Photometers, and Gas-Testing Apparatus, Test Gasbolders and Meters, Registering and other Gauges, &c., &c.

* * See Advertisement on Page III. of the Wrapper of last week's issue.

W. C. HOLMES & Co., Huddersfield,

AND 80, CANNON STREET, LONDON.
Contractors for Gas-Works complete, Makers of Gas-holders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.

* * See Advertisement p. 863 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

ACETATE OF LEAD BOOKS.

TEST Papers and Solutions for Gas-Works prepared by R. D. Gibbs, Summerfield Crescent, Birmingham.

Analysis of Coal, Oxide, and all Gas Materials.

TO GAS MANUFACTURERS AND OTHERS.

THE Directors of the Newark Gas Company have for SALE by Private Treaty disused Plant in consequence of enlargement of Works, comprising:—

Station Meter and Governor passing 10,000 cubic feet per hour, with 12-inch connections.

One Single-Lift, Holder capable of holding 21,000 cubic feet, with 8-inch connection.

Washer-Scrubber, vertical, by Newton, Chambers, and Co., 5 length, total length 25 feet, with 9-inch connections and shut-off valve.

Six Condensers, 2 feet diameter, with cups and dips complete.

Four Purifiers, 9 feet square, with centre-valve. The above can all be seen at the Newark Gas-Works, and further particulars and prices obtained on application being made to me.

Newark, Nov. 8, 1888. C. C. FOOTITT, Secretary.

FIRE-CLAY GOODS.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for the supply of FIRE-CLAY GOODS (Retorts, Bricks, &c.) required for Repairs at their Neepsend and Eppingham Street Stations during the next Twelve months.

Specifications and forms of tender may be had on application at the Company's Offices.

Tenders, marked "Tender for Fire-Clay Goods," must be delivered to the undersigned not later than Monday, Dec. 3, 1888.

HANBURY THOMAS, General Manager.
Commercial Street, Sheffield,
Nov. 10, 1888.

CORPORATION OF LEICESTER.

RETORTS AND FIRE-BRICKS.

CONTRACT No. 10.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for a supply of RETORTS and FIRE-BRICKS.

Specification, quantities, and form of tender can be obtained upon application to the Engineer.

Tenders, addressed to the Chairman, and endorsed "Tender for Retorts, &c.," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, Dec. 8 prox.

The Committee do not bind themselves to accept the lowest or any tender.

ALFRED COLSON, C.E.,
Engineer and Manager.

Gas Offices, Millstone Lane,
Leicester, Nov. 10, 1888.

BAHIA GAS COMPANY, LIMITED.

NOTICE is hereby given, that the Ordinary HALF-YEARLY GENERAL MEETING of this Company will be held at the Company's Offices, Nos. 7 and 8, 101 Lane, London, on Thursday, the 22nd day of November, 1888, to receive the Report of the Directors, the Balance Sheet confirmed by the Auditors, and for General Purposes.

The Chair will be taken at Three o'clock precisely.

By order of the Board,
ALFRED J. HEAN, Secretary.

Nov. 12, 1888.
The Transfer Books are closed from the 8th to the 22nd inst., inclusive.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

(INCORPORATED BY ACT OF PARLIAMENT.)

NOTICE is hereby given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Association was held at the City Terminus Hotel, Cannon Street, London, on Tuesday, the 6th inst.

Sir JULIAN GOLDSMID, Bart., M.P., in the Chair, when the following resolutions were unanimously passed:—

"That the Report of the Directors upon the affairs of the Association be received, adopted, and entered upon the Minutes."

"That a Dividend of £5 per cent. for the Half Year ended the 30th of June last be declared upon the £3,800,000 Stock of the Association; and that the same be payable free of Income-Tax on and after the 1st of December next."

"That the cordial thanks of the Meeting be given to the Directors for their able management of the affairs of the Association; to the Chairman, for his conduct in the chair this day; to Mr. H. V. LINDON, Mr. L. G. DRURY, the Agents, Engineers, and other Officers of the Association on the Continent; and to the Secretary and the London Staff."

By order of the Board,

R. S. GARDNER, Secretary.
30, Clement's Lane, Lombard Street,
London, E.C., Nov. 7, 1888.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased. 120 and 121, NEWGATE STREET, LONDON, E.C.

TUBES.

FOR Gas, Steam, and Water; Galvanized, White Enamelled, and Hydraulic Tubes and Coils
JOHN SPENCER, Globe Tube Works, WEDNESBURY and 14, Great St. Thomas Apostle, LONDON.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID for making SULPHATE OF AMMONIA of high quality and colour.

Highest References and all particulars supplied on application.

HUTCHINSON BROTHERS, Barnsley,

Gas Engineers and Contractors, Makers of Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Tools, and Sundries.

* * See large Advertisement in last week's issue, page 738.

EAST LONDON WATER-WORKS COMPANY.

ISSUE OF NEW CAPITAL.

NOTICE is hereby given, that the Directors are prepared to receive TENDERS for £53,000, being the third portion of the New Perpetual Debenture Stock of the Company, to bear interest at 4½ per cent. per annum, free of Income-Tax, such tenders to be delivered at the Company's Offices, St. Helen's Place, in the City of London, not later than Four p.m. on the 3rd day of December, 1888, and payment of accepted tenders made on the 22nd of December.

Particulars and conditions, together with form of tender, may be obtained at the said Offices, or will be forwarded on application.

By order of the Court of Directors,
ISAAC ADOLPHUS CROOKENDEN,
Secretary.

St. Helen's Place, London, E.C., Nov. 1, 1888.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Invention may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries. Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street WESTMINSTER.

BELGIAN CLAY RETORTS.

J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London and other cities to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communications addressed to J. Sugg & Co., GHENT, will receive immediate attention.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on application.

THE ONLY RELIABLE

DRY CENTRE-VALVE,

WORKING ONE, TWO, THREE, OR FOUR PURIFIERS ON AT THE TIME.

Also MADE FOR TWO OR THREE PURIFIERS.

No Springing. No Leakage. No Foul Gas passed in Changing. Special Facility for Blowing the Air out of the Fresh Box before putting in Action, without driving it forward into the Holders.

Write for Prospectus.

Also DOUBLE-ACTION DOUBLE-FACED GAS & WATER VALVES.

F. WECK, 86, NEW STREET, BIRMINGHAM.

GEO. WELLER & CO.,

Consulting & Contracting Gas Engineers,
SUFFOLK HOUSE,

LAURENCE POUNTNEY HILL,
CANNON STREET, LONDON.

GAS-WORKS LEASED

On Special Terms or Guaranteed Dividends.

Contractors for the Erection of New and Remodelling of existing Gas-Works from own or Engineers' Drawings.

25 Years' experience in Gas Manufacture and Distribution in London and the Provinces.

ESTIMATES GIVEN.

Agents for Fire-Clay Goods and other Gas-Plant. Also for Foreign Gas Companies.

All Communications to be addressed to the Firm.

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THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 20, 1888.

THE REPORT OF THE STANDARDS OFFICE.

THE annual report by the Board of Trade on their proceedings and business under the Weights and Measures Act, 1878, has been presented to Parliament. Mr. H. J. Chaney, the Controller of the Standards Department, generally contrives to make his annual statements worth looking into; and this year's is no exception to the rule. The report as a whole gives one the impression that this particular Government department is very well occupied. It shows that the Standards Office is employed in the verification of weights and measures not only for the United Kingdom and its colonies and dependencies, but also for the world at large; for in regard to gas-measuring apparatus, we learn, from the first page of the report, that such apparatus has been verified during the year for "the city of Stockholm and the town of Kalmar, in Sweden," in addition to other places with more obvious claims upon the British standards officials. It is advisable to remark, before entering into the examination of the details of this report, that a measure is now before Parliament, and

was to be read a second time last night, for amending the law relating to weights and measures in sundry respects that have been recognized as desirable in previous reports. One of the divisions of this Bill relates to the sale of coal. It provides that all coal shall be sold by weight only, under a penalty of £5 for transgressions of the law. Coal retailed in sacks must be in weights of 2 cwt. downward, in aliquot parts of the hundredweight. Regulations are also included for the retailing of coal in bulk, and defining the powers and duties of local authorities in respect of dealings in coal. The Bill contains clauses relating to the weighing or measurement of various commodities; among others providing that the Board of Trade shall from time to time cause to be made and verified any required new denominations of standards for the measurement of electricity, temperature, pressure, or gravities. It is a purely administrative Bill; and it is to be hoped it will become law in the current session of Parliament.

To return to the substance of the report, we notice a paragraph which states that the suggestions drawn up by the Department with reference to the sizes of screw-threads and connecting-pipes to be adopted for gas-meters have met generally with the approval of those practically interested; and a list of the several standard sizes finally agreed upon is attached. It may be remembered that the opinion of the Council of The Gas Institute, as representing the gas industry of the country, was asked upon this matter; and a reply delivered to the effect that the standardizing of gas-meter unions would be desirable. Accordingly a page of the appendix to the report is devoted to illustrations and descriptions of the steel gauges made for meter connections, and to figures explanatory of the form and construction of the union-fittings. It may be trusted that the step thus taken by the Standards Office will prevent for the future a good deal of the trouble that has been experienced in the past in making good meter connections. The Department has also paid attention to the testing of weighbridges, especially such as are employed for weighing coals in trucks. In Lancashire alone over 300 weighing-machines at collieries have been examined during the past year; but it is recognized that the thorough examination of such machines is not often practicable. The report goes on to state that representations have been made as to the want generally of a better system of testing and inspecting all weighing-machines used in trade. In many districts the local authorities do not possess the requisite means of testing weighbridges; and consequently the law relating to the testing of such machines must remain a dead letter. It is declared—and the statement is a very grave one to appear in such a document—that "fraud and trickery in the use of weighing instruments appears to be increasing; and it rests with local authorities, by a systematic inspection, to see that sellers who do not resort to fraud or trickery have that protection which it is the intention of the law to afford them against the unfair competition of those who sell by false weight." Respecting the due testing of weighbridges, it is pointed out in the course of the observations of the Superintendent that it is desirable to do this with verified standard weights only; but it is not easy to get in all districts the ton of such weights declared to be desirable for making the test. Iron is not a very suitable material for standard weights; but it is cheap. Gun metal would be better; but local authorities will not go to the expense, and therefore inspectors are obliged to do the best they can with iron, although it is admitted to be liable to damage under the rough handling to which it is exposed, as well as to rust. It is remarked that a weighbridge ought to turn with a weight of about 4 lbs.; but no hard-and-fast rule is laid down on the point.

The observations of the Superintendent upon matters that have been referred to the Standards Office during the year are sometimes very interesting. Among these remarks we read that a question as to the legality of the measure of a "chaldron" having arisen, it has been pointed out that the Act permitted the use of such a denomination. The chaldron is defined as containing 36 imperial bushels, not heaped, but filled in all parts as nearly to the level of the brim as the size and shape of the article measured will permit. Our readers do not need reminding how awkwardly the legally-enforced obligation to "strike" the imperial bushel measure applies to such a lumpy commodity as coke. It is observed that there is nothing in the Act to require dry measures of capacity to be of any particular shape.

A variety of interesting matter of a scientific order is to be found in the appendices to the report. Thus the comparison of length between the metre and yard is made the subject of

a special note. It appears to be almost practically impossible to duplicate standards, or to obtain an exact comparison between the metre and yard measures; the latter question being further complicated by the consideration that, whereas the standard yard measures a true yard only at the temperature of 62° Fahr., the standard metre only measures a metre at 32° Fahr. It follows from the tests of the Standards Office that the only means of ascertaining the exact comparative lengths of the English and French standards of lineal measure would be by examination of the two standards side by side; and as the English standard cannot be exported, nor is it likely that the French one can be borrowed for this purpose, the matter rests with an approximate determination. There is one thing that we miss from the report; and that is the question of photometrical standards. Is anything to be done at any time to replace the discredited candle with a more reliable standard? There have been enough reports upon the subject; but there is no sign of any positive action in the matter such as the Board of Trade could very easily institute. The Board have promoted the Weights and Measures Amendment Act already referred to in this article; but although taking power to formulate standards for the measurement of "electricity, temperature, pressure, or gravities," as the phraseology of the Bill states it, there is not a word about standards of illuminating power. It may be as stated on many occasions that special action is required to dethrone the sperm candle legalized by so many Acts of Parliament, and to set up anything else in its place; but the subject might at least have found passing mention in the report, considering how the Metropolitan Board of Works have assisted the Board of Trade by inquiring into the merits of the candle and its possible substitutes. We understand that the authorities responsible for the examination of the gas supplied to the Metropolis have arranged for the regular trial of different proposed standards by the gas-testing officers at several photometrical stations. This is a point which the Board of Trade should take note of, with a view to glean information respecting the behaviour in ordinary usage of such standards as may be substituted for the candle. It is possible that the Department may prefer to observe how pentane works for a year in two or three testing stations before taking steps to legalize its use upon recommendations based on special investigations. What we are complaining of, however, is the complete silence of the report regarding this question, which is certainly one of the most important and pressing of the affairs that may be assumed to be now under the notice of the officials of the Standards Office. The Department cannot require further inquiry into the matter; but it is possible, as we have recognized, that some experience may be sought before action is taken. Another year cannot pass, however, without this business being settled in one way or another. Either candles must be retained *faute de mieux*, notwithstanding their shortcomings, or pentane will come to the fore. The existing state of uncertainty cannot be indefinitely protracted. Has Mr. Chaney taken notice of what Mr. Dibdin said at the last Gas Institute meeting respecting the condition of gas testing in London? His declarations on this occasion constituted a grave impeachment of the system under which the shortcomings which he then mentioned have become possible. And this trouble can be so easily remedied, if the Board of Trade once satisfy themselves that the time for legislative action has arrived. A short departmental Bill could be passed through Parliament without any appreciable difficulty; and the existing unsatisfactory condition of things, which amounts to a scandal and a reproach to modern science, would be at an end. If such action is not to be taken, one would like to know some better reason for letting things alone than is at present apparent.

PROPOSED LEGISLATION RESPECTING "COMMISSIONS."

The report of the Royal Commission on the proceedings of the Metropolitan Board of Works, to which we have already referred in a previous issue, terminates with an important recommendation on the subject of "commissions." It is suggested that, in view of the facts elicited by the inquiry, it might have a wholesome effect if it were distinctly made a criminal offence to offer to any member or official of a public body any kind of payment, fee, or reward having any relation to the affairs of the body in question; and also to make the acceptors of such payments amenable to the criminal law. The Commissioners do not propose any definite plan for legislation upon this subject, but suggest that the provisions of the Corrupt Practices Act might be taken as a model. This recommendation of the Commissioners is not to be

allowed to pass unnoticed, for Lord Randolph Churchill has already notified his intention of stirring up the Government to take action in the matter. It is to be hoped that something will be done to deal with the evil of which such glaring examples came under the notice of this Commission; but we fail to see why remedial measures should be confined in their application to members or officials of public bodies. The mischief pervades all departments of trade and manufacture, as well as official life; and to attempt to keep it out of the latter, while allowing it to rage unchecked through the remainder of the business community, would be as idle as to think to keep the cattle plague out of one particular field of an estate while its victims surrounded it on every side. The evil must be legislated for as a whole; or not at all. There is no particular difficulty in the way. It has only to be enacted that any person occupying a position of trust, in which he has power or influence over the outlay of money belonging to other people, or in any way acts on behalf of others, who receives payments of money or private benefits of any kind in relation to the affairs of his employers or those whom he represents, shall be guilty of a criminal offence. The same would, of course, apply to anybody who offers or pays any such private or secret considerations intended to influence business. Surely, some member of Parliament, if not the Government, could undertake a work so badly needed as this. The "commission" system has many ramifications and disguises, but it all comes back to the central idea of a private payment to an agent in connection with the affairs of his principal; and the law that effectually grapples with the evil must apply to all occupiers of a wholly or partially fiduciary office, from members of Parliament and of local governing bodies down to shopmen. There is no branch of industry or department of official life in which an honest man is not liable to be injured by the venality of his fellows. It is in the interest of honest agents not less than in that of principals, that stringent and effectual legislation is urgently called for. So long as it is possible for the "pickings" or perquisites of an office to be recognized as natural accessories to the salary attached to it, so long will a deaf ear be turned to the complaints of poor pay emanating from salaried officers popularly supposed to be favourably situated for gathering such "unconsidered trifles." How often is the remark heard in all classes, and with regard to appointments of every degree: "The salary is rather small, it is true; but that is not all." If salaries attached to official positions are to be improved, it will be only by virtue of the prevalence of a clear understanding that the holder has nothing more to rely upon. It should scarcely be necessary to insist upon the importance of bringing the payers of "commissions" under the same ban as the receivers. The Corrupt Practices Act, to which allusion has been made, would have vainly attempted to check corruption on the part of voters if it had not fixed the heaviest responsibility upon the candidates. Similarly, if the acceptance of illicit "commissions" should make the receiver liable, under a new Act, to a maximum term of imprisonment without the option of a fine, the maximum punishment allotted to the payers of the commission should be at least double. This would make the whole tribe of bribing traders pause in their wicked courses, and would result in the end in materially altering the course of business, because quality of goods and honest prices would for the first time have fair play.

REMARKABLE RESULT OF A LEAK OF GAS.

A CURIOUS case, arising out of a leak of gas from a main, has just been heard by Mr. Justice Denman and a special jury, and will be found reported elsewhere. The plaintiff was a solicitor residing at Carshalton, and the defendants were the local Gas Company. It appeared from the evidence that in October, 1885, the plaintiff discovered a leakage of gas into his wine-cellar, and also in certain parts of his grounds. He thereupon alleged that damage amounting to £70 or £80 was done to his wine by the escaped gas, and that he was put to serious expense in other ways in consequence of the undesirable entrance of gas upon his premises. It is impossible to form any but a particular opinion of such claims as these; and the Company's case—that while admitting the fact of the escape of their gas in the manner stated, the amount of damage done thereby was grossly exaggerated—reads like obvious common sense in comparison. At all events, this was the view of the jury, who decided that there had been no negligence on the part of the Company, and that £5 would cover all the damage. Upon this finding

application was made for judgment to be entered for the defendants with costs; and this was done. The gentleman who was so unfortunate as to keep a cellar full of wine that could be destroyed by an accidental leak of gas, is probably sorry that he did not act differently when he found himself in collision with the Gas Company. It is letting him off very easily to say merely that his claim was "grossly exaggerated;" but remembering how severely he must have been punished in pocket by the failure of his suit, it is impossible to say hard things of him by way of comment. If he made a mistake, he has been forced to suffer for it.

Water and Sanitary Affairs.

THE time-honoured custom of "straining at gnats" and "swallowing camels" is so dear to the official mind, that it would be rash to expect that prompt action will be taken to check the increased pollution of the Thames. Of the gigantic nuisance at Staines, which has now received judicial sanction, and of the wholesale poisoning process proposed to be inaugurated at Weybridge and Shepperton, the JOURNAL has already had something to say. But, in regard to a matter of such vast and vital importance, we shall deem it our duty to say a good deal more. It will be interesting to see how far we shall have the co-operation of our daily contemporaries in drawing public and official attention to the present condition of things, and to the still more appalling prospects of river pollution in the not far-distant future. The daily press is ever ready to give prominence to the supposed delinquencies of the Water Companies. When any trumpety dispute arises between one of the Companies and a consumer, the most is always made of the occasion; and straightway the Companies are pilloried, in the character of greedy and exacting monopolists. Now, therefore, is the time for our contemporaries to show a just and consistent public spirit; and for aiding the Metropolitan Water Companies to secure for their millions of consumers a supply of water, which ought not to be, and need not be, contaminated. The present situation may be described as a tussle between the general public and those whose duty it is to preserve public health, on the one hand, and the rulers of a few ill-managed townships on the other. Hitherto, owing to obstinate adherence to masterly inactivity, and a selfish disregard of the interests of the Metropolitan community, the victory has remained with the minority. Indeed the champions of this great prescriptive nuisance have been strengthened in their position by the recent judgment of Justices Field and Wills. Because their great-grandfathers knew nothing, and cared less, about the principles of sanitation, and loved the old-fashioned method of disposing of sewage by sending it into the nearest stream, those who came after them discover that they can with impunity go and do likewise. Surely this position of affairs, and its inevitable consequences, need only to be thoroughly realized in order that a remedy may be found for a scandal and a danger likely to become intolerable.

It is quite clear that the existing machinery of the law is not capable of coping with the enormous evil complained of. This fact is sufficiently demonstrated by the story of the Staines case. Since September, 1879, the battle between the Local Board of Staines and the Thames Conservators has been persistently maintained. Summary prosecutions have produced no effect; and now even the tedious and costly proceeding by way of indictment has come to nothing. What is to be the next step? To attempt to set the Chancery Division of the High Court to work against the Staines Local Authority would probably involve a large waste of public money and valuable time. Only one remedy will, in our judgment, meet the exigencies of the case—a remedy by Act of Parliament. The interests of Londoners at large must be protected, even if the privileges of a few individuals have to be extinguished. Public policy, apart from pure morality, is against the wholesale poisoning of one's neighbours; and it is to be hoped that the Government will realize and act upon this view before the mischievous effects of river pollution reach a still more sinister stage of development.

To go to the root of the matter, it will be necessary to amend the provisions of the Thames Conservancy Acts. They have been "weighed in the balance" again and again and found wanting; and the present year ought not to be allowed to close without the necessary amendment being provided. A very short Act should be enough for immediate purposes; and there are few, if any, Bills now under the consideration of Parliament which have a stronger claim on the attention of the Legislature, than would be possessed by a practical measure aiming at the preservation of the health of the

Metropolis. We go so far even as to say that if no other method of abating the nuisance can be found, it should be enacted that any person who, after reasonable notice, causes or wilfully permits sewage from his premises to flow into the river should be liable to imprisonment without the option of a fine. Exceptional diseases always demand exceptional methods of cure; and though it might be complained that the suggested form of punishment would be too drastic in its character, we should not fear that many persons would find themselves in durance vile by reason of the passing of such an Act. When it became manifest that they had reached the end of their tether, they would find it both practicable and convenient to mend their ways. In the meantime any larger measure required for the purpose of conferring adequate powers on Local Boards might be carefully considered and intelligently framed. The penal clauses of the Thames Conservancy Acts stand condemned by practical experience of their working. The Acts of 1857, 1864, and 1866, which are to be read as one enactment, enable penalties to be recovered summarily. These penalties may be levied by distress; and, in default of distress, there may be imprisonment. But imprisonment has never been inflicted. Penalties are imposed and paid, and the nuisance has abated not one jot. The theory of the Conservators has been that they had nothing to do with individuals who contributed to the pollution of the river. The Staines Local Board, on the other hand, disclaimed—and successfully disclaimed—responsibility for what those individuals had done, and were continuing to do. There the matter stands; but there it must not be allowed to rest. While legal luminaries are splitting straws, a great wrong is being done to the inhabitants of London; and, if that wrong can only be rectified by abolishing the prescriptive rights of a few property owners to jeopardize the health of the population, the remedy must, nevertheless, be applied, and, assuredly, the sooner the better.

THE Metropolitan Gas Referees have certified that the new testing station in the district of the South Metropolitan Gas Company—at No. 211, Burrage Road, Woolwich—has been fitted up by the Company with proper apparatus, and is now ready for use.

MR. W. CROOKES has presented to the Department of Science and Art a collection of 68 radiometers and similar instruments, for permanent exhibition in the science galleries of the South Kensington Museum. They illustrate the steps by which he was led to the construction of the radiometer, and to the production of motion and of phosphorescence by streams of electrified molecules in high vacua. Many of the instruments are of the greatest historical interest. Among them is included the first radiometer, with many others, which are described in Mr. Crookes's papers in the "Philosophical Transactions of the Royal Society." Nearly all the instruments are in working order.

AMONG the financial schemes of the past week was one launched by Messrs. Baring Bros. and Co., under the title of the Buenos Ayres Water Supply and Drainage Company, Limited, with a capital of £3,500,000, in £10 shares. Later on it is proposed to issue 4 per cent. debentures to the amount of £5,000,000. Our readers will remember that an intimation of the appearance of this project was given in the JOURNAL last week. The Company is formed to take over the concession obtained by Messrs. Samuel B. Hale and Co. from the Argentine Government, for the acquisition and completion of works for the water supply and drainage of Buenos Ayres. The works are to be completed within three years; and under the terms of the concession, the Government are to be paid the sum of £4,200,000, being the amount stated to have been expended during the last 15 years, exclusive of interest. It is estimated that 50,000 houses in the city will be connected with the Company's service, and that the rates therefrom will produce about £720,000 per annum.

ON the occasion of the visit of the Prince of Wales to Derby last week, as the guest of Lord and Lady Hindlip, at Doveridge Hall, and to attend the Derby races, an elegant luncheon-room at the grand stand, which was prepared for his use under the superintendence of Mr. Henry Boden, deserves a passing notice in our columns, as an example of the excellent effect which may be obtained by the judicious use of the "Foo-chow" enamel manufactured by Messrs. Donald Macpherson and Co., of Knott Mill, Manchester. The room was a most successful representation of an old baronial dining-room, with furniture and appointments in keeping; the walls being covered with deal wainscoting made to represent old oak by the aid of the above-named material. Above was a frieze of canvas enamelled with "Foo-chow" dead gold, in imitation of "cloth of gold." Also by means of the enamel, two large round luncheon tables were converted into "old oak;" while an ordinary conventional ceiling was clothed with ribs and bosses which, to all appearance, might have belonged to an Elizabethan or Early Tudor dwelling. The fireplace was of Coalbrookdale iron; but, by the aid of "Foo-chow," it was made to look like majolica. The whole of the decorative work was carried out by Mr. Macpherson and Mr. Boden conjointly, and reflected great credit on their taste and ingenuity.

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET. (FOR STOCK AND SHARE LIST, see p. 905.)

A short week and a flat one was that which, for the Stock Exchange, closed on Friday—the house being shut for repairs on Saturday. Every market and almost every stock (except those in which special gambling is going on) has been flat; and “Goschiens” closed on Friday at the lowest figure, we believe, they have touched—viz., 96½. The Money Market is in a somewhat anomalous condition; and things generally are out of joint. The Gas Market, on the whole, has been much calmer; and business has been less extensive. An agreeable feature is the recovery of Gaslight “A,” which very steadily and progressively advanced day by day from 246 on Monday until the final mark on Friday was 252. The nominal quotation shows a rise of only 2½; but actual transactions were more than once recorded at figures above the top price. South Metropolitan are down; but they were standing relatively higher (as we remarked last week) than the other Metropolitan Companies, and would bear a little reduction. The “A” was done on Friday at 299; and it is many a day since it changed hands below 300. The “B” fell 2, but recovered 1 on Friday; the final price being the best of the week—as in the case of Gaslight “A.” The quotation of Commercial has not moved; but transactions have been marked at rather lower figures. We believe this was caused by a quantity of stock being thrown on the market to close an executorship account. The cause being removed, an improvement in price may be looked for. The Commercial Company are just now inviting tenders for £8766 debenture stock, the unappropriated balance of their last issue, at not less than £123 per £100 stock. This seems a moderate price to buy such a high-class security at, free of commission and stamp duty; and the stock ought to realize mere. Suburban Companies offer nothing for remark. Of the Foreign undertakings, Bahia has gone up ½, upon a better state of things being apparent in the accounts; but San Paulo is ½ weaker. Bombay, Buenos Ayres, and Imperial Continental are quoted *ex div.*, at about equivalent figures. Business in Water has been quieter; but all stocks show out very firm. All variations in quotation are upward; comprising an advance of 3 in each of the Southwark issues, and 2 in West Middlesex and Lambeth 7½ per cents.

The daily operations were: On Monday, Gas was moderately active; but prices were very fair, except for South Metropolitan—the “A” falling 2½, and the “B” 2. Water was quite neglected; but West Middlesex and Lambeth 7½ per cent. rose 2 each. Gas was quieter on Tuesday, with greater firmness in Gaslight “A,” which improved 1½. Very little done in Water, at previous figures. Wednesday was rather more active for gas; and Gaslight “A” rose 1 more, but South Metropolitan “A” fell 3. In Water, Southwark ordinary rose 1. Thursday was the busiest day of the week; and Gaslight “A” was still on the upward march; but the “C,” “D,” and “E” fell 1. Water was quiet and unchanged. Activity in Gas continued on Friday, with a marked tendency to improve. South Metropolitan “B” recovered 1; and Bahia rose ½. In Water, Southwark ordinary rose 2 more, and 7½ per cents., 3.

ELECTRIC LIGHTING MEMORANDA.

THE GROSVENOR GALLERY ELECTRIC LIGHTING STATION—A MISLEADING STATEMENT—ELECTRIC LIGHTING IN AUSTRALIA—THE FORTUNES OF THE FAURE COMPANY.

For the first time since its establishment, the Grosvenor Gallery electric lighting station has been shown to representatives of the press; and last week's *Industries* contains a full account of this remarkable installation. Through good and evil report, the managers of this undertaking have persevered in their attempt to make the Gaulard and Gibbs system a working success, until they have not only secured the largest and probably most profitable electric lighting business in England, but have also ascertained by experience the necessary data on which to plan the Deptford station recently mentioned in this column. When that establishment is in working order, the Grosvenor Gallery station will probably be superseded. It will then have served its purpose, and the removal of the generating factory from Bond Street will be a welcome change for all concerned. We cannot withhold an expression of respect for the quiet, determined, and businesslike way in which, on the whole, this Grosvenor Gallery experiment has been carried out. While other electricians have been lecturing all over the country, and telling what wonders they could do if only the “infamous” Electric Lighting Act of 1882 would permit them, the Grosvenor Gallery managers were pushing trade and gaining experience as though no such enactment had been in existence; thus justifying the position always taken up by the *JOURNAL*, that there was nothing in the Act to deter honest enterprise, whatever obstacles it might put in the way of merely speculative ventures. Now that the Act has been amended it is the Grosvenor Gallery people who are ready to take advantage of it first; though we are not by any means sure that they would not have started larger works even if there had not been any alteration of the law, since their business required better accommodation. The practical success of the station has apparently been largely due to the care and skill of the electrician-engineer in charge, Mr. S. Z. de Ferranti, who succeeded to the post in the beginning of 1886, when the station supplied only 1000 lamps in all. At that time the original Gaulard and Gibbs system was

in use; but Mr. Ferranti soon modified this order of things, and introduced a transformer of his own. At present the collective energy of the steam-engines working at this station is 1600-horse power. About 280 customers are supplied, taking 1400-horse power of electrical energy. At the moderate estimate of 10 lamps per horse power, this would mean 14,000 lamps in all—a very different estimate from the 60,000 lights which the station has been reported in some quarters to be supplying. It is not to be wondered at that the Grosvenor Gallery experiment—being well managed, and giving a fairly good light—should have prospered to this extent in such a choice neighbourhood as Bond Street. The lowest charge to any consumer, however small, is £20 per annum, which, as the writer in *Industries* is forced to admit, “is likely to act as a deterrent to very small consumers.” The present charge for current, above the minimum stated, is after the rate of 7½d. per Board of Trade unit, which is not far from gas at 7s. 6d. per 1000 cubic feet. The average consumption per head of the list of consumers is 5-horse power, or (say) 50 lamps, which is admittedly high, and points to the fact that the majority of the subscribers are large consumers—theatres, restaurants, &c. That is to say, as we have always recognized, the only demand is for the purposes of luxury, and would not be paralleled anywhere save in wealthy quarters of the town.

Messrs. Carey and Fricker, electrical engineers and contractors, of Westminster, have issued a pamphlet dealing with the cost of electric lighting in installations varying in size from 50 to 1000 16-candle power lamps, and comparing the cost with gas at 3s. per 1000 cubic feet. Of course, the electricians make out electric lighting to be always cheaper than gas. In a plan for supplying 250 lamps, for example, they show that the electric light would cost £260 a year, as against £328 for gas. This is a little too audacious, even for partisans of electricity; and accordingly Messrs. Carey and Fricker have been gently admonished by some of our contemporaries that they have overshot the mark in their zeal. The time has gone by, however, when much damage could be done in this way. Everybody knows now that incandescent electric lighting is about twice or three times the cost of gas in the United Kingdom; and the assertions of interested parties, however artfully put forward, will not prevail against common knowledge.

The proprietors of the Australian Electric Light, Power, and Storeage Company have just held their sixth annual general meeting—a good old age for a concessionary Brush concern. Of course, there was a loss on the year's revenue account; and equally of course, the Chairman congratulated his auditory upon the splendid future opening up before the concern. The Company was on the point of winding up a year ago, but was kept afloat principally with a view to seeing whether any profit could be made in connection with the lighting of the Melbourne Exhibition. The local agent of the Company succeeded in getting the contract for the lighting of the whole of the buildings; and although it was admitted that there was very little money at the back of the concern, the Directors contrived to get the necessary plant from the parent Brush Company, paying for it as the remittances came from Australia. It may therefore be said that the Brush Company did the work and the Australian Company acted as intermediaries—clearing £4000 or £5000 by the transaction; which means that the Exhibition Commissioners were somehow induced to pay for their lighting so much more than it was worth. These matters are always mysteries, however. The statement of the Chairman was regarded as so satisfactory that he was actually re-elected; and the meeting dispersed without any proposition for winding up being made from either side of the table—a remarkable thing in connection with a meeting of this class of company.

The unsatisfactory state of the law relating to joint-stock companies was illustrated once more last week in the judgment of Mr. Justice Kay in the action brought by the liquidators of the notorious Faure Accumulator Company against certain of the Directors of the now defunct concern. The object of the suit was to make these Directors personally liable for the money that was lost, squandered, and generally misapplied during their tenure of power. It would be impossible, in the limited space at our disposal, to explain all the grounds upon which the Directors were attacked. Suffice it to say that the attempt to make them liable, as though they had occupied the position of trustees, failed signally. It was laid down that directors of a joint-stock company are in no sense trustees; and that they are not personally responsible for any loss that accrues through their mismanagement, provided there is no fraud. A shareholder of the hapless Company has written to a financial contemporary stating that, before going into liquidation, all the Directors and “those in the swim” exchanged their shares with liability for fully-paid shares (how created, nobody knows); leaving about 26 shareholders on the list of contributories liable for calls. This is a strange tale, if true.

NATURAL GAS A FAILURE IN MANUFACTURING OPERATIONS.—Writing to *Industries* on the 3rd inst., the New York Correspondent of our contemporary says: “I hear that the manufacturers of the Ohio Valley are abandoning the use of natural gas and returning to coal, on account of the irregularity in the supply and the high price. Many of them have gone to great expense in changing their plants from coal to gas burners; but the present high price of gas almost prohibits its economical use. Gas should be furnished at as low a price as coal, or lower; but during the past year the expense has been 20 per cent. over what it formerly was with coal.”

GAS MATTERS AT THE MUNICIPAL ELECTIONS.

Gas matters, as usual, received a large share of attention in the municipal elections throughout the manufacturing towns of Lancashire and Yorkshire. In a few instances, the interest has been so great as to well nigh overshadow every other question. At Halifax, Leeds, and Salford gas has had an unenviable prominence; and various phases of so-called scandals have furnished material for many speeches, and texts for numerous election addresses. Some of these speeches and addresses have already been noticed in the JOURNAL; and our readers are sufficiently acquainted with the subjects to which they pertained. It would be as tiresome as it is unnecessary to go over the old ground; and we propose merely to glance at cases in which gas has entered less prominently as a factor in determining the elections.

At Wigan there was a reminiscence of an old scandal in the candidature of Mr. Worthington, who has been Chairman of the Investigation Committee. He seems to have thought it necessary to defend the proceedings of that body; and though he did not throw much new light on what is now to a large extent ancient history, he stated one or two things not generally known. It sounds like an echo of the far past to be reminded that for many months Mr. Worthington hotly denounced the administration of the gas undertaking, and was unheeded until what he calls "the Salford burst-up" happened. The Committee of inquiry which he wanted came then as a matter of course. He was forced to occupy the position of Chairman; and, as he told the electors, found that a great amount of labour had been put upon him. One statement which he made seems to call for some explanation. The first part of his Committee's report has, he said, already been made public property. As, however, no copy of it has been suffered to leave the Town Clerk's office, except upon the personal application of a burgess, the phrase "public property" is, of course, to be interpreted in a modified sense. Under these circumstances, Mr. Worthington's summary of the report is interesting. "While," he said, "no extensive money frauds are made known, it does show that, upon several transactions, a larger price was paid for canal than the colliery people stated they had received. The report also showed that the work in connection with extensions had been varied in almost every particular." "Mind you," he added, "I am not saying that the contractors made these variations of their own accord. There is no doubt they had some understanding, written or verbal; but it was curious that, when the alterations were in their favour—and they were not a few—not a word was said about it." The differences found to exist in favour of the contractors have amounted, it appears, to thousands of pounds, and claims to the extent of £2000 have already been withdrawn. In one case the Corporation have been served with a writ for over £1000; and there are other claims pending. But Mr. Worthington was sanguine that nearly £2000 more will be saved to the ratepayers. It will not encourage municipal reformers to learn that Mr. Worthington lost his election, though his labours in connection with the Investigation Committee were not the only service he rendered the ratepayers. In one of his speeches, he took occasion to warn them against expecting over-much profit from the gas-works. The average net price of gas in Wigan is 2s. 8½d. per 1000 cubic feet, and the charges for interest amount to 1s.; so that, as Mr. Worthington put it, the margin is not sufficient to justify the ratepayers in being sanguine of much relief in that direction. In fact, as another speaker said, though gas is manufactured cheaply in Wigan, the capital stands at a large figure; and the consumption will have to be very much increased before the works will pay. Perhaps the suggestion that advantage would accrue all round from selling gas to the out-townships at a lower rate than is now charged may some day bear fruit.

Rochdale narrowly escaped inclusion in the list of towns in which discussions on the coal contracts have led to charges of maladministration. Several references have already been made to the subject in our columns; and it is sufficient to say here that one member of the Gas Committee charged his colleagues with having practically ignored all the considerations which are supposed to enter into the letting of large contracts, and that the Chairman and other members of the Committee gave a specific denial to each of his allegations. In the end, the author of the original statement publicly declared that he did not impute either wilful neglect or dishonesty to his colleagues. The matter, which at first had a serious look, resulted in a trivial dispute as to which of two qualities of coal is really the cheaper, and as to who knows most of the gas-making properties of coal—the Chairman of the Gas Committee, or a gentleman who started the discussion, and who seems to be connected with the coal trade. This, however, was not the only question affecting the gas-works talked about at the municipal elections. There was a demand from more than one quarter for a reduction in the price of gas. The Corporation sells gas at a high rate, in order to make up for the loss annually sustained on account of the water-works; and though a reduction in the price has been made within the last twelve months, it has only served to whet the appetite of the consumers for more. The question appears to have been very largely discussed from individual points of view. Men who have large gas bills are naturally anxious that the price shall be reduced, even though the rates should, as a consequence, be increased; while, on the other hand, property-owners and others who are large ratepayers, but small consumers of gas, have manifested a strong desire to see the gas and water undertakings "balance each other." It is interesting to note that, in support of the "balancing" theory, the example of Oldham was cited by a speaker, who is evidently unacquainted with

the later municipal history of that town. One of his arguments was that it would be unwise to reduce the price of gas, because it might lead to an abolition of the differential rate charged in the out-townships, and thus extinguish a large portion of the profit by which the loss on the water-works is met. Had he known that, in the case of Oldham, Parliament put a peremptory stop to this system of "plundering" the gas consumer in order that the water consumer and ratepayer may reap the benefit, he might have cast about for some other example to enforce his argument. Another gentleman told the ratepayers that he had long thought over the question of the price of gas, and the propriety of reducing it to the actual cost. The conclusion he had arrived at was that the ratepayers ought to be regarded in two lights—first, as proprietors of the gas-works, and then as consumers. In the former character they are entitled to a fair return on the business done, and in the latter they have a right to purchase the commodity—gas—at a fair price. And there, just as he was becoming interesting, the speaker stopped. In connection with the question of price, it may be worth while to quote the statement that in 1859 the amount of profit was £2902; in 1865, it was £2368; and in the year ended March last, it was £15,502. The latter is a large figure. According to the gentleman responsible for the statistics, it is equal to a rate of 1s. 2d. in the pound; so that if gas were sold at cost price, the addition to the rates to make up the deficiency would be a very substantial one. One other subject referred to in the election speeches was the increase in the salary of the Gas Manager (Mr. T. Banbury Ball). The gentlemen who cut down that advance to one-half of the original proposal of the Gas Committee, made the most of their heroic conduct; and, of course, posed as great economists. It is really wonderful how far a little of the virtue of economy goes in municipal elections.

Since Oldham has been referred to, it will not be out of place to just glance at what was said there, though happily gas was not this year one of the prominent questions in the elections in that borough. Several of the speakers took credit to themselves for the reduction of 2d. per 1000 cubic feet which has been made in the price of gas; but one gentleman rather dimmed the glory of the others by an untimely reminder that the price was reduced because the Gas Committee are not now allowed to make such large profits as before. One Councilman, who was evidently anxious to magnify the importance of the Gas Department, informed the burgesses whom he addressed that, since 1853 the Committee have paid in relief of the rates more than £200,000, and have aided the water-works, when that undertaking was worked at a loss, to the extent of £100,000.

The ratepayers of Bury continue to be vexed by what they consider the excessive sinking fund charges imposed upon them by their Local Act of 1885, which they intend to get modified, if possible, in the session of 1889. Under the Acts in force before 1885, the Corporation had 50 years in which to pay off the liability upon the gas-works, 100 years for the water-works, and 60 years for the loans for other purposes. But Parliament cut these periods down to 27 years, 43 years, and 35 years respectively; and the result has been an increase of £8000 or £10,000 per annum in the amount to be raised on account of the debt. This is not peculiarly a gas matter; and the administration of that department did not enter very largely into public discussion, as why should it with gas at 2s. per 1000 cubic feet? There was a suggestion that it might be wise to reduce the price to the consumers in the out-townships, and also to those in the district added to the borough under recent Improvement Acts, who are exceptionally treated in reference to some matters of rating. The fear expressed with reference to these people was that they might be driven, by the feeling of injustice done to them by the higher price they are charged, to resort to the use of oil or some other illuminant, and that thereby they will be lost as customers to the Gas Committee. One of the speakers reminded the ratepayers of the success which has attended the manufacture of sulphate of ammonia at the works since it was commenced three years ago, and stated that the Gas Committee have under consideration the question of the distillation of tar, which they believe may be undertaken with similar profit and success. They have also in contemplation a scheme for the haulage of coal from the railway to the works, which will save £600 a year in cartage. He added that in 1884, with gas at 3s. 4d. per 1000 cubic feet, the Committee made a profit of £15,168; while in 1888, with the price 2s. 5d., they made £12,178. This year the price has been reduced by 5½d., which means a loss in profit of £4500.

Two or three little points cropped up at Bolton in connection with the gas-works. The recent difference with the stokers was referred to by some gentlemen, who were anxious to convince the working men voters that "Codlin's your friend, not Short." There was also some discussion as to the reduction in the price of gas which has been made this year. Some members of the Council, it appears, thought the amount of the reduction should have been 6d. per 1000 cubic feet; but the majority declined to let the whole profit be swept away, especially as some of them believed the outside consumers would get the greater part of the benefit of such a step. A queer suggestion, that the reduction should be restricted to large consumers, seems to have been made in Committee, and was naturally a subject of animadversion at meetings of working class electors. It was boasted by the Chairman of the Gas Committee that the profits made by the gas-works since 1871, when the Corporation acquired the undertaking, would soon amount to a sum equal to the cost of the Town Hall, which, as

"loud cheers" greeted the announcement, was no doubt a costly building. In connection with the question of the stokers' treatment, it is interesting to note that, in dealing with it, one of the Councillors paid a compliment to the Manager (Mr. W. Smith), whom he spoke of as a very able man, who has saved the town no less than £15,000 in one year. There was, however, considerable mud-throwing during the contest. One speaker stated that certain members of the Council are interested in a Colliery Company which supplies coal to the gas-works (but this met with a prompt and emphatic contradiction); while another quoted the Bray pamphlet on The Gas Institute as an argument against the practice of sending the Chairman and Manager to Institute meetings. In municipal contests, any stick seems good enough to beat an opponent with; and the ease with which base insinuations are made is only equalled by the eagerness with which they are oftentimes swallowed.

Warrington did not furnish much in the way of discussion on gas matters. There was a good deal of grumbling at the price, and some references to the changes in the management which caused such an outburst a few months ago; but Warrington people have another grievance just now; and the gas-works were only occasionally spoken of.

At Manchester the price of gas was a subject of frequent discussion. Many of the candidates agreed that it is too high, and that the profit made by the Corporation is too large. As the rate to which the Committee ought to reduce the price of gas, 2s. per 1000 cubic feet was suggested—or something less, said one gentleman. Those who are concerned about the smoke nuisance pointed out, of course, that a substantial reduction of price would lead to a more extensive use of gas-stoves, with the result that the pollution of the atmosphere would be lessened, while trade would be stimulated in certain channels. There were differences of opinion, however, as to the extent of the reduction; for while some candidates were in favour of gas being sold at cost price, others held that the price should clear the cost of production, and provide a "fair business profit" on the capital outlay. The system of setting aside a large sum annually as a depreciation fund, in addition to the amount absorbed by the sinking fund, was condemned by more than one candidate for office. One suggestion, as an alternative to the reduction of price, was that the city should be better lighted throughout, and lamps put up in the dark places. The audience heartily endorsed the remark that this would be better than giving large sums yearly to the Improvement Committee, to waste on Victoria Hotels and other jobs. Nor was the question of the cost of collection overlooked. It was stated that there are 36 collectors of gas accounts, some of whom it was hinted owe their positions to the influence of members of the Council. The cost of collection was put at as much as 1½ per cent. of the amount collected; and it was argued that the work might be consolidated and the staff reduced considerably below the present strength. If pledges go for anything, both this question and that of the price at which gas is sold ought to receive attention at an early date.

In Salford there were other gas questions discussed besides those having reference to coal contracts. The case of the stokers was one of these. Among the Salford ratepayers, as among those of Bolton, there seems to be considerable sympathy with the stokers; and as this appears to exist in exact proportion to the ignorance of the facts of the recent dispute, it made a capital election cry. One speaker politely suggested that the present Gas Manager should be "sacked," and the Gas Committee dismissed; for they were endeavouring to cheapen gas, while they were slowly murdering the poor stokers! Others had, however, the honesty to plead for a fair field for the new Committee, until they have had a chance of carrying out the reforms needed in the department. The price of gas and its quality were also discussed; and reduction of one and improvement of the other were advocated and promised on more than one platform.

In many of the smaller towns, there have been reductions in the price of gas during the past year; and the clamour for cheap gas has therefore been less loud and persistent than is frequently the case. The subject has, however, not been entirely neglected; for it forms a very convenient and ready election cry. A demand for cheaper gas or better gas has therefore figured in many election addresses; but in only a few instances has the question been at all prominent.

THE LONDON WATER COMPANIES AND THE THAMES CONSERVATORS.—A correspondent has called our attention to the statement in the first paragraph of the article on "Water and Sanitary Affairs" last week, that the Conservators of the Thames receive £5000 annually from the London Water Companies, under certain guarantees for maintaining the purity of the water. He points out that this was the sum paid in 1866. It is, however, much higher now; having been raised to £12,000 in 1870, and to £18,000 last year.

NAPHTHALENE A CURE FOR DYSENTERY.—Dr. Taylor, of "Science Gossip," writing in the *Australasian*, says: "For some time past naphthalene has been a source of some trouble to gas companies generally. Now it appears as if, like all other 'waste substances,'—which are only 'waste' because we do not know what to do with them—naphthalene will come into vogue for special as well as general uses. Medical men have discovered that it is a valuable drug in cases of dysentery, summer diarrhoea, and other intestinal disorders. Injections of it have proved valuable in cases of dysentery."

WATER ACTS FOR 1888.

LAST week (p. 842) we gave an abstract of the Acts relating to the supply of water by Companies passed during the last session of Parliament; and we complete to-day the Water Legislation of the year by briefly referring to the Acts passed at the instigation of Corporations and other public bodies.

The Falkirk and District Water Act incorporates a public Trust for better supplying with water the burgh of Falkirk and neighbourhood. The Act constitutes a board of sixteen trustees for this purpose, as a body corporate, part elective. The existing water-works of the Commissioners of Falkirk are vested in the new body, who are empowered to extend them by the construction of an impounding reservoir on the Earl's Burn, another on Faughlin Burn, and two others, together with filters and accessory works, to be completed within seven years. The trustees are empowered to borrow £80,000. The Hexham Local Board (Water) Act enables the Board to construct water-works for the supply of their district, taking the water of certain springs, and distributing it from a service reservoir, under restriction as to quantity to be abstracted. The sum of £10,000 is to be borrowed for this purpose; and rates ranging from 7½ to 5 per cent. are chargeable for domestic supplies. The Hinckley Local Board Water Act authorizes the construction of water-works by the Local Board; the said works comprising means for collecting and distributing the water found in a disused coal shaft. The rate for domestic supplies is to be 10 per cent. upon the rateable value. Borrowing powers to the extent of £45,000 are conferred by the Act. The Newport (Monmouthshire) Corporation Water Act transfers the undertaking of the Newport Water-Works Company to the Corporation. The consideration for the transfer is the payment of £10,000 in cash for distribution among the "A" shareholders, and of annuities calculated as follows:—The holders of "A" and "B" stock receive 8 per cent.; the owners of preference stock, 6 per cent.; and holders of "C" shares, 1½s. per share. The Company retain their reserve fund, and cash balance on date of transfer. These annuities are redeemable—preference after 30 years, and ordinary after 20 years—at twenty-five years' purchase. New works are to be constructed within five years. For the purposes of the Act, the Corporation are authorized to borrow the various sums of £10,000, £255,000, and £4000. The Halifax Corporation Water-Works Act enables the Corporation to enlarge their works by the construction of three impounding reservoirs upon the Alcomden or Walshaw Dean Water, in the township of Wadsworth and parish of Halifax, to be completed within seven years. The Corporation are to supply water in bulk to the Hebden Bridge Local Board, at the rate of 4d. per 1000 gallons for seven years, and for ever afterwards at 3½d. per 1000 gallons. The price of water supplied in bulk to the Local Boards for the districts of Brighouse, Elland, Greetland, and Sowerby Bridge, and the Rastrick Water-Works Company is fixed at 5d. per 1000 gallons. The Corporation were, by an Act passed in 1870, authorized to borrow £300,000 for water-works purposes, of which £118,000 had been raised, and a further expenditure of £25,000 had been incurred. The present Act forbids the borrowing any more money under this former Act. For the purposes of the new enterprise, the sum of £180,000 may be raised, to be repaid in 60 years. The Hamilton Water Act authorizes the construction of additional water-works for the Hamilton Water-Works Commissioners, consisting of an impounding reservoir upon the Cadzow Burn, to be completed within five years; the sum of £25,000 being raised for this purpose. The Stockton and Middlesbrough Water Works Act amends the Acts relating to the supply of water by the Stockton and Middlesbrough Water Board, extending the period allowed for the construction of certain works, and regulating the quantity of water to be taken from the River Tees. The Act contains a clause sanctioning the payment of interest on money borrowed out of capital during the construction of the works. The Corporation of Stockton are authorized to borrow £20,000, and the Corporation of Middlesbrough £24,000 for the purposes of the Act. The South Stockton Local Board are also authorized to borrow two sums—£1155 and £4000 respectively. The Lancaster Corporation Act contains a few clauses relating to water. It provides that the Corporation may, if they think fit, refuse to supply water for domestic purposes, except by meter, and regulates the matter of compensation water. The Llanelly Local Board Act contains clauses forbidding the levying of a water rate by the Board, and charging all loans heretofore raised on the security of such a rate to the general district fund. Power is taken to establish a water-works renewal fund, to the extent of £10,000, by annually setting aside not more than £400 out of the net profits of the undertaking. The Nelson Local Board Act empowers the Board to construct water-works, impounding the Ogden Water and Black Moss Water, to be completed in ten years. The sum of £130,000 is to be borrowed for this purpose. The Perth Water and Gas Act enables the Commissioners to sink an additional filtering-well in the Moncreiffe Island of the River Tay, and to construct sundry other works, to be completed in seven years. The sum of £30,000 is to be raised for water-works purposes.

In accordance with the terms of their Act of Parliament, the South Metropolitan Gas Company have intimated to the Metropolitan Board of Works their intention to sell, on the 14th prox., £50,000 of their 5 per cent. perpetual debenture stock.

Notes.

EXPERIMENTS WITH TAR FUEL.

Mr. James Holden, Locomotive Superintendent of the Great Eastern Railway, has been experimenting with liquid fuel for steam raising. His first experiments were made upon a stationary boiler at the oil-gas works of the Company's Stratford factory. Here Pintsch's patent gas is made for lighting the trains; and one of the products of carbonizing the oil is a tar which it was difficult to dispose of at any price, but which is now successfully burnt under the boiler. These trials began in 1886. The boiler is a small one of the Cornish multitubular type, 10 feet long and 4 feet diameter, with a furnace 7 feet long by 3 feet in diameter, from which 122 tubes $1\frac{1}{2}$ inches diameter by 3 feet long extend to the back of the boiler. The boiler is worked at about 60 lbs. pressure; and when fired with coal, it consumed on an average 68 cwt. 1 qr. 16 lbs. weekly, for 79 hours' steaming. With the tar-burning apparatus, the consumption of fuel per week, for 69 hours' steaming, has averaged $454\frac{1}{2}$ gallons of tar, and 2 cwt. of coal, or an hourly average of 65.9 lbs. of tar and 3.3 lbs. of coal, against 97.1 lbs. of coal per hour under the old system. The arrangement was next tried upon three boilers of the locomotive type in the Wagon Department at Stratford; and on these its performance has been very satisfactory. The boilers are worked at 80 lbs. pressure; and the comparative results of a week's working with coal only, and with coal and liquid fuel together, are as follows:—Staveley coal, 156 cwt. for 63 $\frac{1}{2}$ hours' steaming; or 275.1 lbs. per hour, including coal for lighting up. With the coal and oil there was a consumption for 60 $\frac{1}{2}$ hours' work of 55 cwt. of Staveley coal and 546 gallons of green oil, or an average of 101.8 lbs. of coal, and 99.3 lbs. of oil (9 gallons per hour). With coal only the evaporative duty was after the rate of 7.16 lbs. of water per pound of fuel; while with the coal and oil it was 8.91 lbs. per pound of the combined fuels. Subsequently the system was adapted to a furnace in the steam-hammer shop, to a rivet furnace in the boiler-shop, to a Cornish boiler in the printing department, and to two locomotives. Various descriptions of liquid fuel have been tried. *Engineering* reports a trial run of a locomotive burning a mixture of one-third of green oil with two-thirds of tar, which was completely burnt without smoke or trouble. Roughly speaking, the consumption of fuel in this engine was 1 gallon of liquid and 14 lbs. of coal per mile. In Mr. Holden's system the liquid is injected into the furnace (which is not altered in any way) by a steam jet. The steam is supplied to the central jet of the injector, the liquid fuel surrounds it, and an air supply is disposed concentrically outside the whole. A thin coal fire is kept on the grate; and to assist in keeping the grate properly covered with the very thin fire, lumps of chalk are placed on the bars when starting for the day. The locomotives fired in this way with liquid fuel (tar), valued at 1 $\frac{1}{2}$ d. per gallon of 11 lbs., show a slight saving as compared with coal.

A NEW ROLLING MACHINE.

An account is given in a recent number of the *Journal of the Franklin Institute* of a machine for rolling iron bars into finished articles, which has been examined by a Committee of the Institute. The machine is described as consisting essentially of two dies moving in opposite directions, with surfaces that approach each other. The effect produced depends, of course, upon the form of the dies; but all act in the same way, by first rolling the ductile metal into the intended shape, and continuing the action until a finished surface is produced. The metal rod subjected to this operation is stretched in the direction of its length, in contradistinction to the shortening or "upsetting" effect of other roller-finishing machines. It is described as being the invention of Mr. George F. Simonds, and outwardly resembles in shape a steam-hammer, with the difference that where the piston would be are two vertically moving planes, like planer-beds, which by rackwork gearing move in guides simultaneously in opposite directions, rolling a heated bar of iron between them. The dies approach each other as one rises and the other descends, and are inclined from the vertical; so that, while the bar of iron does not shift its position, it rolls on its axis under the pressure of the dies, and its fibres are also extended longitudinally. In this way a plain bar of iron is formed into a screw bolt without requiring other treatment. The machine delivers work approaching lathe-turned articles in finish and accuracy. Bolts with necks of the same diameter as the bottom of the threads are easily made; and the metal is so much improved that it gains in strength and in power to resist corrosion.

ELECTRIC WELDING.

At the last meeting of the Association of Railway Telegraph Superintendents, held at New York, Mr. O. K. Stuart read a paper on electric welding, in which he remarked that, beginning with the joining of small wires of iron and copper, the process has been so successfully developed that bars of very large size and of almost any shape or kind of metal can be soundly welded. So absolutely is the heat localized when pieces of metal carrying a welding current are placed together, that pieces of 1-inch iron bar, 3 inches long, can be welded and afterwards held in the hands for some time without any danger of burning; the only heat which is felt at all being that which is conducted along the metal to the hands after the welding is completed. It is possible by the Thomson process to weld any metal, including those that melt at a very low temperature, such as lead, zinc, and tin, and those which melt at

enormously high temperatures, as, for instance, iridium and platinum. Very perfect means of regulating the heat are required when dealing with such high temperatures so quickly developed as in the Thomson process, and these are provided. A bar of 1-inch iron, 4 inches long, can in this way be raised in 20 seconds to a dull red heat, and kept at this point for an indefinite period; then the heat can be raised in a few seconds to bright red, and increased to welding or even vaporizing point in a very short time. Half-inch round iron rod can be welded in six seconds; and inch rod, in 45 seconds. Soldering, bronzing, annealing, and tempering, as well as the direct joining by fusion of different metals, can be accomplished in this way. Tubes for gas and water can be joined into one length; even the joint between iron and brass being made by fusion. A portable machine for doing light welding *in situ* is being perfected by the Company owning the Thomson patents for electric welding. The machines are not very costly; and their use is expected to revolutionize the plumbing trade.

Communicated Article.

A SPECIAL AIR SUPPLY FOR GAS-BURNERS

By NORTON H. HUMPHRYS, Assoc. M. Inst. C.E., F.C.S.

To those who, from force of circumstances, have been obliged to contemplate the subject of gas consumption from a theoretical point of view only, or from an outside position in a practical sense, the new system described in the *JOURNAL* for the 16th ult. (p. 672), under the head of "A New Combined System of Gas Lighting and Ventilation," is of marked interest. It represents a bold attempt to gather and consolidate into practical shape a number of vague, hazy, and indistinct notions that have been floating about in the brains of most gas engineers who have taken an interest in the scientific and theoretical department of gas manufacture and supply, and which perhaps date back almost from the commencement of the gas industry. The effect of diluents such as carbonic acid, air, nitrogen, and aqueous vapour, on the illuminating value of coal gas has been several times ascertained by experiment. Incidentally, the effect of the air used for the supply of a gas-flame has been noticed, though it does not appear to have occurred to anyone to make experiments in the way of a special air supply. For example, when writing on the subject of "The Commercial Valuation of Illuminating Gas" * about four years since, I remarked—

We know that if gas is burnt under a low atmospheric pressure, such as that furnished by the attenuated air on the top of a mountain, or in an atmosphere rendered poor in oxygen by the presence of other substances, the amount of light given by the flame is much reduced, though at the same time the flame is increased in size. Its intensity is diminished; but its quantity is increased. The presence of diluents in the gas itself has the same effect, of impoverishing the atmosphere in which the combustion is taking place. The result is that the gas is burnt at a disadvantage, and does not yield the amount of light it would be capable of giving under more favourable circumstances. . . . The purer the atmosphere, the less concentrated the flame; and as the flame becomes less concentrated, it gets yellowish in colour and dull in appearance.

Many similar remarks might be quoted from articles or lectures on the subject of gas consumption; but, with the exception of the practice of supplying air under pressure to burners of the incandescent class, the writer is not aware that any proposal in the way of a special air supply has ever been made. In the case of the incandescent burners, the object is to promote combustion; so that the idea of giving a separate and purified air supply, with the object of increasing the duty per cubic foot of gas consumed, is probably entirely novel.

Yet every gas engineer must have noticed at times the important effect exercised by the condition of the atmosphere upon the value of his gas. It is a matter of common remark that the street lamps burn much brighter on a clear, dry, and frosty night than when the weather is heavy, damp, and muggy. Various opinions have been expressed as to the cause of this. Barometric conditions have undoubtedly some effect; for it has been shown in several ways, since Professor Tyndall burnt a candle on the top of Mont Blanc, and noticed that it gave very much less light than when used in the valley below, that any illuminant is affected by variations in atmospheric pressure. By reducing the pressure, the luminosity can be destroyed; and, on the other hand, substances which yield a practically non-luminous flame at ordinary pressure—marsh gas, for instance—give a considerable amount of light when consumed in an atmosphere that has been artificially placed under a pressure of 60 or 70 lbs. per square inch. This being the case, it follows that a barometric variation between 28 and 31 inches, or to the extent of 10 per cent., in the pressure of the atmosphere, will have a notable effect upon the illuminating value of ordinary coal gas. Some experiments on the point would be extremely interesting. In the suggestion that the moisture which is always present in the atmosphere to a greater or less degree—and in England the "greater" usually obtains—has an important effect on the illuminating value, we have a new line of thought opened up. Speaking generally, the lower the barometer, the greater the proportion of moisture present in the air; so much so that the indications of this instrument are regarded as a weather guide—a "fall" indicating wet, and a "rise" fine weather. So it would appear that, at low pressures, the gas has not only to contend with the disadvantages due to an attenuated atmosphere, but also with those

* See *JOURNAL*, Vols. XLIII. and XLIV.

caused by the presence of a larger quantity of moisture in the air than usual.

In contemplating the subject of gas combustion for lighting purposes, and the use of fuel gases as a source of heat for high temperatures, as in retort-settings on the generator system, a remarkable coincidence will be observed. It is a usual experience that the best lighting effect is obtained from a gas-burner just as the gas is on the point of smoking. This means, when it has a sufficient supply of air and no more. The upward draught created by the products of combustion and by the escape of the gas from a gas-burner, causes a continuous fresh air supply to it, exactly as the draught of the chimney brings the air supply to a furnace. An increased pressure causes an augmented supply of air; and a burner under great pressure of supply may be compared to a generator furnace in which the damper is set too high, so as to draw in an excess of air, or to the old-fashioned grate furnace that will not act satisfactorily unless an excess of air is admitted. In the burner we decrease the supply pressure until something near to the theoretical requirement of air is attained; and in the furnace we adopt other means for securing the same end. The result is that more heat is retained in the gas-flame or in the furnace, as shown by the higher temperature obtained, and a proportionately less quantity passes off with the products of combustion. In the gas-burner, the greater temperature yields an increase of light; in the furnace, it gives us a larger proportion of the total heat in a utilizable form. The analogy also extends to the application of regeneration. The object in each case is to bring back some of the heat that would otherwise be wasted, and to use it as a means of increasing the temperature—the initial temperature, it is usually called. It is not unreasonable, then, to suggest that the improvements in modern gas-burners, by which “the duty” attainable for a given quantity of gas has been increased threefold, or, including the claims advanced for this new system, fourfold, are to a great extent due to the same cause that has led to the improved results from fuels secured by means of the generator system. In each case there has been a better adjustment of the air supply. Whereas it was formerly the rule to work with a considerable excess, this has now been reduced to very little above that shown to be necessary for complete combustion and oxidation of the hydrogen and carbon present in the fuel. When the “special air supply” system has been proved to be a success in respect to an increase of duty from the gas, apart from the other advantages it undoubtedly brings with it, it will be time to consider the application of the same system to the use of fuels on the large scale.

With the ordinary batswing or fish-tail burner, used without a globe, there is a free and unimpeded rush of air to the base of the flame on all sides. In Sugg's Argand, and to a greater extent in the various makes of regenerator burners, the air supply is to a certain degree throttled or baffled. In the Argand burner the base of the burner is very much closed in by the cone; and in the regenerator burner the air supply has to take a circuitous course in reaching the burner, while the products of combustion are also “baffled” in passing the arrangement intended to act as the regenerator. It is expressly stated that with the Methven-Sugg system the air supply is arranged to be at the rate of 10 cubic feet per cubic foot of gas. The actual requirement, according to theory, is from 6 to 7 cubic feet; so that an excess of 50 or 60 per cent. is allowed. But this, though apparently high, is a great advance on ordinary burners, all of which require a large excess of air under general circumstances, and probably so with other improved forms of burner; so that, apart from the advantages incidental to the special air supply, some considerable increase of “duty” might be expected from the regulation of the supply.

The statement that an improvement of 10 or 15 per cent. is obtainable by removing the moisture and carbonic acid from the air is striking, but, on consideration, by no means incredible. The effect of the presence of 1 per cent. of carbonic acid in the gas is known to range from 4 per cent. upwards, according to the kind of burner used; and there is reason to suppose it to be a constant quantity, irrespective of the quality of the gas, so that the poorer the gas the greater the percentage of depreciation. As to the effect of moisture, but little is known. Mr. Aitken, in a paper on “The Influence of Aqueous and other Vapours on Illuminating Gas,” read before the West of Scotland Association of Gas Managers in 1878,* remarked that the result of drying a sample of gas, by passing it over anhydrous chloride of calcium, was to raise the illuminating value from 27·24 to 27·46 candles—only a gain of 0·8 per cent. At the same time the gas was diminished in volume to the extent of 2·8 per cent. Dr. Percy Frankland† states that the effect of drying a sample of gas is to reduce its volume about 2 per cent., and to increase its illuminating value from 16·9 to 17·5 candles. In this case the depreciating effect is about half a candle, or 3·3 per cent. Dr. Frankland obtained a very similar result with ethylene—a rich gas of 70-candle power or thereabouts.‡ He also remarks that some years ago the London Gas Referees found that an advantage of 6 or 8 per cent. was obtained by drying the gas.§

The effect of these impurities, when present in the air instead of the gas, will be greatly increased, because ten times as much air is used. Under ordinary circumstances, air contains 5 or 6 grains of aqueous vapour per cubic foot. Pure air in the country contains 2 or 3 parts of carbonic acid in 10,000; but in towns this proportion is

often more than doubled. The air in the upper portion of inhabited rooms would probably contain a larger quantity both of water and carbonic acid; so that the former may be taken at 7 grains per cubic foot, and the latter at 0·1 per cent. Each cubic foot of gas, therefore, receives at least 70 grains of water vapour, and 1 per cent. of carbonic acid from the air; and in the case of ordinary burners a good deal more. This is sufficient to show the importance of extending some consideration to the question of the air supply of gas-flames.

Dr. Frankland, in the paper already mentioned, says: “That the presence of aqueous vapour in gas should tend to reduce its illuminating value was to be anticipated, since this aqueous vapour had to be raised to the temperature of the flame by the heat produced in the combustion of the gas.” Moreover, the aqueous vapour at the temperature of the flame is partly dissociated, which dissociation is attended with a large absorption of heat; 70 grains is just 100th part of a pound, and the specific heat of water vapour is 0·475. Therefore one unit of heat would be sufficient to raise that quantity of moisture to the extent of 210° in temperature. The flame temperature is very high—perhaps 3000° Fahr., so that from 12 to 15 units of heat per cubic foot of gas would be absorbed in raising the temperature of the aqueous vapour. A cubic foot of gas yields 6·20 units of heat and upwards, according to quality; so, with ordinary 16-candle gas, some 2 per cent. or more of the total heat is absorbed in raising the temperature of the aqueous vapour. This is without allowing anything for dissociation. We have no actual knowledge as to whether or not this occurs to any extent; but it is evident that such an effect, taking place just in the hottest part of the flame, would be greatly prejudicial to its light-giving power. The heat-absorbing effect of dissociation would be similar to that involved in raising the temperature of the aqueous vapour another 1000°, and, if it was complete, would involve the loss of another 5 units of heat. If we calculate the effect of atmospheric moisture as an absorbent of heat from an ordinary furnace, and the enormous volume of air that is continually rushing in to maintain the combustion, it will be seen that, as in the case of the gas-flame, the removal of this small and apparently insignificant quantity of moisture is by no means such a whimsical or chimerical idea as it might at first sight appear.

It is a singular fact that the depreciating effect on illuminating value exercised by nitrogen, air, and carbonic acid is greater than that of aqueous vapour, although their specific heat is only about one-half. The loss of heat due to the presence of 1 per cent. of any one of these constituents is very slight—not more than 7 or 8 units, or about 1 per cent. of the whole. Yet the loss of light is four or five times as much; and this seems to show that the loss is due to causes other than the mere abstraction of heat.

Messrs. Methven and Sugg are to be congratulated on having obtained, or being within fair prospect of obtaining such a remarkable duty as that of 13 candles per cubic foot of 16-candle gas—an increase of fourfold on that which was considered to be the limit not very many years ago. Practically, the effect is to cheapen gas to a corresponding extent; for if the consumer is enabled to get 13-candle duty out of a gas which formerly yielded only 3·2-candle, the effect is to render it worth four times as much to him. Mr. W. H. Preece recently estimated (see *ante*, p. 463) that the cost of producing 1000-candle power—one candle for 1000 hours—by London gas was 1s. 3d. The means by which he arrived at so high a figure are not at all clear. If we assume gas to be worth only 3 candles per cubic foot, then the cost of the 333 cubic feet of gas required would be less than 1s. With the Methven-Sugg system, however, the cost would be reduced to less than 3d., seeing that about 80 cubic feet of gas would be sufficient. So it is time for electricians to amend their estimates. Another point for congratulation is that the improvement already realized—an increase of fourfold—may well encourage us to be hopeful as regards the future. It has been repeatedly pointed out that only a mere infinitesimal portion of the total force produced by the combustion of gas is really obtained in the form of light, and therefore that there is a large margin to be worked for improvement—so large that the advance already obtained, important as it is in a practical sense, is really of comparative insignificance. But this advancement, such as it is, gives some promise of future progress.

The fact must be faced that a special air supply, and the removal of moisture and carbonic acid therefrom, means extra expense. But the advantages secured are such as to be more than sufficient to compensate for the cost of obtaining them, apart from any consideration as to increased duty from the gas. Rendering the gas combustion absolutely separate and independent from the atmosphere of the apartment at once secures everything in the way of pure air, long life, &c., that has been claimed for electricity, and does away with the prejudice sometimes exhibited in regard to the effect of sulphur compounds, supposed incompletely consumed constituents of coal gas, and the products of combustion generally. It also opens up a means of arriving at what has never been really obtained before—an absolutely reliable system of ventilation, that may be equally depended upon under all directions and degrees of force of wind, and other climatic conditions. In this respect it has a distinct advantage over the electric light, which, at the best, is only a “neutral” in the matter of ventilation.

THE HALIFAX GAS COAL CONTRACT.—Our readers will see, by an advertisement which appears elsewhere, that the Gas Committee of the Halifax Corporation have decided on inviting tenders for cannel coal, in substitution for that which was to be supplied under the contract of Mr. Wrigley, of Ashton-under-Lyne.

* See JOURNAL, Vol. XXXI., p. 802.

† See *Proc. Chem. Soc.*, Vol. XLV., p. 233.

‡ See JOURNAL, Vol. XLIV., p. 17.

§ *Ibid.*, Vol. XX., p. 625.

Technical Record.

SOUTHERN ASSOCIATION OF GAS MANAGERS.

THE DISCUSSIONS ON MESSRS. LIVESLEY AND PRICE'S PAPERS.

Last week we gave the text of the two papers read by Mr. George Livesley and Mr. W. E. Price respectively, at the quarterly meeting of the Southern Association of Gas Managers, held at the Hôtel Métropole, on the previous Thursday, and to-day we publish a full report of the discussions.

MR. LIVESLEY'S PAPER—"THE GUIDE-FRAMING OF GASHOLDERS: HOW AND HOW FAR MAY IT BE DISPENSED WITH."

(See *ante*, p. 846.)

The PRESIDENT said the members had before them a novel theory in the matter of gasholder construction; and he expected there was not anyone there who was able to give them the result of any really practical experience upon this subject, except in the case of the Rotherhithe holder. There were, however, many present who would be in a position to criticize the matter from a theoretical point of view; and he was sure that they would have a good discussion, which would tend to enable them to come to a clear understanding as to whether Mr. Livesley's system could be carried out economically enough to be substituted in place of guide-framing.

MR. LIVESLEY said he hoped every objection that gentlemen present could think of would be urged, as he was not himself particularly partial to the idea.

MR. W. H. H. BROADBERRY (Tottenham) thought the thanks of all the members were due to Mr. Livesley for the able manner in which he had placed this question before them; but those who knew Mr. Livesley were not at all surprised at that. On the question of the method of guiding gasholders, he did not know that there was anything practical to be said upon the matter. It seemed to him that Mr. Livesley had mentioned all the points that it was possible to discuss. As to erecting gasholders without guide-framing, it really came to the question of cost. Personally, he could not at present see that there was much advantage to be gained by dispensing with the old-fashioned guide-framing, though he must admit that it was possible to improve the latter. The present method of guide-framing seemed to him to be very simple; and up to the present time it had proved efficacious. If, however, it was at any time necessary to build a gasholder where there was no room to put up guide-framing, then they could use one of the ingenious plans which they had before them—either Mr. Livesley's or Mr. Gadd's arrangement. Under these circumstances, there was no doubt that they would prove very useful; but it seemed to him that if they had room for a gasholder to rise, it only required a little more space for the guide-framing to be erected. He should have more confidence in the good old-fashioned guide-framing than in Mr. Livesley's idea. It appeared to him that if the strain was taken away from one place, it must be put on another—that was, on the sheeting and bottom curb of the holder. In any case, they would no doubt have to considerably strengthen the bottom curb; and on the question of dispensing with the upper guide-framing of a three-lift holder, it appeared to him that they would have to strengthen the curbs and cups to prepare for it. He did not know whether or not this was so. The question naturally arose, Where was the saving to come in? Unless they could show that there was to be some saving—unless they could show they would get more for their money—he did not see where the special advantage would occur. At any rate, on the question of gasholder building, they knew that there were really very few who would be able to try experiments in this direction. Mr. Livesley was rather a bold man, and no doubt he liked to depart from trodden paths. As a proof of this they had the experiment at Rotherhithe. This holder appeared to work very well; and he hoped it would continue to do so. He must, however, confess that, unless he saw something more than he had done up to the present, if he had to build a three-lift holder, he should run the guide-framing up to the top. If ever necessity arose to put up a holder without guide-framing on the outside, he would then consult either Mr. Livesley or Mr. Gadd, and see what they could do in the matter. He must acknowledge that he had a prejudice for the old-fashioned outside framing.

MR. C. GANDON (Lower Sydenham) considered that the paper was a most important one. Personally, he had very little to say upon the matter; for as he had not had any practical experience in building holders without framing, it could only be pure speculation. He read with considerable interest, and he hoped with some little advantage, the admirable articles, to which reference had been made in the paper, that appeared in the JOURNAL by "Theory and Practice." Although he had had some doubt as to the possibility—or desirability, at all events—of attempting to work any portion of a gasholder without guiding it, he must confess that these articles convinced him that it could be done, at least so far as the upper lift of a three-lift holder was concerned. If any gentleman present had not read the articles, he would strongly advise him to do so; and he trusted that the suggestion contained in the paper, that they should be printed in a separate form, would be carried out, for they were the most interesting contributions they had on the subject. But these ideas—both Mr. Livesley's and Mr. Gadd's—were entirely different from what he had gathered from the articles. That any one could raise the upper lift of a three-lift holder without guide-framing was, to his (Mr. Gandon's) mind, satisfactorily

proved by the articles, and still more satisfactorily demonstrated by the Rotherhithe experiment. He had seen the holder there at work and fully inflated; and it seemed to him to be perfectly safe. As to these spiral or zig-zag guides, he was bound to confess that he did not know how they acted. Mr. Livesley had mentioned the matter to him some weeks previously, and he had since read the paper; but still he did not quite understand it. He could not see what there was to prevent the holder tilting or jamming. With Mr. Gadd's spiral guiding, he could see it more clearly. Possibly it was only his obtuseness that prevented him comprehending the principle. Mr. Livesley's plan was probably a modification of Mr. Gadd's spiral; but he certainly could not understand how it would prevent tilting. There was also this question for consideration—How far would they have to strengthen the holder to resist the strain which might be thrown on it by doing away with the framing? One difficulty in designing a large gasholder was to prevent it from causing too great a pressure. If they had to strengthen the holder, they would have to put more material into it in order to resist these strains. He did not therefore see that much economy would arise. He fully shared Mr. Broadberry's views in this respect, for he had a conservative feeling and a singular affection for the old-fashioned guide-framing; and if he (Mr. Gandon) had to put up a holder of any considerable dimensions, he should adopt the old method of guiding it. He should like someone else to make an experiment with the new style first. He thought the plan was feasible, and there seemed to be a considerable amount of theory to back it; but he should continue to prefer guide-framing until the new system had been proved. He saw in the illustrations that the projections on the guides were angular. Would it not, he asked, be better in practice that they should be rounded off?

MR. LIVESLEY: You will see that we have experimented with one that has been rounded.

MR. GANDON: Partially rounded; but he thought it might be more so. He could only offer his own views upon the question before them; and, in conclusion, he would again say that until the idea was proved, he should stick to the old framing.

MR. C. E. BOTLEY (Hastings) said that the same ideas had occurred to him which had been expressed by Mr. Gandon. He also thought there would be a tendency for the holder to jam or tilt with the proposed plan of guiding it. He also asked Mr. Livesley to explain the working of his single tangential roller in the guides. If this system would reduce the cost of erecting gasholders, it would be a very great boon. But when they knew that it would be necessary to considerably strengthen the bottom curb and the holder altogether, it was trying an experiment which might not succeed, while at the present time they had a fairly cheap and satisfactory way of guiding holders. What diameter holder, he asked, did Mr. Livesley or Mr. Gadd say could be worked upon with this system of guiding? He had just been designing a new three-lift holder of rather small diameter (about 100 feet), as they had not much ground available on the site; and he was considering whether he would not do without the framing to the upper lift. But he thought it would not be well to risk it for so small a holder. He should like to know whether or not Mr. Livesley's or Mr. Gadd's new system of guiding would be applicable to a holder of small diameter.

MR. W. D. CHILD (Romford) remarked that Mr. Livesley had taken those present into his confidence so thoroughly in regard to his invention, that he (the speaker) thought it was only right on their part to return the compliment by expressing the slightest difference of opinion which they might have regarding the matter, so that one and all might have the benefit of it. They might be in error; and the correction of it would set them right. There was one thing they had to look at in the construction of holders on this principle. Taking it simply as a single-lift holder, he did not see exactly any reason why the strength of the holder should be in any way increased to deal with a question of this description. Mr. Livesley was attempting to control the movement of the holder by gripping the bottom lift; and therefore the sides, it appeared to him, would be entirely in tension. The only thing that occurred to him was whether the projections of the guides were not too sharp—that they would give, as it were, a jerky movement to the holder in rising and falling, and rather a tendency to set itself fast. If it would work without any difficulty and with smoothness, it appeared to him that the system would effect a considerable saving, in the cost of both the holder and the tank, because anyone who had had experience in excavating tanks must have seen that the cutting away of the extra diameter where the piers were required, was frequently a source of great difficulty, and was more likely perhaps to bring about a fall of earth than when making a regular circular excavation.

MR. W. H. Y. WEBBER (London) remarked that there appeared to be some little hesitancy on the part of the general body of members to discuss this question. He thought this might be largely due to the fact that there was some misapprehension in the minds of a good many as to what was the exact scope or object of the various ideas put forward. When trying to imagine how a gasholder could be erected without any guide-framing at all, it was his idea that the real object was the pursuit of truth with regard to the principles governing the stability of gasholders. The first consideration was not so much whether or not they were going to save a few pounds in the construction of a gasholder of given dimensions. They wanted to get at the truth of the conditions governing the stability of the holder; and then if they once found this datum, it followed that they could go on building holders as high

and as large as they liked. Then the question of economy came in. Mr. Botley had made an inquiry in reference to small holders; and he (Mr. Webber) might remark, with regard to small holders, that it was easy to try experiments with them, although the saving might be comparatively slight. He would ask those present to carry their minds a little back to the time (say) when gasholders were always built with very massive cast-iron columns—some fluted and gilded, and all that sort of thing; and the only idea of holding the columns up was an ornamental horizontal girder at the top. The natural consequence of this order of ideas was that there was understood to be a limit in the size and height to which holders could be safely carried. The result was that sometimes when additional storage was wanted, extra ground had to be bought, and another holder put up; whereas if inquiry had been more thorough into the conditions of stability, the existing holder would have had another lift, or even two or three lifts, added. He did not know how many lifts Mr. Livesey thought his holders would bear; but it appeared to him (Mr. Webber), judging from the way in which he was going on, he would make them something like one of those tourists' telescopes of manifold slides, which could be drawn out to an extraordinary length. There was, of course, a good deal of criticism, on suggestions of this kind which was—if he might use the term—comparatively cheap. It was very easy for anyone to say they did not like this sort of thing, and that they would not care about being the first to try it. They would be without gas altogether if everyone had always gone to work in that spirit. With regard to the principal saving effected by the adoption of any successful method of doing away with the superior framing of gasholders, he thought Mr. Newbigging's paper read before the Manchester Institution should be mentioned in connection with any discussion of this subject. He considered that this paper very fairly showed where the economy was likely to come in. A special point was the saving that would be effected in regard to holders intended for export. The matter had only to be mentioned to show what a wonderful difference there would be in this respect, especially if they had to send gasholders inland in places where only horse or caravan carriage was available. A holder of any size could be despatched to any place with comparative ease, provided there was no guide-framing to carry with it. He agreed with Mr. Child in the opinion that there need not be any necessity for greatly increasing the strength of gasholders. If they were to be stayed only from the bottom, it might be so; but this was one of the points which had to be proved. The diagram which Mr. Livesey had included in his paper, from those very able articles to which he had referred so abundantly, certainly showed that the stresses increased as the guide-framing was cut down; but he did not think they showed that the stresses surpassed the point which they might be permitted to attain. He (Mr. Webber) was not altogether certain on this matter. The stresses would be much greater, but were they excessive? He did not think they were; and he considered that Mr. Child was quite right on this point. The matter was entirely open for discussion now. Nobody could say very much about it one way or the other. Whether or not the thing succeeded, there were numbers of gas managers who would not reconcile themselves to it, and who would continue to profess that they would be able to retire to rest more comfortably if they were able to rely upon the old guide-framing. Some of them might be disposed to laugh at this timidity. But he thought there was quite as much reason for it as some engineers had for not believing in telescopic holders at all; and it was notorious that there were some clever engineers in the world who had not been able to reconcile themselves to the idea of a telescoped holder. Meanwhile, however, he protested against suggestions of this or any other novel kind of thing being condemned by the mere prejudice of those who could only say they did not like them, and would be more comfortable under an old system.

Mr. F. S. CRIPPS (London) said he was pleased that he had been invited to the meeting, for he was glad to have an opportunity of hearing Mr. Livesey read his paper. It was certainly a very practical paper—at any rate what the author had said was put in a very practical and clear way. Mr. Livesey had stated at the commencement that a copy of the paper had been supplied before the day of meeting; but unfortunately it had not been sent to him (Mr. Cripps), or he might have criticized it to greater advantage. He agreed with practically everything that Mr. Livesey had said; but the question of the zig-zag kind of guides was one that required to be very closely looked into. If he might make a criticism, it seemed to him that the holder would have a jerky motion in going over what perhaps he might call the "corners" of the guides. He would therefore suggest that these should be made easier. Mr. Gandon had alluded to the same thing, but in a different way. Presuming, however, that they could get a gasholder perfectly level, and cause it to rise perfectly level throughout, what had they to gain by it? This system of constructing gasholders without any guide-framing might possibly be more economical in first cost; but that would depend upon the quantity of material they were going to use. If they increased the strains coming upon the holder, they must increase the weight of metal they put into it; and this would counterbalance some of the saving obtained. The question was, in doing away with the whole of the guide-framing, how much were the strains increased? Mr. Webber and Mr. Child did not think that the strains would be very much greater; or, in other words, that the extra strains would not make it necessary to put much additional material into the holder. He (Mr. Cripps) could not altogether

agree with them. Mr. Gadd had on a previous occasion said that the sheeting of a gasholder was of no importance at all as regards resisting the strains—that it depended entirely upon the framing. Mr. Gadd likened it to an umbrella, the cover of which might be thrown away, trusting to the framing to resist all the strains. Taking it for granted, then, that the sheeting could be disregarded, as far as resisting the strains was concerned, What had they left? A fragile frame, consisting of a series of horizontal rings one above the other (curbs, cups, &c.), and connected together vertically by a number of vertical posts (guides) all round the circumference. Now, even supposing they looked upon each of the horizontal rings as incapable of distorting out of shape, and that they would retain their circular shape under every condition, the whole frame was not even then by any means rigid; it was unstable, because it was made up of a series of parallelograms, which could all rock over sideways together, without altering the lengths of their parts. The only thing which prevented them doing so was the assumption that they were perfectly fixed and rigidly attached at the base, and that the holder was considered, for argument's sake, to be as good as standing upon solid ground. In order to be rigid, it must be a series of triangles; and to get this they must introduce into the gasholder a system of diagonal ties between the vertical posts all round the holder. This could not be done, as the space between the sides of the various lifts would not admit of it. So they must depend upon the sheeting fulfilling the function of the diagonal ties. But the sheeting could not do so, owing to its curved form between the stays, because under diagonal stress it would at once straighten across the corners, instead of resisting the force. It came to this, then—that they could not have diagonal ties, and they might not rely upon the sheeting. Therefore, the simple framework had to take all the strains. To show how incapable it was of doing so, he would take an actual example. Take a gasholder 200 feet diameter and 120 feet high. The size of the guides in the outer lift would be about 6 inches by $3\frac{1}{2}$ inches by $\frac{1}{2}$ inch channel iron, or (say) 8 inches by $2\frac{1}{2}$ inches by $\frac{1}{2}$ inch; and there would be (say) 44 in the circumference. Now, as they assumed the horizontal cups, curbs, &c., to be rigid rings, incapable of deformation, the force (due to wind pressure) would be equally distributed over the whole of these vertical posts, and would tend to break them all short off at the base. The breaking load of all the 44 channel-guide, 120-feet high cantilevers, taken together, was only about 13 tons (uniformly distributed). The safe load would only be one-fourth of this—say, 3 tons. Now, no one would contend that the wind pressure on the side of a gasholder 200 feet in diameter by 120 feet high did not exceed 3 tons. Why, at 10 lbs. per square foot only, it would be 10 tons! Therefore, they must depend upon something else beyond the guides, or increase their strength, which meant weight. If they put in Mr. Gadd's diagonal guides, they would probably in a measure act like diagonal ties; but they were curved, not direct-acting, and would need vertical posts as well to make the bracing continuous. Otherwise it would be like a girder with the lattices all one way. He thought that even then there would be a good deal of twisting and distortion of the gasholder bell, especially when they considered he had been treating of only one set of strains upon the holder. There were other matters which could not be ignored; and even what he had already dealt with were based upon such very favourable conditions (perfectly rigid cups, &c.), by no means tenable. It seemed to him to be forgotten that the higher they went into the air, the greater were the strains. Mr. Child had remarked that it made no difference how high a gasholder was.

Mr. CHILD said he should like to disclaim this at once. He went straight to the principle of guiding a bottom lift of a holder the whole way. He was not speaking specially of a one, two, or three lift holder.

Mr. CRIPPS said he had misunderstood Mr. Child. If they did away with the guide-framing to a single-lift gasholder, they increased the strains on the bell fourfold; with a two-lift holder, they would have 16 times as much strain; while with a three-lift holder, without guide-framing, it would be 36 times as much as in an ordinary single-lift holder of the same diameter and depth of lift. The lower lift of a gasholder had the most strain; the next, less; and the top one, the least of all. No one who had advocated the total abolition of guide-framing had as yet shown scientifically that the guide-framing could be abolished altogether. Mr. Livesey had abolished it for only one lift—viz., the top lift of the Rotherhithe gasholder; but he had not gone so far as to do away with guide-framing entirely in a three-lift holder.

Mr. LIVESEY. And I am not going to try.

Mr. CRIPPS (continuing) observed that before the system of no guide-framing was really brought out, it should be shown theoretically and scientifically that it would work—not simply brought forward and said that it could be done. It must be proved, just as he could prove to the contrary. When this was done, possibly they might launch forth into making gasholders without guide-framing; but not till then.

Mr. CUTLER (London) expressed his satisfaction at having been invited to be present to hear this interesting paper of Mr. Livesey's. Of course, the idea of erecting a gasholder without guide-framing was quite contrary to the traditions of the gas engineering profession, and there was no experience to bring to bear on it. It did not require any argument or mathematical investigation to prove that if a holder had to rise and fall without guide-framing, the strains which in the ordinary way were taken up and resisted by the framing, would have to be borne by the holder; and it seemed

to him that they needed proof to show the advisability of putting this additional work on a vessel designed for a different purpose than that of resisting such forces—viz., that of containing gas; and therefore of necessity it should be kept in a condition not likely to allow of its escape, and therefore kept as free as possible from unnecessary straining. The experience of the past proved the advantage of framing; and for his part he was unable at present to see any possible advantage in attempting to do away with it. Mr. Livesey had referred to the experiment at Rotherhithe; but he (Mr. Cutler) could scarcely agree that the fact of this holder working all right demonstrated the advantage of doing away with the upper portion of the framing, although it certainly proved the possibility of so doing. Was not the holder and its framing exceptionally strong? and was it proved that the additional strain coming on to the bell might not be detrimental to it as a gasholder? With regard to the idea suggested in the paper, he had not had an opportunity of seeing the paper before he came to the meeting; but certainly he was exceedingly doubtful as to the successful working of such a gasholder. Its condition had been described as if it were locked or fastened at the bottom, and thus unable to tilt, and as if it were on the solid ground, when, of course, it could not be made to tilt. But, he asked, was not such an idea contrary to the proper conception of what a gasholder is—viz., a bell freely floating on the gas which it contains, and giving to the gas a pressure equal to its weight. If the holder became locked at the bottom its weight would be more or less supported, not by the gas, but by the slanting guides on which it worked; and what sort of influence would this have on the pressure-gauge? He should be glad to have some explanation on this point. One portion of the gasholder—viz., the bottom curb—he was glad to observe was now receiving more like the attention it deserved. Engineers had hitherto seemed very much to overlook the importance of this member of the structure. For his part he did not remember ever to have seen a bottom curb really of sufficient strength in large gasholders. In his opinion, too much importance could not be given to the bottom curb, and to the lower guide-wheels, which should always be carefully adjusted, and receive much more watchfulness than was frequently the case.

Mr. W. GADD (Manchester), on the invitation of the President, said he found it was somewhat difficult to speak generally upon the paper before them. He did not know that he ought to do this under present circumstances, because it would not be necessary for him to deal with the special propositions put forward by Mr. Livesey; inasmuch as there had been a great amount of discussion thereon amongst the members. He would like to say one thing, however, relating to his own experiments. He had tried the effect of his spiral guides going short distances and returning and spiralling the opposite way. It seemed to him to be something very like what Mr. Livesey proposed to do. He showed a modification of this idea in one of the models which he exhibited at Doncaster at the meeting of the Manchester Institution. Those who were present would remember that the lift travelled in one direction—

Mr. LIVESY: But each lift travelled all its height in the same direction.

Mr. GADD said this was so; but it was a modification of the same idea as was shown at Doncaster. He found that there was a little jump or jerk; and he took it that it was accounted for in this way: However slowly the lift might be going, there was sure to be a certain momentum acquired. This had to be overcome; and when they came to the return, it had to be acquired in the contrary direction. To go to the more general principles, which had been mentioned by the various speakers, of dispensing with guide-framing, he thought, with all deference to those gentlemen who naturally felt that they would like some one else to try the experiment—they all liked this—it was, at any rate, not the way in which important improvements had been effected. The great improvements they had seen in the past had always to be brought about by someone making the trials and risking something. Of course, it would be quite improper, as Mr. Cripps had pointed out, to undertake a practical experiment without knowing something about the theoretical stresses, and satisfying one's self beforehand that there was a firm foundation to build upon. He had listened very attentively to the part of the discussion in which Mr. Cripps engaged, because he had a great respect—to put it in the mildest form—for that gentleman's opinions and for his knowledge of such matters, which he (the speaker) recognized as very considerable; and therefore Mr. Cripps would probably excuse him for slightly dissenting from his description of his (Mr. Gadd's) views. It was perfectly true that he tried to liken a holder to an umbrella covered with light canvas; but it was also perfectly true that he (Mr. Gadd) did not exactly say that he would let the sheeting go to the winds. What he did say was that, in designing a holder, it was wise to have the framing sufficiently strong to carry the sheeting, which nevertheless had its own work to do, and was, after all, most necessary to the strength of the structure. It seemed to him that a holder without framing was subjected occasionally to all possible strains at once. This would be dangerous. First of all there was the strain of distortion—that was, as he took it, the tendency to get out of true shape. The second, which to his mind was the most important thing to be considered, was the possibility of what he would call the shearing strain—that was, the possibility of bending over. Now, if the holder would resist this shearing strain, he contended that it was strong enough for any pressure to which it could be subjected, because he believed if it would resist the shearing strain, it would resist distortion; for the simple reason—that at present a gasholder was subjected to the

chance of distortion, though it was held against the guide-framing, because if there was power enough in the wind, it surely went without saying that it could crush up one side against the guide-framing and thus distort it. Now, if it was at present strong enough to resist this strain, it would be strong enough, under any circumstances, without the framing, to resist distortion *per se*. Then came the necessity for resisting the possibility of shearing over. So far as the comparison of a holder with its edges resting on the solid ground went, the proposal he had made—of spiral framing—did compare therewith, to this extent, that the holder was held at its edges, and kept horizontally, the edges firmly and solidly gripped at every possible height as it ascended or descended. It therefore appeared to his mind that—he did not purpose going into any of the minor details—the only possibility of destroying a holder was by shearing action, because it was impossible to move it out of the horizontal without breaking the bottom rollers or guides. His holder worked equally well with three rollers as with six or more. So long as there were three sound bottom rollers—not necessarily in an equal sided triangle—his holder would work up and down all right. If the present make of holders was not sufficiently strong to form in themselves huge cantilevers of sufficient rigidity, they would require to be strengthened up to that point; but not necessarily by adding weight. As regards weight of material, it was in the main quite strong enough. He was perfectly free to admit that it might be necessary to alter the form or disposition of the material somewhat for the purpose. Mr. Newbigging, in his paper, suggested that the stays should be in the triangular form, at or near the bottom curb of the holder. This, he thought, would give the requisite strength; and, furthermore, the spiral guides necessarily formed an arch or bow which must strengthen the holder against distortion. He was convinced that if it could be demonstrated that a stable holder could be made, the economy would necessarily be great; and this had been incidentally shown by one of the previous speakers, when he mentioned the cost of the foundations of the piers, and so forth. This was a very important matter indeed. They had, by the system proposed, a simple, plain tank, without counterforts. The guides could be either built into the tank or be attached to the sides in any way which the engineer designing the tank thought best. If it was true that something like 50 per cent. of the weight could be taken out of the total structure, it must, of course, make a large reduction in the cost. He took it that this was a question which must not be lightly disposed of—that this possible saving could not be ignored. He did not know that there was anything more he particularly desired to say on the subject. He would only mention that the two models of holders on his system that he had in the room were not so perfectly constructed as he should have liked them to be. However, they were sufficient to show how the system worked. With regard to the fitting of the rollers on the guides, he had purposely left them very loose; his object being to show that, with loose-fitting guides, without the necessity of anything tight at all, the thing would work. Of course, in practice on a large scale, they would be made just as tight as was found necessary for the purpose.

The PRESIDENT said he noticed Mr. Henry Woodall, the President of The Gas Institute, in the room; and he was sure all present would be pleased to hear a few remarks from him on the subject under discussion.

Mr. WOODALL said he had only just come from Birmingham, and had not had the pleasure of hearing the paper. He was not prepared to say much of consequence on the question, because, as they were all aware, he had been out of office, and had not had any opportunities of inquiring into the particular aspect of the question which was at the present time engaging the attention of the meeting. Although he could not offer any technical suggestions, he could speak of his experience with gasholders, and give one or two illustrations which would have some interest in connection with this question, and might possibly be of some value. Looking at the matter from the light afforded by his experience, he might ask whether it was not a fact that the holder often supported the framing, rather than the framing the holder. That the framing of holders had ordinarily been built very much stronger than was needed, he had been convinced for many years past. He was the more assured of this from an accident which happened to a large two-lift holder at Leeds, when, in consequence of the upper lift being frozen (gas being delivered from it at the time), the holder fell with such a crash that the sudden vibration caused a fracture of every one of the 16 columns, 3 feet in diameter. He applied four straps of wrought iron to each column, each having two bolts above and below the fracture; and in this way the holder, 150 feet in diameter, lasted several seasons—until he had it converted into a three-lift one. This was only one of two or three cases of the kind he might mention, though perhaps not so distressing. That holder only cost £5 for patching.

Mr. LIVESY asked if the holder had diagonal bracing.

Mr. WOODALL replied that it had not. They were cast-iron columns, with two tiers of girders. Then in course of time he dispensed with this framing, and used very light wrought-iron framing. These holders had been characterized as "gossamer" structures, that would not stand a gale. It so happened that the first of the six holders he put up was met by a very severe gale before half the bolts were tightened, and it stood perfectly. If any of the gentlemen present went to Leeds, they would see some of the lightest possible structures. He had never heard of the slightest difficulty with them, although there were ten three-lift holders there.

The PRESIDENT said the discussion had been very full and interesting. Some of those who had spoken were very conservative, and some very radical; and he supposed that between the two they would find the answer to the great question before them. It seemed to him, as Mr. Woodall had said, that they had in many of the gasholders round and about them too much work in the portion of the structure which held the holder in position. On the other side, he thought that when they came to construct gasholders on the system demonstrated by Mr. Livesey and Mr. Gadd, they would require to have a great deal more strength in the lower part of the structure.

Mr. LIVESSEY, in reply, said that he had been extremely interested in the discussion that had been carried on so ably by so many of those present; and he really felt there was very little to say. Perhaps it would be better to take the remarks *seriatim*. Mr. Broadberry thought it would be necessary to strengthen the cups. Well, he did not think the use of tangential rollers had been sufficiently appreciated. By their use, the strain was applied in such a way that the cup was in the best position to resist it. Where they had radial rollers, they by their bearing on the guides tended to push the cup inwards; but with tangential rollers, the stress was in a direct line with the cup in its strongest position. That was a source of additional strength, or rather it removed a cause of weakness. In regard to their friend's anxiety as to the strength of the unsupported holder, the experience of the President of The Gas Institute seemed to show that the framing used in years gone by had been stronger than was necessary. That extraordinary experience of his showed that a holder would work safely with very weak framing indeed; and therefore, if they were to assume that by the abolition of framing they might have to strengthen the holder, it did not at all follow that they must put as much strength into the holder as was now found in the framing of ordinary holders. It was shown by experience that the framing was stronger than was necessary. Mr. Botley raised an important question about the tilting or wedging; and he wished to know how these new guides of his worked. It was a difficult matter to explain how the thing worked; it was necessary that each one should think it out for himself. Of course, in practice, they would have a series of these guides extending all round the tank—perhaps a score or more, and all placed, as he had said in the paper, in exact correspondence. Thus, the projections and hollows of all the guides would be exactly at the same level. Consequently, when the holder was going down, supposing the rollers to be in the top hollows of the guides, all the rollers must move in the same direction, (say) to the right, until they passed the projection. They then moved to the left, then again to the right, and so on. Of course it had to be proved whether the thing would tilt or wedge. He had been experimenting, but unfortunately had not had time to carry out the experiments thoroughly; but so far as they had gone it seemed that, while tilting to the extent of an inch or two might take place, in practice there was no danger of wedging. He was about having a model made. If it succeeded, he would show it at the next meeting; and if it failed, he would explain why it had done so. A radial roller would work straight up these guides in the clear space of 6 inches in the middle between the projections; but as it might possibly catch against the projections, they could have a channel-shaped groove or recess cast in the centre, which would provide a suitable path, 6 inches wide, for the radial roller. Perhaps he had better say that he was not going to recommend anybody to adopt this system. As was well put by Mr. Webber, this was a discussion on a principle; and what they wanted to do was to settle sound principles. Mr. Botley's question as to the size of holder adaptable to the system referred more to doing away with the upper framing, or employing a shortened framing. He (Mr. Livesey) did not see why that should not be applicable to gasholders of any diameter; and he was not at all sure that they would not be safer for small holders than large ones, because small holders were relatively stronger than large ones to resist distortion. Mr. Child said there was no reason for increasing the strength; and Mr. Cripps had dealt very exhaustively with the matter. For a single-lift holder, he, like Mr. Child, did not think it would be necessary to increase the strength of the sides at all. He must say that so far Mr. Cripps had proved his point, that to leave two lifts unsupported would cause greatly increased strains on the sides, and to leave three lifts unsupported would be quite out of the question. He could not but believe that the strains would be very considerably increased on the side sheeting if entirely unsupported by guide-framing. In this connection he could not do better than again recommend those who had not done so to study those able articles by "Theory and Practice." He must make one remark on what had been said by Mr. Webber. He said that Mr. Newbigging's paper ought not to be passed by without mention. With that he (Mr. Livesey) quite agreed. The paper was very interesting, and dealt with a part of the subject which was of great importance. In that paper was shown the proportion which the framing bore to the bell; and hence the argument, seeing that the framing bore so large a proportion to the weight of the holder, if they could do away with the framing there would be a considerable saving effected. Mr. Cripps asked whether it would not be better to make those projections easier or more rounded in his (Mr. Livesey's) guide. In one of the sketches in the paper, they were shown easier; but that was really a matter of experiment. It had to be found out what kind of curve in the guide would be most suitable for the purpose. The specimens handed round for inspection merely showed the principle. Mr. Cripps spoke about

the possibility of a jerky motion with this guide. Possibly there might be a slight jerky motion, but that also had to be proved. He did not think there would be any difficulty on this score whatever. Mr. Cutler had spoken about the Rotherhithe holder being a holder of great strength. It had, he confessed, heavy guide-framing; but he did not call it a strong holder at all.

Mr. CUTLER: The bell of the holder is strong.

Mr. LIVESSEY: The holder has strong roof framing and sheeting; but it is not uniformly strong. But the guide-framing was not at all strong, apart from its great weight, to resist the strains that might be supposed to come upon it. He was sure that if they were going to build a three-lift holder, and to stop short at the second lift, they would put up a much stronger framing at less cost and weight. As he had explained, the holder (imagining it to be standing on the ground) with the new form of guides, was held down at the sides, and was supported from its crown by the pressure of the gas on the crown; and by Mr. Gadd's plan and his own it was held down at the sides. If Mr. Cutler was right when he spoke about the bottom curbs being weak, it was a difficult matter to make a bottom curb very strong, as its width was restricted. But the same object could be obtained by increasing the number of rollers or points of support, or by using tangential rollers. By doubling the rollers, and thus reducing the distance between the bearings by one-half, probably the curb would be strengthened fourfold; and, paradoxical as it might seem, they might thus reduce the weight of the curb very materially, and yet increase its effective strength. He had not any comment to make upon Mr. Gadd's remarks; but he must say he did not think he had answered Mr. Cripps in relation to the question of distortion of the sides of the holder. He spoke of the shearing action; but it appeared to him (Mr. Livesey) that the wind-pressure on the holder must tend to distort and buckle it; and until that was proved not to be so, he would be a very rash man who would build a three-lift holder without any framing at all. Another thing occurred to him. He did not think the sides of the holder were sufficiently rigid to fix the guides to. They might well be fixed to the tin sides of a model; but that was not like a gasholder. There was no relative proportion between the two. If they were to fix spiral or his guides to the thin sheeting of a gasholder, and depend entirely upon them, it would not be sufficiently rigid to resist the strains that came upon it. If these guides, on the other hand, were fixed to the tank, they had there a perfectly rigid support; and the rollers on a strong bottom curb could not disturb the guides. But if they fixed the guides on the sheeting of the holder, he was very much afraid that it would spring and give way under the strains that would come upon it in a holder entirely unsupported by guide-framing. His idea was this: As to doing away with the framing altogether, he had never thought of it; and from all he had seen and heard, he did not think it would be advisable or practicable. The more he thought of it, the less he considered it would be safe to abolish the framing altogether. He should think it would be practicable to build a three-lift holder with guide-framing one-lift high, and to adopt for it Mr. Gadd's or his own guide. Of course, he should naturally prefer the latter. The inner and second lifts would be guided till they cupped by radial rollers working up the centres of the guides; and with two series of tangential rollers on the outer lift—one on the cup and the other on the curb working in the corrugated guides—he thought the bottom lift would be perfectly rigid and safe; and the two upper lifts, if they were strong enough to resist the distorting action, would also be perfectly safe. That he might tell them, was the utmost to which he thought it would be safe to go. He was much obliged to them for the patience with which they had listened to the paper; and he could only hope that the result would be that it would help to settle what were the true principles of gasholder construction.

Mr. PRICE'S PAPER—"SOME HINDRANCES TO THE SALE OF GAS."
(See *ante*, p. 847.)

The PRESIDENT said he was sure the members were all pleased with the interesting paper they had just heard. They had in the first paper economy in the construction of gasholders; and now they had had shown to them the benefit which would come to gas companies if they extended their business into small cottages. Much might be said on the various points raised in the paper. At the commencement of his year of office, he referred to the matter of deposits; and he must again say that in the case of country companies, they were a source of much mischief and obstruction to any increase in the consumption of gas. The inhabitants in small towns had a very strong feeling against deposits. In one place he had heard of, where they were demanded of some publicans, they immediately resorted to oil-lamps. The deposit system was, he believed, being abolished in many cases, on account of its deleterious effect upon the consumption of gas. It was necessary that every obstacle which impeded the growth of the consumption of gas should be removed.

Mr. W. H. BROADBERRY (Tottenham) remarked that there was scarcely a point in Mr. Price's paper which at some time or another had not come under the notice of most of them; and he thought it would result in a considerable improvement to their business if they could remove the obstacles referred to. In the first place, the author mentioned the question of deposits. If (Mr. Broadberry) must say he felt very strongly on this question. There was no doubt whatever that there were not half-a-dozen

gentlemen present in the room who would not be considerably annoyed if the baker were to ask them for a deposit before he would deliver bread to them. Why gas companies should be different from other people in business, in the matter of demanding a deposit, he could not at all understand. A few years ago, he must admit, they were a little more independent on the subject of the supply of light than they were at the present time. They could then say to intending customers, "You must come to our terms, or we will not supply you with gas." But this was altered; and they had now to show more consideration to the consumers' terms. The general demand for deposits could not be justified under any system of business whatever. For some years he had to work against his conscience, and ask for a deposit from every consumer. Nine months ago, his Company were not supplying gas in their district to more than about 25 per cent. of the inhabitants; and he certainly believed the principal cause was the infliction of the deposit.

Mr. LIVESEY: In every case?

Mr. BROADBERRY replied in the affirmative. Their instructions were not to put on a supply of gas without a deposit; and only consumers who were in existence before this rule was laid down were exempt. He made several reports on the subject; and the system had now been abolished. What they did now was to ask the name of the company that last supplied the intending customer; or if they could show by their receipts that their gas accounts had been promptly paid and so on, then they were supplied. If not, the company wrote for a reference; and if they did not get a satisfactory one, they found the simplest plan was to ask for a deposit. He had one case not long ago, in which he wrote to the company who had previously supplied the person applying for gas; and the answer came back: "Kindly give us his address; he owes us for two quarters." (Laughter.) As to the question of oil, there was no possibility of doubt that gas companies had to consider this more than the electric light. He carried out some extensive experiments on this matter of oil lighting; and there was no doubt that, light for light, gas at 8s. per 1000 cubic feet could not compete with oil. When, however, the trouble, the cost of chimneys, &c., was taken into account, most people would gladly pay the small additional cost of gas. He advocated that gas accounts should be collected at shorter intervals than three months. Whether prepayment was to be the system of the future, or whether the collections were to be easier, he did not know; but he certainly thought they should make the collection at least monthly, or even at shorter periods than that. In regard to the question of fittings, the first cost was considerable for small householders. They could buy a good oil-lamp for 15s.; but if they wanted a supply of gas they must spend about £3 or £4 for fittings in order to get the same amount of light. They would have to endeavour to meet the small householders in this extraordinary expense; and then they would certainly be able to hold their own. He thought that the fittings should be put in by the gas companies, and a monthly rental charged for them. The prepayment meter Mr. Price had exhibited was a very ingenious contrivance, and would help to meet the difficulty of quarterly collections.

Mr. GEORGE LANE (Aylesbury) contended that deposits were, in certain cases, absolutely necessary. At Aylesbury, they found it essential to require them from the publicans, and allow teetotallers to go "scot free." They found, on looking back for some years, that the bad debts were mostly caused by the coming and going of the publicans, which showed, perhaps, that they had not a large and lucrative business in the town. In reference to the meter exhibited, it appeared to him to be like a money-box; and when a tenant happened to be in arrears and in serious difficulty, he (Mr. Lane) thought there would be the temptation to disconnect the meter and run off with the source of profit.

Mr. C. E. BOTLEY (Hastings) said it seemed to him that in discussions of this kind very great difficulty occurred on account of there being different kinds of procedure in regard to deposits and so forth in various towns. There were not two cases that seemed to be the same in every respect. By recent Gas Acts deposits were sanctioned, provided 5 per cent. interest was paid on them; and he could not conceive that there was any injustice in this. In his own case they asked for a reference from the company who previously supplied the person wishing to have gas; and if they had a satisfactory reply, they connected the meter. In other cases they demanded a deposit, and allowed 5 per cent. upon it. One of their customers a short time ago inquired if they wanted any more money, because he could let them have some at the same rate of interest. With regard to laying on the gas, they were very liberal to their customers, as they put in 100 feet of service-pipe free of charge; and if it extended farther than this, they let them have it at cost price. They did not charge anything for fixing the meter. They charged meter-rents, though he should like to do away with them; but his Directors thought the amount of revenue produced under this head would not justify their abolition.

Mr. LIVESEY: If you abolished meter-rents, you would have to put up the price of gas.

Mr. BOTLEY: Just so; and the consumers appreciated a reduction in price more than the abolition of meter-rental. As to complaints, all gas companies received them. The consumers used in a great many cases bad gas-fittings and bad burners; but they would not be convinced that these were the real cause of their complaints, and said that the gas was bad. The Hastings Town Council had recently appointed a Gas Examiner. They had had extremely good reports from him; and now he believed the Council thought they had made a mistake. They had appointed an

Examiner to test the gas; and he was giving the Company a good advertisement, by showing that they more than carried out all their legal requirements. As to the prepayment meter, there was no doubt that they would, if they wished to cultivate the small class of consumers, have to look to something of this kind to help them. The question of fixing fittings in small houses was, he thought, the more serious question for gas companies to consider.

Mr. C. GANDON, referring to the deposit question, said that if it was necessary to ask for a deposit at all, great discretion should be used. If they knew they had an untrustworthy person to deal with, of course a deposit would have to be demanded. He had found the same thing as had been mentioned by a previous speaker with regard to the losses by publicans. They were very difficult people to deal with. They went into a public house, and would leave before the gas officials were aware that anything was wrong with them; and then it would be found that the brewer had a lien on everything in the place. As to meter-rents, this was also a question on which it was rather difficult to lay down any absolute rule. The Crystal Palace District Gas Company made a charge of 9d. per quarter for meter hire; the object being not so much to obtain a profit, as to prevent people keeping meters in their houses when they did not use gas. If no charge was ever made, some people would allow the meter to remain *in situ* when they were not using gas, rather than have it removed. As to Mr. Price's prepayment meter, he had not yet had an opportunity of examining it; but he was rather disposed to think that the contrivance would be found difficult to work in practice. Could the meter discriminate between a half-crown and a piece of lead of the same weight as a half-crown?

Mr. JABEZ CHURCH (London) said that, with regard to gas-fittings, he thought it was a question that all gas managers would have to consider—how they could put proper and good fittings in houses. It was certainly one of the problems which gas managers had to solve. In the case of water companies, they had their own plumbers; and they had to use stipulated fittings.

Mr. C. C. CARPENTER (London) said he was afraid there was a tendency to run after the small consumers, and let the large ones go after the electric light. Electric light was no doubt making headway; and he thought that the subject should be dealt with. For himself, he believed that everything could be done with gas that the electric light was capable of effecting. He was one of few gas people who lived within the range of electric lighting. They were on one of the oldest circuits in London; and they were continually having breakdowns. With the electric light, unless they had some artificial means of ventilation, the atmosphere was not so fresh as with gas light. They heard people say that ferns and flowers were unable to live in rooms lighted by means of gas; but his ferns "turned up their toes" in a week in a room where the electric light was used. By putting in one of Sugg's ventilating burners, however, the difficulty was overcome. The other occupants of the house where he resided were quite ignorant as to what gas could do; their notion of it being based upon that relic of barbaric gas times—the union-jet burner—whereas gas lighting could be made as artistic and decorative as electricity itself, at less than one-third its cost. He thought the proper education of the consumer was a very important subject, and one that would have eventually to be taken up. He noticed nearly every night, when going home, that some shop or hotel or lodging-house had the electric light where it was not on the night before.

Mr. CUTLER urged the desirability of giving more attention to the small consumers than was done at present. In conjunction with Mr. Cloudesley, he had devised a meter to enable gas to be paid for beforehand; and he might say, it would be shortly brought before gas companies and corporations for their consideration.

The PRESIDENT considered the subject they had been discussing was a very interesting one. He thought that if the prepayment meter came into use, some arrangement should be made with the landlords of small houses to put in gas-fittings. In regard to the use of oil, he had read in the papers that the authorities in one part of China considered that more material damage had been done by the oil than by the opium traffic. He believed in Mr. Botley's plan of supplying the services and fixing meters free of charge.

Mr. PRICE, in reply, said that in reference to the question of fraud in connection with his prepayment meter, the arguments that applied to a machine for supplying sweets and so on would not apply to his instrument, because in the case of the meter there was a responsible owner; while with a machine at a railway station a person could drop in a piece of lead and be 100 miles away before the collector came round to take away the pence. As to the question of running away with the meter, he did not think anyone would do this for the sake of the few shillings contained in it; besides, a meter was not a thing that a person could remove without being seen. With this machine he should think the collection ought to be made once in six weeks. As stated by one gentleman, there was no doubt that the use of the electric light was increasing in the houses of the wealthy, and those to whom expense was no object when a new and attractive light was the temptation; but let things settle down to the inevitable balance of supply and demand, and the usual comparisons of expense—when the quarter's electric light bill was compared with the corresponding quarter's gas account—and he had no fear but that the "survival of the fittest" would obtain. He was strongly of opinion that the small consumers should be looked after; and he believed that a considerable amount of revenue could be obtained from them. He was much obliged for the attention that had been given to his paper.

AMERICAN GASLIGHT ASSOCIATION.

The Sixteenth Annual Meeting of this Association was held at Toronto—as already intimated in the JOURNAL—on the 17th, 18th, and 19th ult. The PRESIDENT (Mr. T. Turner, of the Charleston Gas-Works) occupied the chair. The summary of the proceedings which we publish to-day, and shall continue in subsequent issues of the JOURNAL, is prepared from the "Official Report" published in the *American Gaslight Journal*.

The first matter which received the attention of the members was the report of the Executive Committee, who recommended that a portion of the surplus funds of the Association should be disposed of in the purchase of badges, at a cost of about \$4 each, one of which should be presented to each member. The report having been accepted, the Secretary and Treasurer (Mr. C. J. R. Humphreys) read the financial statements.

The PRESIDENT then proceeded to deliver his Inaugural Address. He commenced by congratulating the members on the general and almost unprecedented prosperity that had attended the gas industry during the past year. The increase in the consumption of gas had ranged from 5 up to 30 per cent. Considering the cause of this, he thought the natural tendency with all consumers was towards the use of more light. The low price allowed a more free and extended use of gas; and the consumption for cooking and heating purposes was constantly increasing. The application and use of the electric light had almost compelled people to have more light of all kinds; and though the market price of gas stocks had at times suffered from the progress of this new system, the gas business as a whole had rather progressed. He regarded the idea of "fighting" the electric light as a mistaken policy; and urged that they should rather lend their energies to the development of the possibilities in their own business, which were greater than most people were aware of. All things considered, gas must still remain, as it had been in the past, as best adapted for universal illumination and heating. He was not entirely in favour of the policy of amalgamating the business of electric lighting with that of gas lighting, and did not think that any man could manage two different kinds of business as he could one. One or other must in some degree be neglected, and perhaps both. At the same time he acknowledged that in some cases, local circumstances and conditions might render it advantageous to consolidate the two interests; and wise managers would be governed by these circumstances rather than by any general rule. If the gas industry had prospered during the last 30 or 40 years, in the hands of men who, in many cases, had no special training or education for it, he was certain that still greater improvements might be expected in the future, now that the carbonization of coal and the treatment of the resultant gases were more thoroughly understood; and that it would receive a fresh impetus when the young men who were now coming up with specially trained minds and hands, bent their energies to the development of the science of manufacturing illuminating and heating gas. With regard to naphthalene, conditions of carbonization, and other points, much remained to be learnt; and the engineer who was to be the most successful in the future, was he who had taken advantage of a thoroughly technical education, coupled with actual practical ability and application. Under the present system of education, the students had no opportunity of acquiring that practical judgment which must needs accompany a technical education in order to place them in the best possible position as managers of any great industrial establishment; and this was one reason why the man who had learnt a trade, and worked with his own hands, was usually more successful than the one who had acquired a theoretical education, but had never enjoyed the advantage of any practical experience in the work.

The Executive Committee on the proposed amendment of the constitution of the Association then presented their report, which embodied a remodelled set of rules; and after some discussion it was adopted. It was subsequently decided that the next meeting of the Association should be held at Baltimore.

The reading of papers was next preceded with.

Mr. W. H. PEARSON, of Toronto, read the first paper, which consisted of a description of the latest forms of Herr Lux's gas-balance. As this was similar to that given at the recent meeting of The Gas Institute in London, it is unnecessary to give an abstract of the present paper.

Mr. J. SOMERVILLE, of Indianapolis, contributed a paper, entitled "Daily Experience and Observations of a Gas Manager." Alluding to the retort-house, he said that he preferred that it should be built on the stage principle, as the best and cheapest in the end, and leaving ample room for the erection of generator furnaces. He found it quite sufficient to brace the settings in the front and rear only, and arranged them so as to allow enough space and also plenty of time for the combustion of the furnace gases. In passing, he laid some stress on the importance of the element of time in all gas-works operations. There was no advantage in running the heats so high as to approach a white heat, as the gas produced under such circumstances was poor, and would readily deposit naphthalene. The spent charge should, on the removal of the retort-lid, present a bright red sparkling appearance without a trace of smoke; and the coke should be curled up at the sides, and come out easily when the rake was applied. He also found that the higher the heats, the greater the production of ammonia. [It may be here remarked that the author's experience in this respect does not agree with that of many English gas engineers, or with the experiments made by Mr. Lewis T. Wright.] Self-sealing lids, Mr. Somerville continued,

were only so in name, as after the first year or so they were unable to stand the wear and tear of the retort-house. The hot scrubber, in which all the heavy tar should be deposited, ought to be so hot that the hand could not be held on it—say, about 120°. The light oils and naphthas would flow on with the gas; and these should be taken out in a Pelouze and Audouin condenser. Some gas managers place the latter appliance first, where he put the hot scrubber; but he objected to such a course, as being likely to impoverish the gas, and also to allow a little tar to pass forward to the scrubber. He preferred weak liquor of 2° or 3° strength to clean water in the scrubber. Referring to gasholders, the author said that his observations led to the conclusion that, whenever trouble occurred, it was due to the weakness of the bottom curb. Let the bottom rollers get out of place, and the stability and safe working of the holder was destroyed. Much had been said against the sperm candle as a standard of light; but he found that, when burnt under proper conditions, and with due corrections, it did, for all practical purposes, fairly test the illuminating value of the gas. When the specific gravity rose without a corresponding increase of illuminating power, it was time to look to the exhaustor governor. Every meter ought to be examined, and repaired if needful, every five years. The result of one year's testing of consumers' meters at Indianapolis showed that, out of 209 meters, 116 were correct, 53 slow, and 40 fast. The average percentage of slowness was 8.6, and of fastness, 7.3. As to the supply of gas for cooking and heating, he had taken this into his own hands with great success; having now over 2000 stoves out, giving great satisfaction. He also collected accounts weekly if desired; and at present he had 600 consumers on these terms.

In the course of the subsequent discussion, Mr. King referred to the statement that "the safe working of the gasholder was entirely dependent on the strength of the bottom curb and rollers" as agreeing with the claims of Mr. Livesey, Mr. Gadd, and others in England. Mr. Clark said he could not agree with some points raised in the paper. He used self-sealing lids successfully; the only point necessary being to take care that they were carefully scraped. He preferred to have the exhaustor close to the hydraulic, as it then needed no lubrication; but he agreed that the hot scrubber should come immediately after, and before the Pelouze and Audouin condenser. Mr. Mooney, Mr. M'Millin, and Mr. Scriver spoke in favour of self-sealing lids, supporting the remark made by Mr. Clark on this subject. Mr. Scriver had followed with great advantage the advice given in the paper with regard to the use of gas for purposes other than lighting, to the extent of making his own stoves, and supplying them at cost price, and also offering a special rate for the gas so used. Mr. Harbison supported the reader of the paper, but did not agree with the policy of Mr. Scriver in charging a special price for gas used for purposes other than lighting. He believed in a uniform price, and this so low that everybody could afford to use the gas for every purpose. He had no hot scrubber, but used a Walker tar extractor and a standard washer; and this arrangement he found to answer well. Mr. Nettleton suggested that self-sealing lids would work well for small but not for large retorts. Mr. Floyd demurred to this; and thought that the principal difficulty lay in the treatment of the lids. Mr. Somerville, in the course of his reply, entered in detail into some of the reasons that had led him to the conclusions expressed in the paper.

The Committee on Standard Meter Unions reported that, after careful consideration, they had decided to recommend the adoption of the following sizes:—

Size.	Standard Thread.	Diameter.	Tail of Swivel.	Nose of Swivel.
		Inch.	Inch.	Inch.
3-light meter . .	18	.. $\frac{3}{16}$	.. $\frac{1}{8}$	.. $\frac{1}{8}$
5 " . .	12	.. $1\frac{1}{8}$	.. $\frac{1}{4}$	.. $\frac{1}{4}$
10 " . .	11½	.. $1\frac{3}{4}$	.. $1\frac{1}{4}$	.. 1

The Committee also recommended that the foregoing be submitted to other Associations for approval and adoption, and that they should continue their labours with regard to other sizes of meters, and report at the next meeting. It having been proposed and seconded that the report be accepted, Mr. Down, the Chairman of the Committee, entered into a full explanation of the course by which the Committee had been guided. They found that the meter-connections in use differed in diameter, in number of threads to the inch, and in the size and shape of the thread; and it had been their endeavour to arrive at a standard that would, as nearly as possible, be a mean between these differences. Even $\frac{1}{16}$ of an inch variation in diameter made a great practical difference, enough to bother anyone in attempting to make the coupling. It was the desire of the Committee (which comprised representatives of the principal American meter makers), if their recommendations were adopted, to make a set of steel standards at their own cost, and place the same in charge of the Association. Responding to a suggestion from Mr. A. C. Humphreys, he said he thought the standard unions might be made of a distinctive shape, or stamped with the letter "S." Being asked whether the new standards would fit all existing meters, he replied that they had been carefully selected to fit the greatest number; but it was useless to deny that some difficulty would arise, until the standards were generally introduced. After some further discussion, the report was adopted. On the motion of Mr. Harbison, it was decided that the three standard sizes embodied in the report should be adopted by the members of the Association on and after March 1 next, and that the Committee be requested to design other standard sizes.

Mr. F. MAYER, of Baltimore, then read a paper on the "Construction of Gasholders with Wrought-Iron or Steel Tanks above

Ground." He said it had been the desire of gas engineers in all modern works of magnitude to provide an easy access to all parts of the apparatus. The advantages of this system were apparent; and in works where all the apparatus was above ground, exposed to air and light, it was an easy matter to control and maintain the same in a proper state of repair. But little or no attention was paid in this direction as to the construction of gasholder tanks; the old and well-known brick tank being repeated in almost every instance, although it was known that the guarantees for perfect construction and proper results were doubtful, even in good ground. With a view of meeting this objection, he had proposed and advocated for three years the construction of wrought-iron or steel tanks built above ground, and had erected several on this principle, which appeared to him to yield the advantages of reduced cost of construction, less time required in construction, positive assurance of proper construction, easy accessibility to all parts, and no deterioration of the ground. The probable cost of a brick tank in treacherous ground was very uncertain; but the cost of a suitable foundation on which to construct an iron tank was comparatively easy of estimation. Even in tanks of 35 feet depth, the load per square foot would not exceed a ton, which was not an unusual pressure on foundations. Piling was necessary in very bad ground. The character of the soil could readily be determined if an iron tank was to be used; but proper tests for a brick construction were difficult of attainment, owing to the increased depth. Consequently, expenses for additional sheet piling, &c., and dealing with water and quicksand, were frequently incurred in excess of that originally contemplated. This extra expense was coupled with delay in completion. The time which would be occupied in construction could be established with certainty to within a week or two, when iron tanks above ground were used, and was 20 to 30 per cent. less as compared with ordinary brick tanks. With proper precautions in erection, the iron tank would be fairly reliable as to soundness; but brick tanks frequently did not develop their defects till they had been filled with water. The cause was simply that the exterior of the latter was inaccessible. Therefore defects might exist there that could not be observed from the interior, but which in the case of an iron tank would be at once seen and remedied. An iron tank could be readily taken apart, and removed to another site, if desired; leaving the ground free and undisturbed, ready for immediate use as a building site or for any desired purpose. Attention was then directed by the author to the details of construction, as exemplified by photographs of tanks erected on this system. The entire weight of the guide-framing, which was of wrought iron, was supported by the side plating of the tank. The bottom was perfectly horizontal, and solidly bedded upon the foundations with cement grouting, poured in through hand holes after the bottom was in position. The strains imposed upon the ironwork of the tank by internal pressure were directly proportional to the diameter, and in the construction shown did not in any part of the rivetted joints exceed 10,700 lbs. per square inch. The strength of the rivetting as compared with the plating was 81 per cent. for the lower vertical triple-rivetted seams, and 76 per cent. for the upper double-rivetted seams. The upper edge of the tank was formed of a strong continuous circular girder of plate iron; and the supports for the standards consisted of large brackets extending through the entire depth of the tank, constructed of angle and bar iron. The weight of the guide-framing was thus uniformly distributed over the whole surface of the foundation. Quite a "low" overflow was provided in addition to the ordinary one near the edge of the tank; so that the water could be lowered when necessary, to admit of painting the inner and upper surface of the tank at this point. In large tanks it was very necessary to make provision for expansion and contraction. The guide-framing consisted of trussed standards, joined by lattice girders, and diagonal tie-bars. It was light in appearance, but stronger than the usual pattern. As a proof, he cited a tank and holder 100 feet in diameter at Memphis, which was caught in a tornado just when inflated to its full height for testing. Though the wind reached a velocity of 70 miles per hour, the holder was not the least damaged. Combined systems of radial and tangential rollers were used; and the carriages were constructed entirely of wrought iron under recently obtained patents. An important question was how to prevent the formation of ice. Spare steam might be utilized if obtainable; but where additional apparatus was necessary, he preferred heating by hot water. In any case the heating surface should be uniformly distributed round the inner circumference of the tank.

The paper was discussed at some length. Mr. Harbison considered the plan described in the paper a vast step in advance of present experience. It would be a great advantage to him if all his tanks were as tight as he believed these iron or steel tanks could be made; and he thought that most of the members had had more or less experience with leaky tanks. He was located where there was a rise and fall of 27 feet in the water level; and the ground was made ground. Of four tanks, two had already been lined with $4\frac{1}{2}$ -inch brickwork, and a third was split from top to bottom; and he was considering the advisability of putting in an iron or steel lining instead of a brick one. In building a new tank, he should therefore be inclined to try Mr. Mayer's plan. As to the prevention of ice, it would not be a difficult matter to house the holder and tank together. Mr. Somerville thought there would be some difficulty from rust, particularly at the bottom of the tank, and also from freezing. Mr. A. C. Humphreys quite agreed with the reader of the paper.

He did not believe there would be any trouble from rust; but thought that extra precautions against frost would be necessary. Mr. Mayer observed that iron under water, or otherwise protected from the air, merely became covered with oxide and then stopped rusting; so he thought there would be no difficulty in preventing the formation of rust, as the outside was open to examination. The bottom plates ranged from $\frac{1}{4}$ to $\frac{3}{4}$ inch according to the size of the holder, and were about 4 feet wide by 16 feet long.

Mr. D. H. GEGGIE, of Quebec, read the next paper, which was entitled "Experience in Distributing Gas under Extremely Low Temperatures." He commenced by stating that at Quebec the winters are long and severe; the average temperature from Nov. 1 to April 1 averaging about 15° Fahr., and for at least two months of that time it was below zero. His gas was first passed through an air condenser, then a St. John and Rockwell scrubber-condenser, next a series of upright pipes provided with a lattice-work of corrugated plates, and lastly through a standard washer. This apparatus not only eliminated tar, but prevented trouble from naphthalene either on the works or elsewhere. The illuminating power of his gas, as tested by the Government Inspector, averaged nearly 18 candles throughout the winter. He used Newcastle and provincial coal, with 4 per cent. of cannel; and attributed the small percentage of enricher required to the efficient action of the St. John apparatus. The gasholders were all enclosed in buildings heated by steam; and the distributing plant was divided into three sections, each with its own governor, and subdivided by valves, so that in case of breakage or fire a small section could be shut off without interfering with the rest. The mains were 4 to 6 feet deep, laid near the curb line, and protected in damp or rocky ground with wood cases, tar, and sawdust. He found the lead joint preferable to the turned and bored joint, as more elastic and less liable to fracture by frost, contraction, or subsidence; and he now used lead joints entirely, as, if the frost reached the pipes, it was invariably the body of a turned and bored joint that broke. On account of the low temperature, the gas was reduced to the extent of 5 per cent. in volume in the course of distribution. The exposure of his mains and services in the course of laying water and drain pipes caused him much trouble; and as the earth was frozen when the trenches were re-filled, great difficulty occurred when the thaw came in the spring, when his mains would sag, fill with water, and break, owing to the subsidence of the ground. In the extremely cold weather, the services remained clear; but at warmer temperatures frost would form close to the walls of the house, and cut off the supply. This was removed by means of spirits.

In the course of the discussion, Mr. R. Baxter, who said he was also a native of the frigid zone, related some of his experiences. At Halifax the temperature did not fall quite so low as at Quebec; but while the latter town was peculiarly well adapted for districting, Halifax, like many other towns, was not. Although his pipes were 4 or 5 feet deep, the frost would sometimes get down to them; but he did not find the turned and bored joints break; and in fact used them entirely. His great difficulty, both with mains and services, was due to people making drains, &c., and not filling up the ground properly below them. He used wet meters, charged with one part of methylated spirit to two of water, which answered well, but caused some annoyance from evaporation. Glycerine was also employed; and each meter was fitted with a reserve supply of liquid. Mr. Scriver, of Montreal, said he also came from a cold country; and his great trouble was excessive capital. Having to house in all the plant, and also to keep it warm, and to lay the mains 5 feet deep, the cost of plant was increased to about double of that which would be sufficient in warmer climates. On more than one occasion, he had lengths of 100 feet of main or so frozen solid; and the only remedy was to open the ground and build coke fires upon the pipes. He was also much troubled with naphthalene; and this principally when the winter set in. Another disadvantage he had to encounter was that, not having railroad communication with the mines, he was under the necessity of laying in a very large stock of coals in the summer season. He did not lay pipes across bridges, but went down underground instead. Mr. Shelton, of Philadelphia, remarked that he had used slacked lime to thaw frozen ground instead of coke. He took off a few inches of earth, spread the lime in the space, poured water on, and covered it over closely with canvas. By the next morning, the frost had been drawn out of the ground to a depth of nearly 3 feet. The lime required to be left for a night to give it time to work. Mr. A. C. Humphreys remarked that the difficulty with frozen mains, &c., arose where the line of frost and the line of pipe intersected. If laid at various levels below the surface, the pipes would be exposed to the frost in some parts, but would be found below it in others. Mr. Starr, of Richmond, Ind., said he frequently had the temperature 20° to 25° below zero, and was much troubled with his lamp columns, until he put in $1\frac{1}{2}$ -inch services, instead of $\frac{3}{4}$ -inch. With regard to frozen holders, he had put small iron brackets round the inner edge of the tank, to support a frame of wood, which, as nearly as possible, covered the exposed surface of the water. Throughout the cold season, a layer of manure was put on the frame; and this prevented any trouble. He carried up the tank wall about 3 feet above the water-level; and this plan was no doubt some help. At bridges and exposed places he had enclosed the mains in wooden boxes. Mr. Pearson, of Toronto, observed that he had followed the same plan, and found his experience agree with the suggestion made by Mr. Humphreys. He was much troubled with frozen service-pipes; and he found methylated spirits effective for thawing them out. Mr. Lindsley,

of Cleveland, said he had efficiently protected a service-pipe in a very exposed situation, by providing a wooden box one inch larger than the pipe, and filling in the space with pitch. Mr. A. C. Humphreys, in reply to enquiries, said that he always widened the pipe at all exposed parts. On a line of 8-inch pipes for instance, where crossing a bridge, he would lay 12-inch pipes. If they were covered with canvas, so much the better; but he did not think the pipe would freeze without covering. He had applied this plan to lamp posts with great success; using 1½-inch pipes in place of ¾-inch. He did not consider that the expansion merely left room for the frost, but that a less actual formation took place in the larger pipe. Mr. Douglas, of Savannah, also testified to the success of this plan. Mr. M. Millin, of Columbus, had two lines of 16-inch pipe crossing a bridge, which caused much trouble. At the point where the gas entered the exposed part, the main was carried perpendicularly out of the ground to a height of 5 feet or 6 feet. He enclosed this part in an 18-inch pipe, packing the space with felt, and for 10 feet or so beyond added a jacket of sheet iron with the object of causing the exposure to cold to be gradual, and not sudden. He believed that the application of this plan would prevent trouble in all cases. Mr. Slater, of Providence, preferred cement joints to lead joints for mains; and said he did not find the rigid joints broke at all. If he hated anything it was broken pipes. He always boxed in the pipes passing over bridges. This concluded the first day's proceedings.

DEATH OF MR. D. VINCENT, OF ERITH.—The death is announced of Mr. Daniel Vincent, who for 28 years had been Manager of the West Kent Gas Company's works at Erith. He was 63 years of age, and had charge of the works before the West Kent Company was formed. He enjoyed the entire confidence of the Directors from the time of his taking service under them, on the formation of the Company in 1865, until the last. He proved himself to be a thoroughly practical man of business, and remarkably well fitted for the discharge of the duties with which he was entrusted. The late Mr. Vincent's father (Mr. Matthew Vincent) was Manager of the Crayford works.

MID-SUSSEX WATER COMPANY, LIMITED.—The prospectus of this Company, which has been formed for the construction of works and the supply of water to Hayward's Heath and other places in Sussex, has been issued. The capital is £35,000, in £5 shares; and the Company have borrowing powers to the extent of £8750. It is proposed to issue 6000 shares at par; but only three-fifths of the amount will have to be paid within three months from the date of allotment. The population of the district covered by the Company's powers is estimated at about 14,000, who are at present in urgent need of a good supply of water; the existing sources being much contaminated. The works have been designed by Mr. Jabez Church, M. Inst. C.E., F.G.S., and are being carried out by Messrs. J. and H. Robus.

OVERHEAD WIRES FOR ELECTRIC LIGHTING.—In the House of Commons last Thursday, Mr. Bradlaugh asked the President of the Board of Trade whether the Board had sanctioned any existing overhead wires for the purpose of electric lighting; and whether they intended to authorize, under Provisional Orders or Licences, the transmission of electricity at high tension by such wires within the Metropolis. Sir M. Hicks-Beach replied that no overhead wires had been sanctioned so far; and although he was not prepared to make any definite promise as to future applications on the subject, he should not be disposed to accede to such request. In reply to a question by another member, as to whether or not he had power to prohibit the erection of overhead wires, he said he would rather not give an answer at present.

A HANDBOOK FOR THE LONDON COUNTY COUNCILLORS.—Mr. D. Nutt has published a neat little work by Mr. G. Laurence Gomme, F.S.A., upon the duties and powers of the London County Council under the Local Government Act of the current year. Mr. Gomme has written an interesting introduction to his subject, in which he recognizes that the method adopted for dealing with "such a concentrated area of human life as London," by invoking the idea of the shire or county, was a stroke of good statesmanship. It is regrettable, however, that writers of books who take the trouble to prepare introductions or prefaces to explain the objects of their works, so frequently fall into a slipshod way of expressing themselves in these explanatory compositions. In this instance, it is to be presumed that Mr. Gomme knows what he means by such a contradiction in terms as "a concentrated area;" but the phrase certainly looks odd. Concentrated soup we know, and to concentrated attention we are not strangers; but how an "area" is to be concentrated surpasses our ken. This, however, by the way. Mr. Gomme has presumably been more careful of his facts than of his language. There is an ample index of subject titles; and the contents of the book are arranged alphabetically in short paragraphs, under side-headed titles printed in bold capitals. Every subject respecting which inquiry may be made is consequently easily found, and the required information ascertained at a glance. The incorporated Acts are in most cases referred to, together with other information to the point. Thus, under the heading "Gas Testing," there are references to the Acts under which the duty of testing gas was confided to the Metropolitan Board, and also a list of the testing stations. The book will be found a concise index to the Local Government Act itself, and the other statutes which have to be construed with it. It is clearly printed, and well worth the small price asked for it.

NEW PROCESS FOR THE TREATMENT OF AMMONIACAL LIQUOR.

In the number of *Industries* for the 9th inst., an illustrated description was given of the plant in use at the Wear Patent Fuel Works, Sunderland, for the treatment of ammoniacal liquor for the manufacture of sulphate of ammonia. Since the first adoption of apparatus for this purpose, various minor improvements have been made in its arrangement; the latest—a new method of dealing with the waste gases—having been introduced at the beginning of March last. The General Manager of the works (Mr. W. Dixon) courteously furnished to our contemporary drawings of the plant and a description of the entire process; and from these the following particulars, with the accompanying illustrations, have been prepared.

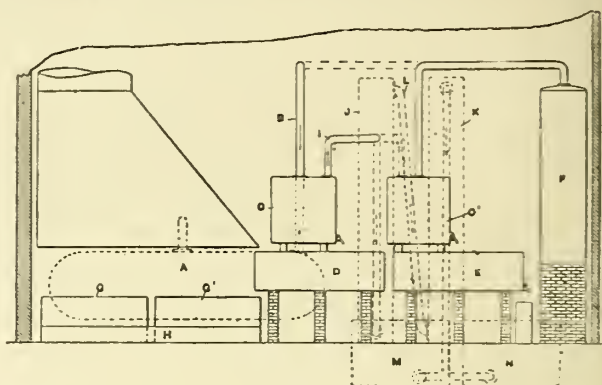


FIG. 1.

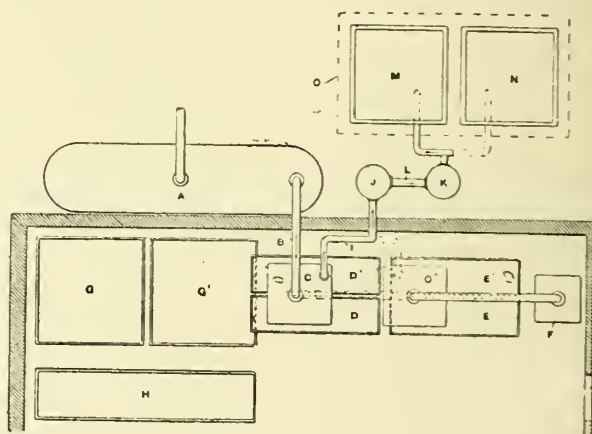


FIG. 2.

As stated above, the new arrangement was brought into use at the beginning of March last. Prior to that date, the "column" system was employed at the works; and the plant is still retained, being made use of when that for the improved process is being repaired. The annexed illustrations show in fig. 1 an elevation, and in fig. 2 a plan of the complete plant. The first process through which the liquor passes is that of being boiled. This is effected in the "stripper," an egg-ended cylindrical boiler A, 25 feet long and 6 feet in diameter, elevated above the ground, to allow the necessary connections of pipes to be made for carrying off the sedimental refuse to the drains. The boiling is effected by means of steam, at a pressure of 60 lbs. per square inch, which is passed into the stripper through a system of 2-inch copper pipes from the main boilers. The portions of the pipes inside the stripper are perforated, so that the steam comes into actual contact and mixes with the liquor. As soon as the latter has been raised to boiling point, the supply of steam through the perforated tubes is cut off, and the boiling is continued by means of steam passing through a coil of pipes which is also located inside the stripper. The vapours from the liquor, which commence to evolve at a temperature of about 190° Fahr., pass out of the stripper through metal pipes B to the saturators C, situated in an adjoining building, where it is neutralized in the ordinary manner by means of sulphuric acid. As soon as the process of neutralization is completed, the fluid is passed into the settlers D or D', situated conveniently below the saturators—settlers D and D' being in connection with the saturator C; while the remaining settlers E and E' and the saturator C' form an independent arrangement in connection with the column F. In case of need, however, both sets of saturators and settlers can be used for either the old or the improved process. After the settling process is completed, which usually takes about an hour the clear liquor is passed into the evaporators G and G', which are of the ordinary type, having in close conjunction drainers H, on which the sulphate is deposited. Returning to the stripping process, the lime is introduced into the boiling liquor, as in the ordinary column process, in order to free the fixed ammonia; and one of the advantages of this improved method is that it facilitates the lining process, which is effected by injecting the lime by water pressure into the top of the stripper. Besides other minor advantages as compared with the column system, Mr. Dixon's improved arrangement obviates the necessity of heating the liquor prior to

introducing it into the stripper. There is also a considerable saving of time, as the entire operation of treating 3000 gallons of liquor is effected in the new plant in from 8 to 18 hours, according to the strength of the liquor; while in the old system from 10 to 20 hours were occupied in completing the process.

The disposal of the waste gases is also carried out by an improved method. The sulphuretted hydrogen which accumulates in the saturators passes through suitable pipes I to the condensers J and K. Previously these gases were discharged underneath the grates of the furnaces of the main boilers. This practice, however, had to be abandoned under the provisions of the Alkali Act. The gases are now conducted into the condensers J and K, which are two flat-ended cylinders 12 feet high and 3 feet in diameter. They are connected together by a cast-iron pipe L, 8 inches in diameter, and placed at an angle so as to connect the bottom of the condenser K to the top of the condenser J, as shown in fig. 1. The gases enter J, and are therein partially condensed by the atmosphere and by a spray of water. After passing through the condenser K, all the moisture in the gases is removed. They then pass through a 6-inch pipe into one of the two purifiers M and N. Each of the condensers is provided with traps formed of 2-inch pipes for passing to the sewers the retained moisture and the water used in condensing. The purifiers shown are built of bricks, and are 7 feet square and 6 feet deep. Some distance above them is erected a substantial shed roof O to protect from the weather the oxide of iron with which the purifiers are filled. As already indicated, the gases from the condensers pass into the bottom of one of the purifiers, although two are provided, so that in case one becomes fully charged, the other is available while the sulphuretted oxide of iron is removed and the purifier recharged.

ISSUE OF ADDITIONAL DEBENTURE STOCK BY THE SOUTHWARK AND VAUXHALL WATER-WORKS COMPANY.—The Directors of the above-named Company are about to offer for sale, by tender, £100,000 of 4 per cent. perpetual debenture stock; being a portion of the additional capital authorized by the Company's Act of 1886, and created by the resolution passed by the proprietors at their meeting on the 30th ult. The stock will be consolidated with the existing 4 per cent. debenture stock, and will rank before the present paid-up stock and share capital of the Company.

DEATH OF MR. J. LEIGH, OF MANCHESTER.—We regret to announce the death, on the 11th inst., in his 74th year, of Mr. John Leigh, M.R.C.S., Medical Officer of Health for the City of Manchester, and Gas Analyst to the Gas Department of the Corporation. In the latter capacity he was some years ago engaged in making experiments, and became convinced that the illuminating power of gas did not lie in the olefant gas, to which it had usually been attributed, but to more condensed hydrocarbon or hydrocarbons. To test this he passed a quantity of gas through fuming nitric acid, and obtained a large quantity of nitro-benzol and oxalic acid. The discovery of nitro-benzol had been made long before by Mr. Leigh, and was communicated by him to the British Association at their Manchester meeting in 1842. The deceased gentleman was interested in other departments of science, and also possessed considerable literary ability.

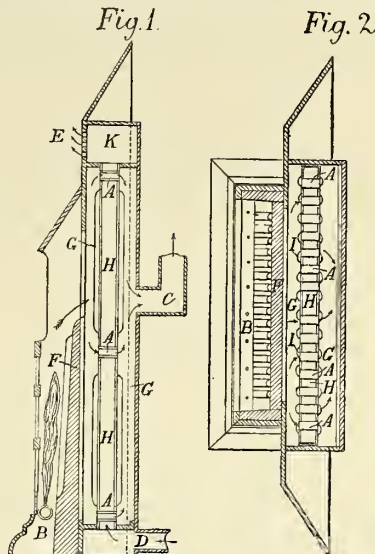
SOCIETY OF ARTS.—The first meeting of the 135th session of this Society will be held to-morrow evening, when the opening address will be delivered by the Duke of Abercorn, C.B., Chairman of the Council. We mentioned last week that arrangements have been made for Mr. W. J. Dibdin, F.I.C., F.C.S., to read a paper on "Standards of Light," on the 19th prox. Among the Cantor Lectures to be delivered on Monday evenings during the session, there will be four on "Light and Colour," by Captain W. de W. Abney, C.B., F.R.S.; four on "Instruments for the Measurement of Heat," by Mr. C. V. Boys, F.R.S.; and four on "Heat Engines other than Steam," by Mr. H. Graham Harris, M. Inst. C.E. Captain Abney's lectures will be commenced on the 26th inst.; those by Mr. Boys on the 25th of March next; and Mr. Harris's on May 6. The papers to be read after Christmas comprise one on the "Forth Bridge," by Mr. B. Baker, M. Inst. C.E.; and others on "Automatic Selling Machines" and "Secondary Batteries," by Mr. J. G. Lorrain and Mr. W. H. Preece, F.R.S., respectively.

THE LAYING OF GAS AND WATER MAINS IN THE METROPOLIS.—With the view of placing the London County Council, when elected, in a position to proceed with the measure, the Metropolitan Board of Works have given notice of a Bill to amend the local management of the Metropolis, one of the clauses of which is to confer upon the Council and upon the Vestries and District Boards named in Schedule B to the Metropolis Management Act, 1855, further powers to control and regulate the laying within their districts of mains and pipes for water or gas, or hydraulic power purposes, and to remove or limit the liability of such Vestries and District Boards for damage or injury to such mains and pipes; and another to confer on the Council, Boards, and Vestries further powers with reference to the formation of streets and roads, and to prevent or regulate the removal of gravel or other subsoil in the formation thereof, and the substitution of other material for such subsoil. They have also, with the same object, given notice of a Bill in reference to Metropolitan improvements, in which power is sought to prohibit the breaking up or interference with any new streets to be made, or the approaches thereto, for laying down any gas, water, or other mains or pipes, except with the consent of the County Council, and subject to such terms and conditions as to payment and otherwise, as the Council may determine.

Register of Patents.

GAS FIRES AND STOVES.—Rhodes, S. G., of Leeds. No. 15,529; Nov. 14, 1887. [6d.]

These improvements consist in applying to gas-fires or gas-stoves one or more tubes or diaphragms H, made of two corrugated plates of metal joined together at the sides, but open at the top and bottom, having a number of tubes A passing through them. The hot products of combustion pass on to the diaphragm through the tubes to the back, before



being allowed to escape to the chimney C. The tube is open to the atmosphere at the bottom, its upper end entering the box K; thus allowing a current of air to pass through H and out at openings E warmed. B is the burner for supplying the fire; and F, the fire-clay back of the stove. The arrows show the direction taken by the hot gases into the box or casing G, in which is placed a tube or diaphragm H. D is an opening for fresh air to pass through the diaphragm into the box K and out at E. I are the corrugations of the diaphragm.

SUPPLYING A DEFINITE QUANTITY OF GAS ON PREPAYMENT BY THE INSERTION OF A COIN IN THE METER.—Price, W. E., of Hampton Wick. No. 15,410; Nov. 11, 1887. [1s. 1d.]

In allusion to his invention, the patentee remarks that it has been found that the use of gas among the artisan classes and other small householders is checked by the present arrangements of quarterly payments (for which their weekly wages and general habits in relation to money matters do not offer facilities), whereas the collection of weekly gas bills would be expensive, and might necessitate the charging of a higher rate for such consumers. His invention therefore has for its object the removal of these hindrances to the spread of the use of gas, by providing a meter with fittings in addition to those usually appertaining to it, by which, on a coin of definite denomination being dropped into a slot provided for the purpose, apparatus connected with the recording mechanism of the meter is operated, so that the consumer may obtain a definite supply of gas.

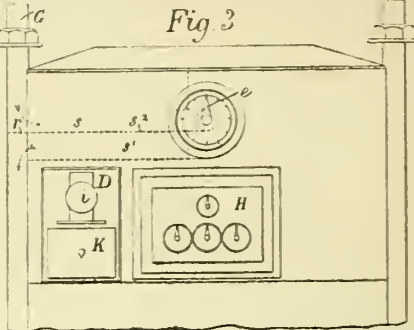
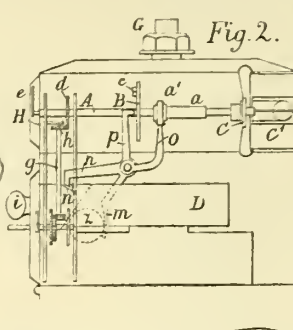
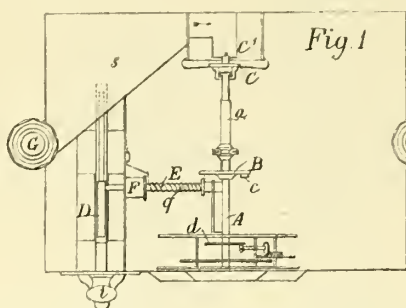
Fig. 1 [see next page] is a plan, and fig. 2 a sectional elevation of parts additional to an ordinary meter, together with the ordinary recording wheels forming the apparatus when the shaft is placed horizontally. Fig. 3 is an outside front elevation of the meter.

A is a horizontal shaft or spindle carrying the pointer *e* of the upper dial, the wheel *d*, the table B, and terminating in a stem on which a tubular spindle *a* connected with the valve C is made to slide. The counting-wheels of the meter are connected to, and are driven by the ordinary moving parts in the usual manner; and these give motion to the spindle *g*, and the wheel *h*, by which it is transmitted to the wheel *d* and the shaft A put in motion. Each revolution of the wheel is made to correspond with the passage of one unit quantity of gas—say, for example, 300 feet valued at 1s. D is a slide, which may be drawn out by the knob *i* for the purpose of inserting a coin. There is a slot quite through the slide for the reception of the coin, as well as a stud which fixes the distance to which the slide can be drawn out, so as to limit the size of the coin that can be inserted. Under the slide D, but separated from it by a horizontal partition (in which is a slot through which the coin passes, first partly and afterwards entirely), is a drawer K, into which the coins drop when they have passed the apparatus. Two chambers *s s*¹ are formed in a corner of the meter case, one above the other, separated by a horizontal partition *s*² communicating with the pipe G—*s* above and *s*¹ below the diaphragm *r*—and serving to conduct the gas from the pipe G to the valve C, and back again to the pipe G. When a coin *z* is inserted in the slot, and the slide D pushed home, the coin is carried against the arm or tail-piece *m*, which it pushes backwards, and is itself pressed downwards by the obliquely cut ending of the slot, until it assumes the position shown in the figure, where it is returned by the pressure of the tail-piece holding it against the end of the slot in the partition until it is released. When the tail-piece is pushed back by the coin, the arm *n*, which moves with it, is brought downwards so as to engage with the notch *n*¹; thereby preventing the slide being drawn out as long as the coin remains in the position indicated. The arms *m* and *n* are attached to the spindle E, which passes through a stuffing-box F, and carries the arms *o* and *p*—the latter of which carries at its end a pin-like projection; while the arm *o* terminates in a fork holding the tubular spindle *a* by the collar *a*¹. The disc forming the table B has a hole through it, into which the pin drops when the gas which has been paid for is consumed. This disc may be bevelled towards one side of the hole so that the pin may at first sink gradually; and thus, by partially closing the valve, give notice to the consumer that the supply is near

exhausted. When the hole *b* passes in front of the pin, the latter (being pressed forward by a coiled spring *q*) passes through, allowing the lever *p* to advance by the length of the pin, carrying with it the arm *o*, and thus moving the spindle *a* longitudinally, and closing the valve *C* and shutting off the gas. On an appropriate coin, however, being inserted in the slot in the slide *D*, and the slide pushed home, the arms *m* and *n* are operated as before, and the gas readmitted.

The meter thus started, the passage of the gas as it is consumed causes the rotation of the disc *B*; and the inclined surface of the projection or cam *c* soon comes in contact with the pin, and pushes it back further than it was carried by the pressure of the coin in the first instance, and thereby removing the arm *m* from contact with the coin, which then drops through the slot in the partition into the drawer. As the disc revolves, the cam passes from under the pin; and the pin

advances so as to be in contact with the surface of the disc. The other arms moving similarly, the arm *n* is raised out of the notch *n'*, leaving the slide free to be drawn out, and the arm *m* in position to be operated by the next inserted coin. If now another coin is inserted, the arm *p* is thereby moved back just far enough to lift the pin off the surface of the disc; so that, when the hole passes in front of it, the pin remains held back by the coin, but when the cam *c* passes the pin it again pushes it back, and releases the coin as before. The gas enters the meter by the inlet-pipe *G*, which is closed by a diaphragm shown in fig. 3 by a dotted line, and passes, by an opening in the side of the tube, into chamber *s*, and thence into and through the valve *C*, thence through the valve-box *C'* to the chamber *s'*, and so into the pipe *G*, below the diaphragm *r*, as indicated by the arrows, and thence into, through, and out of the meter proper in the usual manner. *H* is the ordinary dial of the meter.



THE CONTINUOUS PRODUCTION OF GAS.—Dempster, J., of Manchester. No. 16,582; Dec. 2, 1887. [1s. 3d.]

In his specification of this invention—which is described as relating “more particularly to the retorts and attachments used in the manufacture of illuminating gas from coal as is well understood”—the patentee remarks that the charging and drawing of retorts, if done by hand, is “laborious and uncertain, while most of the machines at present in use for these purposes are expensive in prime cost, difficult to keep in order, and occupy considerable space.” He has therefore devised an apparatus which is “easily worked, occupies little room, and

pushed into gear with the other half, whereby this latter half, together with the eccentric *e*, is caused to make one revolution; the loop *Z* in the cam groove being calculated to give exactly this length of contact between the halves of the clutch. The eccentric straps carry a tail *f*, which is formed as a rack, and which gears with pinions *g*, which are of such proportions that the rise and fall of the rack will cause the ram shafts to revolve sufficiently to give the proper charging advance to the rams, and also effect their withdrawal. To hold the tail rack *f* in gear with the pinions *g*, a bridle *h* and bowl are used. The space of time during which the bowl travels in the concentric portion of the eccentric

Fig. 1.

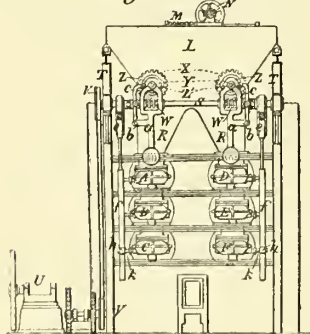


Fig. 2.

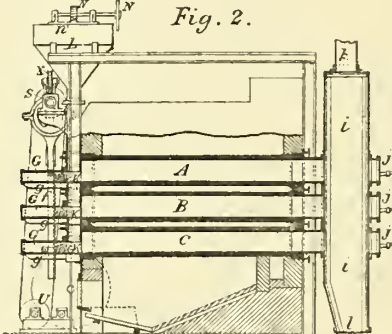


Fig. 3.

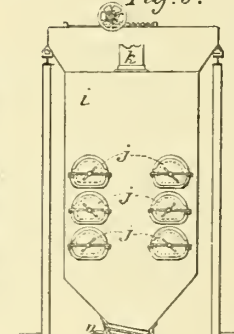
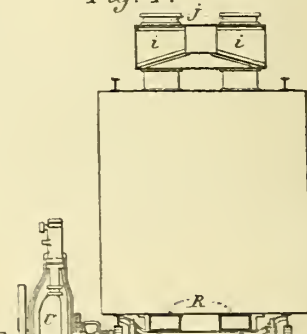


Fig. 4.



is considerably cheaper than existing machines; while the retorts may be charged and the coke removed either continuously or intermittently, as desired.”

In the illustration, the apparatus is shown applied to a set of six retorts *A B C D E F*, arranged in vertical sets of three and side by side; but it is, of course, understood that the apparatus is capable of application to single retorts or to sets of any number or disposition of retorts. In front of each retort is a mouthpiece *G*, which contains a reciprocating ram, by which the coal is thrust into the retort. Above the retort is a hopper *L* closed at the top by a door, which can be slid to and fro by a hand-wheel shaft and pinion *N*; the pinion gearing with a rack on the door. The coal in the hopper is led by branches *R* to the front of the retorts and rams. When the ram *H* is advanced, the plate with which it is fitted pushes the coal in front of it into the retort; and when it is withdrawn, a fresh supply of coal falls down from the hopper, and lodges in front of the ram ready to be pushed in by its next advance. When the charge of coal is beyond the reach of the ram-plate, it has been sufficiently long subjected to heat to cohere and form a caked mass, which will not break up before the pressure of the ram. The coal occupying the length of the retort is also sufficiently caked together by the heat to form a mass which will not break or crumble up, and which is pushed gradually through the retort by the successive movements of the ram. Some classes of coal cohere more firmly than others; and the length of the retorts has thus to be regulated in accordance with the behaviour of the coal employed. The retorts may either be arranged horizontally as shown, or set at an angle (sloping downward from the front towards the back) so as to assist the passage of the charge, and render it less liable to break up under the pressure of the rams.

The mechanism for automatically advancing and retracing the rams is as follows: Above the retorts and in front of the setting is a revolving-shaft *S*, carried in bearings *T*, and driven by a pulley and strap *V* from a small motor *U*. For each of the operating appliances there is on the shaft a worm *W*, which gears with a worm-wheel *X*, running loosely on a stud *Y*. In the worm-wheel is a cam groove *Z*; and a jawed and weighted bracket *a* hangs from the stud, and has an arm *b* to which is pivoted the link *c*. At the upper end of the link is a bowl, which runs in the cam groove *Z*. Midway between the arm *b* and the bowl, the link is connected to a clutch, one-half of which slides on the shaft *S* and revolves therewith by means of a slip feather and groove; the other half being loose on the shaft, and carrying an eccentric *e*. When the loop *Z* in the cam groove comes round and pushes the bowl and link *c* to one side, the sliding and revolving half of the clutch is

groove *Z* represents the dwell which takes place before the ram is again advanced and withdrawn.

The coal which has been fed into, and traversed through, the retorts in this manner falls in the form of coke from the delivery ends into the coke-delivery trunk *i*, which is simply a large upright box, into which all the retorts open, and which is provided with man or spy hole doors *j* opposite to the several retorts. The gas as evolved may be withdrawn in the ordinary manner or through an outlet *k* at the top of the trunk. At the foot of the trunk is a hinged door *l*, through which the spent charge of coke is discharged. It consists of a plate applied preferably at an angle to the mouthpiece casting; the casting and the plate being both machined or faced, so as to make a good joint when the door is closed. The door is held against the mouthpiece by a counter-balance weighted lever *n* held by a hasp. When the trunk *i* contains sufficient coke, the hasp is knocked aside, and the door is allowed to fall open, and permit of the coke being discharged upon the ground or into a truck or other receptacle.

CONTROLLING AND REGULATING THE DISCHARGE OF WATER OR OTHER LIQUID AT ANY HEAD BELOW THE INITIAL PRESSURE.—Braithwaite

C. L. and I., of Kendal. No. 13,649; Oct. 8, 1887. [8d.]

The objects of this invention are to produce an apparatus which will reduce to any desired extent the pressure of liquids passing into it, and also to provide means of admitting a liquid under pressure behind a diaphragm in any valves or cocks in which a diaphragm is used in connection with the controlling and regulating of liquids. To accomplish these objects, a diaphragm-valve is employed, past which the liquid flows; and that which has passed this valve is allowed to act upon a second diaphragm, connected by a lever with a small controlling-valve belonging to the diaphragm-valve in such a way that the pressure on the second diaphragm tends to close the controlling-valve.

GOVERNING THE SPEED OF GAS-ENGINES.—Wallwork, R., of Manchester, and Sturgeon, T., of Ilkley. No. 17,353; Dec. 17, 1887. [8d.]

In order to carry out this invention, there is fixed upon the slide-valve or some other convenient reciprocating part of the gas-engine a pin which works against an inclined lever in such a manner as to cause a constant up-and-down or to-and-fro motion of the lever. Upon the fulcrum of this lever is fixed another short lever having a projecting lip, which is called the “pecker.” This pecker is placed opposite to the end of the gas-valve spindle; but there is a certain space allowed between the end of the valve spindle and the pecker. This space is occupied by

a block on the end of a rod; and when the block is in its normal position and the pecker is depressed, it forces the block against the valve spindle, and so opens the gas-valve, and allows gas to be admitted to the engine, but when it is moved away the action of the pecker does not affect the gas-valve, which therefore remains shut—no gas being allowed to pass to the engine. The other end of the rod which carries the block is attached to a short lever carried by the same fulcrum, which carries another lever acted upon by a cam on the crank-shaft, so arranged that it will gradually raise the lever and suddenly release it. The raising of the lever pushes the block from underneath the pecker; and on the lever being released, it falls and brings the block again underneath the pecker. Should the engine be running at its proper speed, this block will return to its normal position in time to be caught by the pecker as it comes down; and gas will thus be admitted for the next stroke of the engine. But should the engine be running too fast, the block will not return in time to be caught by the pecker as it descends. Thus no gas will be admitted to the engine, which therefore slows down again to its proper speed.

MANUFACTURING ILLUMINATING AND FUEL GAS.—Rew, H. C., of Chicago, U.S.A. No. 12,733; Sept. 4, 1888. [1s. 1d.]

This invention embraces improvements upon matters described in patents granted in the United States. One of these, dated December, 1883, related to the continuous generation and fixing of gas; oil vapours being introduced into the fixing chamber to enrich the gas; superheating and fixing chambers being heated simultaneously by the combustion of gas free from ash; and nitrogen being excluded from the final product. A second patent, dated April, 1886, related to a method of heating superheating and fixing chambers simultaneously by passing downwardly through them the hot products of combustion from two hard coal furnaces connected at the base; the heat of the latter being maintained by conducting away the manufactured gas at the base in a similar manner. The superheating and fixing chambers containing refractory material extended from the bottom of the apparatus about its full height; means being provided for introducing oil into the chambers (the use of external metallic flues for the passage of the products or gases to the chambers being avoided). The third patent, dated April, 1886, related to the decomposition of superheated steam in the presence of gas in a chamber containing heated refractory material; the use of oil vapours to convert the carbonic acid thus produced to carbonic oxide; and the enriching of the final product. The fuel in the chambers located above the chambers containing the refractory material was heated by radiation and direct upward circulation of the gases used in heating the latter chambers, and by conduction through open flues in the masonry, so as to save heat that would otherwise be radiated upward into the open air and lost. The fourth patent, dated May, 1886, related to a method of heating both steam superheating and fixing gas chambers simultaneously, by passing hot products of combustion, generated in two hard coal furnaces connected at the top, downwardly through them; the heat of the latter being maintained, as in the previous patent, by conducting away the manufactured gas at the base in a similar manner. The superheating and fixing chambers in this case were located immediately below the fuel chambers.

The object of the present invention, however, is to provide much quicker and more efficient means for completely utilizing bituminous coal in the manufacture of illuminating and fuel gas by methods and apparatus which, though they have a general resemblance to previous plant, are nevertheless new. The operation is such that hydrocarbon vapours and gases are quickly expelled from bituminous coal; and the coal is first reduced to coke without the use of externally heated retorts, and without the passage therethrough of the heated products of combustion. Means are provided for conducting the hot hydrocarbon vapours and gases from the vertical retorts or compartments, adapted for coking coal, into the current of hot gases generated by the decomposition of steam, air, or gas in and by the hot coke which is first rendered incandescent by air blasts. The coke is supplied by gravity from the coking compartments to the chambers adapted for the decomposition of superheated steam. The coal is thus quickly coked; and the coke can then be converted into water gas in one continuous operation. The latter can then be enriched by the coal gas passing from the coking chambers without carbonizing the hydrocarbon vapours, and without suspending the operation to introduce either coal or coke. The heat radiated and conducted directly from the generating compartments and regenerators to the coal in the coking chambers is utilized to quickly expel the volatile and gaseous hydrocarbons from the bituminous coal employed; thus avoiding the use of costly and poor heat-conducting retorts and converting the coke into water gas without withdrawing it from the apparatus.

APPLICATIONS FOR LETTERS PATENT.

- 16,194.—DINSMORE, J. H. R., "Improvements in and connected with the manufacture of illuminating gas." Nov. 8.
 16,196.—MILLER, H. P., "Improvements in gas heating, cooking, and vaporizing apparatus, which improvements are partly applicable to other purposes." Nov. 8.
 16,220.—ROOTS, J., "Improvements in gas-engines." Nov. 9.
 16,268.—LALBIN, E. L., "Improvements in and relating to gas-engines." Nov. 9.
 16,289.—BUNTING, S., "Improvements in apparatus for gas and electric motors." Nov. 10.
 16,307.—WATSON, G., "A reversible hydraulic gas-valve to be fixed between the retort and the gas-main of the retort-bed; applicable also to regenerative furnaces." Nov. 10.
 16,324.—BOWING, J., "Improvements in the distillation of coal tar and similar substances." Nov. 10.
 16,379.—SOMZEE, L., "Improvements in regenerative gas-lamps." Nov. 12.
 16,421.—ARROWSMITH, R., "The better regulation of gas-meters, entitled 'Stormont and Co.'s gas-regulator." Nov. 13.
 16,580.—LITTLEHALES, A., "An improved blade and band to be attached to existing gas-burners for the better illuminating power of the gas." Nov. 15.
 16,610.—SOMERVILLE, J., and ALLAN, A., "Improvements in apparatus for the prevention of stoppages in gas-ascension pipes, and increasing the illuminating power of the said gas." Nov. 15.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

GASHOLDER CONSTRUCTION.

SIR,—Permit me to echo the hope expressed by Mr. George Livesey in his paper on this subject, in your issue of the 13th inst., that your contributor "Theory and Practice" will give us in pamphlet form the series of papers on gasholder construction which have appeared in your pages from time to time, and which I venture to think are the most valuable contributions of the kind which have appeared anywhere. The examination as to the stresses of every kind to which holders are liable under all circumstances, and the demonstration of the actual functions discharged by the various portions of the guide-framing, are far beyond anything I have yet read on the subject.

On a former occasion, I expressed the conviction that it would not be possible to reduce the height of the standards outside the gasholder, or to lighten their framing, without putting more than the saving in money into the floating part of the holder, in the shape of internal framing to stiffen it. All that has been written since—including Mr. Newbigging's eulogium of Mr. Gadd's invention, and Mr. Livesey's suggestions of curvilinear roller paths with tangential rollers—only confirms me in this belief.

If we are to have standards outside the holder at all, the higher they are carried the more effect will be given to the ties at the head of them in relation to the stress thrown by the gasholder; and they can only be cut down by being largely strengthened. Unless the guides project above the holder, Mr. Paddon's valuable plan of triangulated horizontal ties cannot be applied; and these are of the highest value in contributing stability. The illustration at the old works of the Surrey Consumers Gas Company only shows that the existing columns were far above the duty they had previously to perform.

Referring to the suggestions of Mr. Gadd and Mr. Livesey, there can be no doubt that in the model they will work fairly enough. There is equally no doubt that in gasholders of the size which are now commonly adopted, sufficient rigidity at the points of attachment of the numerous rollers on the curb, and sufficient accuracy in the adjustment of the roller paths (whether spiral or curvilinear), would not practically be attained without enormous cost and great weight in the floating part of the structure. The whole question is one of rigidity in the thing to be guided; and these are, as I have before observed, already getting to a weight which is inconvenient in practical operation.

I would point out the extreme liability of both these latter suggestions to jamming when the holder is flattened by side wind pressure; and to their exposing the holder to much friction and jerking when being rapidly raised or lowered. A further great practical drawback would be that the rollers would be inaccessible—being always submerged, and often at a depth rendering them entirely unapproachable in case of accident or requirement of adjustment.

Gas-Works, Stepney, Nov. 17, 1888.

HY. E. JONES.

COALS AND COAL CONTRACTS.

SIR,—I have no desire to obtrude into, or to prolong the discussion which is going on as to what are called gas scandals, coal purchases, substitutions, &c., &c.; but I think it most important that a reply from the highest authority should be given to questions which I venture to submit for insertion in your columns, viz.—

1. Is there any "trade mark" in the case of coal?
2. Is the same coal often sold under different names?
3. Are not some names which used to be distinctive of certain coals from particular pits now frequently applied to coal from other pits?
4. If coal is tendered at a price; if the coal is tested or guaranteed to produce certain results; and if price, test, or guarantee are satisfactory—what does it matter by what name the coal is called?
5. If when a contract is entered into, and deliveries are made in strict accordance therewith (without any substitution), where is there any wrong or fraud by whatever name the coal may or may not be called?
6. Is every truck of coal, every lump of coal, absolutely free from inferior matter; and, if not, is it fair to pick out portions of the inferior stuff only as samples of the bulk?
7. Is it not quite true that each coal contractor in his own estimation can supply cheaper and better material than any or all other coal proprietors? And does not this explain the secret of much of the present controversy?

It will be seen that the above questions have no reference to "commissions;" but I submit that they have an important bearing on the present controversy.

Nov. 15, 1888.

ENQUIRER.

THE IMPERIAL CONTINENTAL GAS ASSOCIATION.

SIR,—I observe the foot-note in your issue of the 13th inst. to your correspondent's letter of the 7th of the above subject. I feel every confidence in our Directors, and believe that they have good reason for not entering too much into detail; but I do think that they might at least inform the shareholders in what cities or towns our four millions' worth of plant is to be found.

Nov. 15, 1888.

ANOTHER SHAREHOLDER.

WATER BY MEASURE.

SIR,—“Meter” has given his views on the subject in a very able manner; and it is valuable information to your readers. But “True Measure” has not yet added anything to the discussion—not even the description of his meter. The conclusions at which “True Measure” has arrived appear to entirely hinge upon the new “meter, which he has in view.” From what I know of low-pressure water-meters, they are not so accurate as the present positive meters. The latter I have continually tested, and find them sufficiently accurate for all practical purposes.

It is quite evident that “True Measure” has not had experience, or he would not advocate meters at the end of a service. Gas men would

not do that. How many services are continually being altered, and additions made throughout houses, and taps put on direct from the mains unknown to the water companies? Is it not a temptation to steal water? Stolen it would be in thousands of cases, both intentionally and unintentionally, through the plumber's ignorance.

In conclusion, I would ask "True Measure" to kindly give us a description of his meter, if such a thing exists. It would be exceedingly interesting to all concerned.

Nov. 16, 1888.

POSITIVE.

Legal Intelligence.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

WEDNESDAY, NOV. 14.

(Before Mr. Justice DENMAN and a Special Jury.)

JACKSON v. CARSHALTON GAS COMPANY.

CLAIM FOR ALLEGED DAMAGE CAUSED BY LEAKAGE OF GAS.

This was an action to recover damages in respect of injury done to the plaintiff's premises through an escape of gas from the defendant's mains, which, it was alleged, were improperly laid. The defendants denied that their pipes were out of repair; and alleged that the work done by the plaintiff was unnecessary.

Mr. KEMP, Q.C., and Mr. PAGET appeared for the plaintiff; Mr. JELF, Q.C., and Mr. R. M. BRAY for the defendants.

Mr. KEMP said the plaintiff was a gentleman who for many years had lived in the neighbourhood of Carshalton, where he had a house known as Beechwood Lodge, upon which he had expended a considerable amount of money. Near the house were four cross roads, along which were the mains of the Company. The present complaint related to the year 1885; but prior to that the plaintiff had to draw attention to the state of the mains, and he made a claim for damage done by an escape of gas, and received compensation. This showed that the Company had had their attention called to the defective state of their pipes, and that they ought to have done more than they did. In the basement of the plaintiff's house, was an arched vault, used as a wine-cellar; the bins being filled with wines of a valuable character. In October, 1885, on the plaintiff going to the cellar, he was beaten back by the strong smell of gas. As he knew there were no gas-pipes in the cellar, it was a great surprise to him to find that there could possibly be an escape in this place. A gas-fitter was sent for, but he could not discover the leak. Things having grown worse, on Oct. 26, the plaintiff gave notice to the Company that he should hold them liable for all loss and damage occasioned by the escape of gas. With a view to keep the gas out, the plaintiff had the ground excavated, the walls cemented and the floor concreted; but the gas then found its way into the premises through the stoke-hole. The Company's Inspector again visited the premises, but was unable to discover the escape. The plaintiff afterwards had a hole cut in the arch of the cellar, which allowed the gas to escape; but this thoroughly destroyed the cellar as a cellar. Upon the ground being opened outside the house, it was found that, to a considerable depth, it was saturated with gas. According to the admissions in the case, the average leakage was 12 per cent., whereas the maximum ought to be 5 per cent.; so that the Jury would readily understand there must be something wrong with the pipes. Upon the ground being excavated, it was found that the work had been abominably soamped. At the corner where there was a cellar, the pipe had been bent round, and stuffed up with white lead; and the gas escaping from here had entered an old drain-pipe which passed under the cellar. In addition to damages, the plaintiff claimed an injunction to restrain the continuance of the acts complained of.

Mr. H. Jackson, the plaintiff, was then called, and gave evidence bearing out the statement of Counsel.

In cross-examination, on being asked why he had waited for three years before commencing the action, witness said he knew that a new main was to be laid; and he wished to see whether this would cure the evil. As to the damage to the wine, he "fancied" this was due to the gas having percolated the corks. He did not know that in 1885 or 1886 he intended to make any claim for damage to the wine; and he could not produce the invoices for wine purchased since 1885, nor could he state the quantity of wine in stock in 1885, although he claimed as damage 20 per cent. upon the value of the wine in stock. The gas entered the cellar through an old disused drain, which was stopped up in May, 1887. A small service-pipe he had heard had been found broken in Mill Lane, about 200 yards from his premises; but his troubles did not cease when this pipe was mended. He could not say that the work done on his behalf, for which he claimed payment, had remedied the mischief—in fact, his workmen had been on a false scent.

James Martin, road foreman to the Local Board, deposed that in November, 1885, the Gas Company opened the road about 126 yards from the plaintiff's house; and witness and Mr. Good (the Company's Manager) had a dispute as to whether there was an escape of coal gas or sewer gas—witness being of opinion that it was coal gas. About October, the road was opened in another place for the purpose of taking up some drains; and on a light being applied, the gas blazed up. The pipe was cracked, and eaten through with rust, so much so that he could pick it to pieces with his thumb and finger. The Company took up the pipe, and put in a fresh one. Speaking generally, the gas-pipes were in a leaky condition.

Edwin Alders, gas-fitter and plumber, of Carshalton, said he visited plaintiff's house in November, 1885, and found coal gas in the cellar. Having inspected the fittings, and found them all perfect, he went outside, and detected gas coming through the ground. An excavation was made; and it was discovered that gas came through an old drain. One of the Company's men named Green was present, and said: "We must not have a light here." Witness afterwards saw the ground opened at the cross roads, and inspected the pipes. They were not properly laid; a collar having been dispensed with, and white lead used. He also inspected some of the other pipes, and found the joints "blown;" the ground round them being black. Green had admitted that the pipes were in a bad condition. If the joints were properly "set up," there would not be any leakage. He had observed about 30 or 40 joints leaking. There had been a smell of gas at plaintiff's house during the last week; it came through the shaft.

Cross-examined: Pipes could be laid in such a way that there would be no leakage. As a rule, there was always leakage, however well the pipes were laid, owing to the road sinking. In a district where there was a large amount of main without service-pipes, there would be more leakage than where the gas was driven through and sent to the services quickly; and this would be owing to the gas having to stand longer in the pipe, and so getting condensed. The Carshalton Company had a great extent of main without services thereon; so that he should expect them to have a larger percentage of loss than companies not similarly situated. His charges for work done amounted to £23.

Re-examined, witness said the ordinary leakage of a gas company was 5 per cent.; and he thought 12½ per cent. showed the pipes were faulty.

George Lowry, formerly in the employ of the defendants, deposed that, during the time he was in the employ of the Company, the pipes were in a dilapidated condition. He knew the pipes at the four cross roads near plaintiff's house. In 1885, he inspected these pipes; and one out of every two or three joints leaked. None of them were properly "set up;" the lead was just as it was run into the joint. It was a 12-inch main. There was a strong escape of gas; and the ground was very black. The T-piece, which ought to have joined with a collar, had a piece of 4-inch pipe to imitate a collar; and this was broken. He applied a light; and the gas flared up. Green was then present; and witness asked him whether he should go to the works and fetch a double collar. Green said there were none in stock. The pipe was covered over with a piece of sheet iron, and bound up with yarn and red lead, and the ground filled in.

In cross-examination, witness admitted that if the pipe was repaired with red lead and yarn, it would keep all right for some time.

Re-examined, he could not say how long it would be before the pipe would leak again when thus repaired.

Jas. Buckingham, labourer in the employ of the Carshalton Local Board, and formerly in the Gas Company's service, stated that in 1885 he was engaged in removing the main out of the path and relaying it in the road. The condition of the main was very bad. In November, 1885, he was searching the main in Paper Mill Lane; and now and then found two or three joints leaky. About 200 yards from the plaintiff's house a service-pipe was found eaten away; and on a light being applied, the trench took fire. The gully in the road near the plaintiff's house had lately been trapped; and there was now no escape of gas there.

Cross-examined: The pipe, which was broken as well as eaten away, was laid across the surface-drain. No doubt the surface-drain had weakened the ground; and a heavy waggon going over the road would help to break the pipe if it was old and rusty.

Amy Smith, formerly in plaintiff's employ as cook, testified to there being a strong smell of gas in the wine-cellar in the latter part of 1885. The windows and doors had to be kept open night and day; and she could not have a light in the kitchen, scullery, or passages.

Alfred Jacques, a reporter, produced a copy of the Director's report presented at a meeting of the Gas Company held on March 20 last, from which it appeared that the quantity of gas unaccounted for was 1,886,100 cubic feet, or 12 per cent. of the quantity made.

Mr. JELF objected to this evidence, as it related to three years after the date in question.

Mr. PAGET submitted that it went to show the present state of the main. Counsel then put in the report for the half year ending Dec. 31, 1885, from which it appeared that the quantity of gas unaccounted-for was 1,951,600 cubic feet.

Mr. JELF admitted that the percentage was about the same in all the reports.

Mr. A. Dyett, a shareholder in the Company, said that in October and November, 1885, he was frequently on the plaintiff's premises, and noticed the excavations. At the meetings of the Company, the subject of the mains was frequently discussed. At the last meeting, the Chairman made a statement with regard to the mains.

Mr. JELF objected to the evidence; but his Lordship thought the objection premature.

Examination continued: The Chairman stated at the meeting referred to that he was very sorry a larger dividend could not be paid; but it was due to the fact that there had been a large leakage.

Mr. S. Hayward, a Gas Engineer, deposed that the average percentage of leakage in the United Kingdom was 6 per cent. If 12½ per cent. of gas was unaccounted-for, it would represent an excessive amount of leakage.

Cross-examined: The amount of gas unaccounted-for in the case of the Dorking Gas Company was 12½; and the Epsom Company, 12½.

Mr. Jackson, recalled, produced various receipts from wine merchants for wine purchased in 1886 and 1887.

Mr. JELF, in submitting that there was no case to go to the jury, said an incorporated Company were not in the same position as a person who had a dangerous animal in his possession; and in the present case negligence had not been proved. All the Company had to do was to take reasonable means to prevent accidents happening; and the plaintiff could not possibly succeed without showing two things—first, negligence; and next that negligence caused the thing complained of. No evidence had been given to show that the pipes were in a bad state owing to the neglect of the defendants; or if it were, that it caused the mischief. The pipe broke owing to heavy waggons passing over ground weakened by a surface-drain, and this was sufficient to entitle the defendants to judgment. He should ask the Court to hold the plaintiff strictly to his pleadings, especially when such a stale claim was made; and the pleading was that the defendants "allowed their pipe to get out of repair," not that it was an "old pipe." There was nothing to trace the gas along the drain to the house.

Justice DENMAN said that if the defendants had caused gas to travel about there, and it had escaped from their pipes, the first question would be whether it was allowed to escape negligently. If so, it would not be so difficult for the plaintiff to make out that the gas which hurt him was gas which was negligently suffered to escape. He did not think he could withdraw the plea of negligence from the jury.

Mr. JELF said there was the third alternative, if the plaintiff showed that the gas got into the wine-cellar through the defendants' negligence—viz., the question of whether it caused the damage.

Justice DENMAN thought that was also a question for the jury.

Mr. JELF then proceeded to address the jury. He said whatever might be the rights of the parties in the case, it certainly was not an action which ought to have been brought at this late period, and under the circumstances. No one had been called to say that the wine tasted a bit the worse for the gas; and even the plaintiff only said he "fancied" it had deteriorated. Every vestige of damage ceased in 1885; but nevertheless the plaintiff persisted in claiming an injunction. It was about the coolest and most impudent case that was ever brought into Court; and if the jury were driven by any defect in the defendants' case to find against them, he submitted they should give, by way of damages, the smallest possible coin of the realm.

Mr. W. H. Green, Assistant Manager of the Bournemouth Gas and Water Company, said that from May, 1881, to February, 1886, he was in the employ of the defendants, as fitter and inspector of mains and pipes. He remembered the complaint made by the plaintiff; and by direction of Mr. Good he visited the houses. There was no escape from the service pipe or fittings in the house. On the following morning he inspected the wine-cellar; but, not being satisfied that the smell arose from coal gas, he fetched Mr. Good. There was a nasty smell in the cellar. He proceeded to strip the main; and when he came to the cellar, discovered there was a slight leakage. Upon remedying this, and finding that it made no difference to the house, he came to the conclusion that this was not the source of the mischief. The main was then stripped for a further distance of 200 or 300 yards; but nothing was found to account for the smell. There was no escape of any magnitude from the mains. Upon the mains being opened opposite Mr. Wallis's (some 200 yards from

the plaintiff's house), a service pipe was found to be broken. This pipe was laid in March, 1884. It was a new pipe; and when uncovered, was found to be sound. It was not eaten away by rust. He attributed the breakage to a heavy weight passing over the ground, or to the natural sinking of the soil. There was a surface-drain at this spot, which would weaken the ground.

Cross-examined: The annual percentage of unaccounted-for gas at the Bournemouth works was about 5 per cent. If 11 or 12 per cent. was unaccounted for, it would not indicate that the leakage was excessive. There might be an under-estimate of the quantity consumed by the public lamps. After the pipe which was found broken had been laid, the road was opened by the Local Board for the purpose of putting in new drains. As to the alleged defective collar, he was opinion that the work was properly done; but the material was not the right thing to use.

Re-examined: The escape from the collar had nothing whatever to do with the escape in plaintiff's house. In Bournemouth the services went out from the main very frequently; and as the gas passed quickly through the pipes there was not the same loss from condensation as at Carshalton. It took the defendants about two months to discover the leak.

By Justice DENMAN: He had had 17 years' experience. His theory was that the gas in the plaintiff's house came from the broken service to which he had referred; the fractured collar had nothing to do with it.

THURSDAY, NOV. 15.

On the resumption of the proceedings this morning, Mr. R. Good, Manager of the defendant Company, was examined. He stated that, on visiting the plaintiff's premises, he found there was some coal gas in the wine-cellar, mixed with sewer gas. He told Mr. Jackson it was useless for him to search for the escape; that the gas came through the drain outside; and if this was trapped, at the cost of 2s. 6d., the nuisance would be at once stopped. He also said the Company would do what was necessary to prevent the gas entering the premises. Witness confirmed the evidence given by the last witness as to the gas coming from the fractured service-pipe; and said that after the fracture was made good, the gas ceased to enter plaintiff's house. The percentage of unaccounted-for gas varied according to the size of the works. His Company had 20 miles of mains; and at places there were no services for a distance of three-quarters of a mile. Consequently there was considerable condensation. It was not fair to compare the defendant Company with the Bournemouth Gas Company. He had not received any complaint from persons in the district beside the plaintiff.

Cross-examined: In 1885, the leakage was about 10½ per cent. He did not consider this a considerable blot on the balance-sheet for such a small Company. The shareholders did not complain bitterly of the leakage.

Mr. Hudson, a wine merchant, was then called to prove that the wine could not have been injured as the plaintiff alleged by the gas.

Mr. PAGET asked if he should address his Lordship on the question of injunction.

Justice DENMAN said he certainly should not grant an injunction. Mr. JELF then summed up the defendants' case. He admitted that some gas had escaped into the cellar, though the amount had been grossly exaggerated; and it seemed to him that a great part of what had been complained of arose from sewer gas—not from coal gas at all. As to the source of the coal gas which did get into the cellar, he contended that it came from a defective service-pipe, and for this the Company were not responsible. When complaint was made, the Company did everything which reasonable men could to discover the source of the evil; and after finding the broken service, and repairing it, the mischief ceased. It was not for three years afterwards that this claim for damages was raised, in order to bolster up the claim for an injunction, which his Lordship had said there was not a shadow of foundation for. He commented rather severely on the manner in which the plaintiff's case had been conducted; and the evidence which had been given, and submitted that the plaintiff had failed entirely in the case he put forward.

Mr. KEMP addressed the jury in reply. Justice DENMAN then summed up the case. Having stated the nature of it, which was first for damages from gas escaping into his cellar and greenhouse, and, secondly, for an injunction such as was not granted, except on very strong grounds, especially if there had been considerable delay in taking proceedings, his Lordship said that the plaintiff was clearly disentitled to any injunction; and this being a question of law, he should not ask the jury any question about it. The matter of damages was to some extent affected by the same circumstance of delay; the only damage claimed for being for what occurred in the months of November and December, 1885. On this question, the facts were tolerably simple, more so perhaps than the law, because it might be argued that the defendant Company were bound so to deal with their gas as to prevent it, under any circumstances, escaping into people's houses, and that if it did, they were answerable, whether they were guilty of negligence or not. On the other hand, it might be held that the plaintiff was bound to prove more than an escape, and to establish negligence, or want of due and reasonable care on the part of the defendants, to entitle him to recover. In order to prevent future difficulty or the expense of a new trial in case his decisions on the legal point were disputed, he should ask the jury in any case to say what amount of damage they considered the plaintiff had sustained. The two questions for them would be—First, whether the escape of gas was caused by the negligence of the Company; and, secondly, whether it was so caused or not, what damages had the plaintiff in fact sustained. His Lordship then commented at length on the evidence, some of which he suggested was more suited for a Commission sitting on gas companies, or a Parliamentary Committee, than for a jury. He concluded by asking the jury to keep entirely separate and distinct the two questions they had to decide—not on the one hand under-estimating the damages because they thought there was no negligence; nor on the other hand saying the defendants were guilty of negligence, because they thought the damages were very small.

The jury, after very brief consideration, found that the defendants were not guilty of negligence; and they assessed the actual amount of damages at £5.

Mr. PAGET asked for judgment; but after a brief argument, Justice DENMAN said he was of opinion that the defendants were not liable unless negligence were found; and he should therefore give judgment in their favour.

COURT OF SESSION—OUTER HOUSE.—FRIDAY, NOV. 16.
(Before Lord WELLWOOD.)

MACKAY AND CO. v. THE EDINBURGH GASLIGHT COMPANY.

To-day Messrs. Mackay and Co., of St. Margaret's Brewery, Edinburgh, sought declarator that the Edinburgh Gaslight Company are not entitled to manufacture or store gas at their premises in Canongate in such a way as to foul, contaminate, or pollute the water in a well in St. Margaret's Brewery, and that defendants are bound to take effectual means to prevent the escape from their works into the well of gas, steam, vapour, gas washings, or noxious substances. Interdict was also asked, or payment

of £5000 as damages. The water in the well, it was stated, is peculiarly well suited, and had been used for upwards of a century, for brewing purposes. In 1883 a new gasholder was erected by the Company on their ground at Canongate, and shortly afterwards the water in the well was found to be contaminated or tainted by some foreign matter. It became worse in quality; and in 1885 pursuers were obliged to cease using the water for brewing. In July of that year they ascertained that the water was being contaminated by gas or noxious vapours coming from the defenders' works; and on the 23rd of that month pursuer's Law Agents wrote to the Company intimating that the well was being contaminated. No measures, it is said, were taken by the Company to put a stop to the contamination, and the water is now in such a foul state as to be quite unfit for brewing.

Defenders found upon the Edinburgh and Leith Corporations Gas Act of this year, and quoted several sections of the statute in which provision is made for the transfer of all the liabilities and obligations of the Company, except revenue debts, to the Corporations; and it is enacted that after the date of transfer, the Company shall only exist for the purpose of being wound up. It was pleaded that all parties were not called; that in terms of the statute the action was incompetent; that defenders, having ceased to manufacture gas, should be absolved from the declaratory conclusion of the action and from the conclusion for interdict; that no damage had been sustained by the pursuers for which defenders were liable; and that, in any view, the damages claimed were excessive.

The record was closed, and the case was sent to the procedure roll for discussion upon the preliminary pleas.

LAMBETH COUNTY COURT.—TUESDAY, NOV. 13.

(Before Mr. J. J. POWELL, Q.C., Judge.)

PROCEEDINGS UNDER THE WATER COMPANIES (REGULATION OF POWERS) ACT.

To-day the Lambeth Water Company summoned, under the recent Water Companies (Regulation of Powers) Act, 1887, several occupiers of small houses for payment of water-rate due; these being the first summonses issued under the Act. At the last moment, however, the amounts claimed were paid into Court.

Mr. WASHINGTON, who appeared for the Company, on applying for an order for costs, said he wished to explain why these proceedings were necessary, as heretofore water companies had been allowed to cut off the water for non-payment of rates, and the mere threat of doing so was generally sufficient to obtain payment of their claims. The Water Companies (Regulation of Powers) Act limited the powers of the Companies to cut off the tenant's water supply where the rates were agreed to be paid by the landlord; and in such cases it was now necessary, when the amount due was not paid, or could not be obtained from the landlord, to serve the tenant with a notice informing him that he might pay such sum, and deduct it out of the rent then due, or thereafter to become due from him to his landlord, and that if he did not do so, legal proceedings would be commenced against him for the recovery of the amount, with interest thereon and expenses. No doubt, he would be able to deduct such payments from the rent payable to his landlord. In mentioning the matter, Mr. Washington remarked that no doubt the Act was passed mainly in the interests of poor people. The Company endeavoured to make the landlord pay in the first instance, and would only resort to proceedings against tenants if the landlord failed to pay. But the Act further provided that if the rates were not paid by either landlord or tenant, the amount due became a first charge on the property. It therefore behoved all purchasers, not only of small property, but also of that large class of property which had now become as much in vogue—viz., residential flats—where the rates were paid by the landlords and not by the tenants, to see that all arrears of water-rates were paid, or complications might ensue on the transfer of the property.

Orders were made against the defendants for the costs as asked.

THE NORTHERN COAL TRADE.—The northern coal trade last week felt the unsettled state arising from the labour disputes; there being a demand for increased wages both in the steam coal trade of Northumberland and in the Durham coal trade. In the latter, whence gas coal is so largely produced, there is a desire on the part of the miners to anticipate the rise which the sliding scale is expected to give them; and it is probable that the coal-owners will grant the increase thus desired. The tendency of these demands, nevertheless, is to unsettle the trade. The steam coal business is, however, otherwise slightly weaker; the demand being less from the Baltic, though above the usual at this time of the year. In gas coal the consumption is now very high; and there is difficulty in meeting it—many of the miners evidently restricting the output, so that contracts are kept up to with difficulty. And there is also a scarcity of steamers by which to ship the coal, so that there is some reason for the delay. The rate of freight for coal from the Tyne to London has risen to 5s. 3d. per ton—which is 1s. 3d. above the usual at this period—and some expect it to advance still higher. It will be seen that very great activity characterizes the gas coal trade; and it may be added that as high as 8s. per ton free on board is now asked for best gas coal—the scarcity for early delivery being the chief cause of this. Other kinds of coal partake in a smaller degree in the improvement in price. There are all the indications of a very full demand for the winter, with one exception—viz., that as yet November has not locally brought much fog.

ORIENTAL GAS COMPANY, LIMITED.—The Directors of this Company report that, during the year ending June 30 last, there has been an improvement in the revenue; and they say the operations of the Company would have resulted in an increase of profit over the previous financial year, but for the heavy additional charge for exchange. The sum received from the sale of gas was £64,528; and from coke, tar, fittings, &c., £18,723—making together £83,251. The expenditure amounted to £49,513; the balance carried to general revenue account being £33,737. The balance of general revenue (after payment of debenture interest, and the appropriation of £1300 to reserve account) is £27,185, out of which the Directors recommend a distribution of 6 per cent., free of income-tax, payable on the 4th prox., making, with the interim dividend of 4 per cent. on June 4 last, a total of 10 per cent. for the year. There has been an increase in public lighting during the twelve months; and in private lighting, 179 new consumers were obtained, and 1423 burners added. The Company's buildings have received during the year such a complete examination and thorough repair, that they are now in a most excellent state; and the respective apparatus and holders are in good order and working condition. There has been an extension of mains for new public lights of about 2200 yards. The Directors further state that the local affairs of the Company continue to receive the careful supervision of the Resident Committee; and they also recognize the exertions of the Manager, Mr. Niven, in maintaining the prosperity of the Company. Reference is made in the report to the decease, on April 21 last, of Mr. W. White, who, as a Director for a period of about 25 years, afforded the Company the benefit of his valuable experience, and devoted himself at all times to the furtherance of its best interests. The vacancy on the Board has been filled provisionally by the appointment of Mr. H. L. Hammack.

Miscellaneous News.

THE LATE DR. WALLACE.

In the JOURNAL last week (p. 841), we recorded the death of Dr. William Wallace, of Glasgow, which took place on the 5th inst., and gave a short sketch of the deceased gentleman's career. We now supplement those particulars by the following account of Dr. Wallace's life-work (more especially in its relation to the gas industry), which has been forwarded to us by our Glasgow Correspondent:—

Dealing first with the late Dr. Wallace's work as an analyst, I may say that for a period of about ten years—from 1868 to 1877—he devoted much of his time to analyzing and testing for use in gas making upwards of 200 varieties of Scotch coals, including cannel, splints, shales, &c.; as also samples of such minerals from America, Australia, and other foreign coal-fields. His results were embraced under various heads—such as the physical properties of the coal, the composition of the volatile matters contained therein, the composition of the coke, and in respect of the gas, its yield per ton of coal, its illuminating power, its sperm value, &c. These analyses, which have been published in a collected form, are of the highest value to gas managers. I may also mention that prior to the year 1876 Dr. Wallace had made something like 2000 analyses of ironstones of various kinds, limestones, fire-clays, furnace coals, pig iron, and slag. Of these a number of examples illustrative of the Scottish iron manufacture were published in that year in a volume on "The Leading Industries of Glasgow and the West of Scotland"—one of three guide-books presented to the members of the British Association at the Glasgow meeting of 1876. For a number of years Dr. Wallace gave himself up largely to the science of sugar-refining, in which, as well as in gas matters, he was a leading authority.

I now come to Dr. Wallace's connection with the science and practice of the gas industry; this being the subject of most interest to the readers of the JOURNAL. The first published paper in this department of his work of which we can find any notice was entitled "On Some Points in the History of Coal Gas"—a subject which he treated in a lecture delivered at the annual meeting of the North British Association of Gas Managers in 1869. His next paper was "On the Economical Combustion of Coal Gas." It was an experimental discourse which he gave in March, 1874, to the Philosophical Society of Glasgow, whose membership he entered in the year 1851. This was a most comprehensive and interesting paper; and it showed that Dr. Wallace had an extensive and intimate acquaintance with the gas-burners that had up to that time been brought into notice. In the year 1874 the members of the North British Association of Gas Managers had the pleasure of hearing a discourse from Dr. Wallace on the influence of pressure on the illuminating power of coal gas; and on that occasion he also had a paper on a new system of photometry for gas. Three years later, at the annual meeting of the same Association held in Stirling, he gave another lecture, the subject of which was "The Bunsen Burner." In the course of his exceedingly interesting remarks, he not only described the burner in detail and the character of the flame produced by it, but also showed the various modes of applying it in practice in the laboratory.

A marked recognition of the position now secured by Dr. Wallace in connection with the development of the illuminating properties of coal gas was made in the year 1877, at the Plymouth meeting of the British Association, on which occasion a Committee, which included himself, Professor Dittmar, and the late Mr. T. Wills, was constituted for the purpose of reporting on the best means for the development of light from coal gas of different qualities. Dr. Wallace was appointed Secretary, or "Reporter"; and in the following year, at the Dublin meeting of the Association, Part I. of the report, which had been drawn up by Dr. Wallace, was submitted. (See JOURNAL, Vol. XXXII., p. 423.) Part II. of the report (which was drawn up by Mr. J. Pattinson, of Newcastle-on-Tyne, who had taken the place of Mr. Wills on the Committee) dealt chiefly with gas made from common bituminous coal of the Newcastle and other coal-fields; while Dr. Wallace's portion of the report had reference chiefly to the use of cannel gas, such as is supplied in most towns of Scotland. (Part II. of the report will be found in Vol. XXXVI. of the JOURNAL, p. 376.)

In the year 1879 Dr. Wallace communicated to the Philosophical Society of Glasgow a paper bearing the title, "On the Heating Power of Coal Gas of Different Qualities," in the course of which he worked out the general fact that gas of low illuminating power is the cheapest for heating purposes. About this time he also gave attention to the condition in which sulphur exists in coal—a subject with which he dealt in a paper read before the Chemical Section of that Society. Within the last three or four years the deceased was much associated with Mr. W. Poulis, the General Manager of the Glasgow Corporation Gas Undertaking, in prosecuting an inquiry as to the propriety of reducing the illuminating power of the gas made in Glasgow, in consequence of the Corporation Gas Committee having resolved to ask for parliamentary powers to make an important change in this direction. The reports prepared for the Committee (chiefly by Dr. Wallace) have appeared in the JOURNAL as they were rendered available; and consequently it is not necessary to refer to them with any detail.

As makers of gas-burners and patentees of new gas-lamps are well aware, Dr. Wallace was extensively consulted in reference to such inventions, and commissioned to report upon them professionally. One of his most important pieces of work in connection with gas matters was to serve as a juror in the exhibition of gas and electric lighting appliances held under the auspices of the Philosophical Society in the year 1880. The work he had to do on that occasion, in the way of testing and reporting upon gas-meters, governors, &c., was very great, and of permanent value. His fellow-jurors freely admit that the work was his and not theirs.

The deceased was largely employed by the Glasgow municipal authorities from time to time to inspect and report upon sewage systems in operation in various parts of the country; and other local authorities had his professional advice on many occasions in reference both to sewage schemes and water supply. One of the "Glasgow Health Lectures" was delivered by him in 1881; his subject being "On Water and Water Supply." On another occasion he delivered a course of four public lectures under the auspices of the Lord Provost, Magistrates, and Town Council of Glasgow, when he dealt with "The Air of Towns," "The Water Supply of Towns," "The Disposal of Sewage," and "Food and its Preservation." At the Glasgow Congress of the Sanitary Institute, he read a paper on "Some Sanitary Aspects of House Construction." In this connection I may state that one of his Philosophical Society papers was on "Air and Water in Relation to Public Health;" and another on "The Germ Theory of Putrefaction."

I have already mentioned that Dr. Wallace became a member of the Philosophical Society in 1851; and I may now add that he was elected a member of the Council in November, 1870. He entered the Council again in 1879, to serve a second term of three years. This was followed by his election to the office of President, which he filled with the greatest credit to himself and success to the Society for another period of three

years. He was an honorary member of The Gas Institute, and of the North British Association of Gas Managers, and a Fellow of the Royal Society of Edinburgh, of the Chemical Society, and of the Institute of Chemistry. Dr. Wallace will long be remembered as a zealous servant of science, an excellent citizen, and a faithful friend. In testimony of the respect in which he was held by his fellow-members of the Glasgow and Scottish Section of the Society of Chemical Industry, the first meeting of the present session, which was to have taken place on the 6th inst., was postponed till the 12th. A few members assembled on the first-named date, when the Vice-Chairman (Mr. R. R. Tatlock) alluded in feeling terms to the loss the Society had sustained in the death of Dr. Wallace, and of the loss which the event had brought to him personally; the deceased having been his partner in business for a long series of years, during which, he said, the slightest dissension had never arisen between himself and his friend thus prematurely removed.

SINGAPORE GAS COMPANY, LIMITED.

An Extraordinary General Meeting of this Company was held last Tuesday, at the Cannon Street Hotel, E.C.—Mr. R. S. FOREMAN in the chair.

The SECRETARY (Mr. Robert King) read the notice convening the meeting; and the Directors' report and the statement of accounts, an epitome of which appeared in the JOURNAL last week (p. 838), were taken as read.

The CHAIRMAN said he would only detain the shareholders with a few remarks before formally moving the adoption of the report. As a consequence, he observed, of the increased use of kerosene oil as an illuminant, by reason of its present low price, and the cheapness with which the German and American lamps and other fittings could be supplied for its service, the gas and meter rental from private sources, and necessarily also the fittings department, showed some reduction as compared with the previous and corresponding half years. On the other hand, the public lighting exhibited a decided increase. Forty-eight additional lamps had been fixed and lighted within the last few months; and the indications of further development in this direction were most encouraging. Whilst on this subject, he might be allowed to call the shareholders' attention to a paragraph which appeared in *The Times* on Sept. 15 last, which some of them probably had noticed, headed "Kerosene in China," from which the following was an extract:—"The Viceroy of Canton, the famous Chang Chingtung, has addressed a memorial to the Emperor which contained a terrible indictment of kerosene oil. He brings a long series of charges against it. Not long ago it caused the destruction of 400 houses in Swatow; just before it burnt a steamer to the water's edge, taking the lives of about 800 persons; shortly afterwards, it burnt out 1000 families in Canton, and destroyed 10 million dollars' worth of property. It is responsible for nine-tenths of the fires occurring every year in the city of Canton. Therefore, the Viceroy denounces it." There was much more, the Chairman continued, in the article to a like purport; but the foregoing extract, he thought, was sufficient to show that, notwithstanding the low price at which this commodity could be supplied, its introduction into some parts of the East was not regarded as altogether one of unqualified advantage. In regard to the residual products, he might mention that they had met with a brisk demand, and realized good prices. The collections, which required constant and unremitting attention, had been thoroughly well maintained, and the outstandings reduced to the lowest possible point. Considerable improvements had been carried out on the works during the half year—notably the old coal-stores, which were put up when the Company was first established, had been strongly but cheaply reconstructed. The level of the flooring had been raised, and also the ground in other parts of the works hitherto subject to flooding at high spring tides. The two new purifiers recently erected were also working satisfactorily. The whole of the material for a new gasholder and tank, after a careful inspection by the Engineer (Mr. R. King), was landed on the works at Singapore early in October; and the whole of the work of erection, including repairs to one of the original holders, was expected to be completed early in the commencement of the ensuing year. Before concluding, he might mention that, as the proprietors had probably noticed, the accounts were sent out on the present occasion with the signature of only one of the Auditors appended. This was in consequence of the absence of Mr. W. T. Morrison from England at the time appointed for holding the audit; so that the whole of this work devolved upon Mr. Alfred Williams. He then moved—"That the report, with the balance-sheet thereto attached, be received, adopted, and entered on the minutes."

Mr. SMITH said he should have pleasure in seconding the report. He thought he might venture to say that the shareholders were much obliged for the free and ample explanation which the Chairman had given them. Looking at the profit and loss account, and the revenue account, he considered the whole a very fair and reasonable working statement. Although there were items with which they had at times to find fault, they all knew that in such undertakings as this there were always variations. He noticed that the gas-rental and fittings account was rather less than before; but to this he attached little importance, because this was simply one half year. From the increase in the number of public lamps and the improvement in the value of residuals, together with the revival of trade, he was under the impression that the accounts for the whole year would prove satisfactory. Compared with the corresponding half year, the accounts were very similar. He was glad to see the Company in a prosperous condition, which he trusted would still continue in the future.

Mr. SPENCER said that at the last meeting he referred to the leakage; and he should like to know how it stood now.

The SECRETARY replied that it amounted to about 14 per cent.

Mr. SPENCER remarked that this was better; but, of course, it still was a considerable amount for leakage.

The SECRETARY observed that they were troubled at Singapore with the steam-roller of the Municipality. It broke the Company's mains; and they were bothered a good deal with them.

The CHAIRMAN said that whenever it was brought home to the Municipality, they always paid for any damage.

Mr. SPENCER inquired what was the mileage of the mains.

The SECRETARY replied about 35 or 36 miles.

Mr. SMITH expressed the opinion that a leakage of 14 per cent. was not extravagant. The ground in which the mains were laid was, he said, very watery, and the district a scattered one.

Mr. WILLIAMS remarked that with a leakage of 14 per cent., they might depend upon it that they were not doing badly.

The motion was then carried unanimously.

The CHAIRMAN proposed the declaration of a dividend on the ordinary share capital at the rate of 7½ per cent. per annum, less income-tax; such dividend to be payable on the 20th inst.

Mr. F. A. M. NICOL seconded the motion, which was agreed to.

On the motion of Mr. SMITH, seconded by Mr. NEWTON, a vote of thanks was passed to the Chairman and Directors, for the satisfactory manner in which they had conducted the affairs of the Company during the past half year.

The CHAIRMAN, in acknowledging the compliment on behalf of himself

and his co-Directors, observed that there was no doubt the Board had of late had a very anxious time. The strike in the coal trade and the advance in freight had caused the Directors considerable anxiety. They would do their best in the future, as they had done in the past, to merit the shareholders' approbation.

A vote of thanks was unanimously passed to the officers of the Company; recognition being made of the trouble Mr. A. Williams had taken in doing double duty in auditing the accounts.

The SECRETARY and Mr. WILLIAMS having both suitably responded to the vote, the proceedings terminated.

PARTICK, HILLHEAD, AND MARYHILL GAS COMPANY.

THE POSITION OF THE PREFERENCE SHAREHOLDERS.

In the JOURNAL for the 6th inst. (p. 810), it was stated that an extraordinary general meeting of the above-named Company was to be held on the following Thursday for the purpose of considering resolutions authorizing the Directors (1) to enter into an agreement with the Corporation of Glasgow for the sale to them of the whole of the Company's undertaking and assets, at the net price, over and above the Company's liabilities, of £122,370; and (2) sanctioning the payment to the holders of the 5½ per cent. preference shares of the amount of their shares and 10 per cent. premium, and to the holders of the ordinary shares of the amount of their shares, less 10 per cent. discount. In view of the proposal contained in the second resolution, the preference shareholders had a meeting on the previous Monday, at which it was unanimously resolved that the terms offered by the Directors were inequitable, and that though they might agree to the purchase of the Company's undertaking by the Corporation at the lump sum of £122,370, they could not agree to accept the proportion proposed to be allotted to them. A Committee was formed to obtain the opinion of Counsel on the question, and generally to attend to the interests of the preference shareholders. The Directors becoming acquainted with this determination, also sought the advice of Counsel, which appears to have been similar to that given in answer to the question of the preference shareholders. At the meeting on the 8th inst., the Chairman (Mr. H. Cowan) read a statement on behalf of the Directors, in which, after announcing, in regard to the first resolution, that the proposed sale of the undertaking to the Corporation of Glasgow had been approved of by a large proportion of the shareholders, they said that, as opposition to the second resolution might be expected, they had deemed it advisable to take Counsel's opinion on the whole position. This they had done; and the reply received, established the following points:—(1) That the first resolution was undoubtedly competent, and, if passed by the requisite majority, would authorize the sale of the works at the price stated. (2) That by law the assets of the Company on its dissolution would fall to be divided among the shareholders *pro rata*, without reference to whether the shares were preference or ordinary; and that, as the second resolution would have the effect of conferring upon the preference shareholders a benefit as in a question with the ordinary shareholders beyond what the law allows, it was doubtful whether that resolution, if passed, could be carried into effect without the consent of every shareholder of the Company. On receipt of this opinion, and on finding that a unanimous acceptance of the second resolution was not to be expected, the Directors found it necessary carefully to reconsider the position. It would, of course, have been open to them to propose the first resolution, of the validity of which there was no possible doubt, and simply to drop the second, on the legality of which doubt had been thrown; but, on consideration, they felt that this course would not be fair to absent shareholders, who might have granted proxies on the understanding that both resolutions were to be submitted. The Directors accordingly came to the conclusion that the proper course to take was not to submit at that meeting either of the resolutions, but to hold another meeting at as early a date as possible for the purpose of considering and, if so resolved, of adopting the first resolution only. This course involved the abandonment of the idea of putting the preference shareholders on a better footing, in the division of the money received for the undertaking, than the ordinary shareholders; but, however willing the Directors might be that the preference shareholders should be dealt with specially, they found it to be impossible, without incurring serious risk, for the Company to pass any resolution altering in any way the statutory mode of dividing the price of the Company's works if sold. After this statement had been read, it was unanimously resolved to dissolve the meeting; not a word of objection being raised by the preference shareholders. The result of the opinion of Counsel therefore is, that whatever sum the Corporation of Glasgow decide to give as a premium on the preference stock in their scheme of purchase must be divided equally with the ordinary shareholders. As for the 20,000 ordinary and 6000 preference shares, each of £5, the proposed purchase price is £122,370, this comes to only about £4 14s. 1½d. each; so that when the general division comes, the preference shares are likely to be levelled down from £5 10s., and the ordinary shares levelled up from £4 10s., to the above-named figure. In the meantime, the holders of the former will continue to get 5½ per cent., and the holders of the latter 4 per cent. dividend on their shares. As many of these were purchased when the price was down to 37s. 6d., or from that to 45s. each, the holders will not have much cause to complain.

THE ELECTRIC LIGHTING AT LEAMINGTON.—On Monday and Tuesday evenings last week, the first instalments of the improvements now being carried out in connection with the electric lighting system at Leamington were completed, and brought into use. The new lights are of the arc type, ranging from 300 down to 50 candle power. They are placed at intervals along the Parade; and their brilliancy detracts somewhat from the power of the ordinary electric lights.

THE PUBLIC LIGHTING OF TWERTON, NEAR BATH.—After having had before them, at various times during the past 17 years, the subject of lighting the district, the inhabitants of Twerton have now decided to adopt gas. At a largely attended meeting held last week, a Committee was appointed to take up the matter; and a sum of £200 placed at their disposal for the first year, on the understanding that they are to "make it go as far as possible." This will mean a rate of 3d. or 4d. in the pound.

THE ELECTRIC LIGHTING OF KENSINGTON.—The question of the lighting of the parish of Kensington by electricity came up at the meeting of the Kensington Vestry last week. Mr. Lindsay objected to mapping out the parish, as was proposed, to four companies; and said that, though the Committee pretended not to want to grant a monopoly, this would be virtually created by the adoption of their proposal. He, therefore, moved that the Vestry should give authority to the whole seven electric light companies who had applied for permission to supply light, without allotting any particular part of the area. The proposal was carried by 38 votes to 19. The Chairman of the Committee (Mr. Jordan) and two members resigned their positions in consequence of this decision. Ultimately the Vestry reconsidered their decision, and postponed the matter for a fortnight.

LEEDS CORPORATION GAS SUPPLY.

THE COAL QUESTION.

At the Meeting of the Leeds Town Council last Wednesday, the MAYOR (Mr. Alderman Ward) in the chair—the question of the quality of the coal supplied to the Corporation, which, as our readers are aware, had been under investigation by a Special Committee, was discussed.

Mr. GILSTON, in moving the adoption of the Gas Committee's minutes referred to statements made during the past month about the quality of the Leeds gas, and more particularly about the coal. The Council were aware, he said, that Mr. Ellis Lever, had had interviews with the Committee on the question of the coal supplied to them. A more favourable time for the purpose could not have happened, as finding themselves on the eve of a coal crisis, the Committee had for several weeks been pressing the contractors to send in every ton of coal they could possibly spare; and if ever there was a time when coal-owners would be likely to send in surplus stock, they might then have been expected to do it. Every facility was given to Mr. Lever to secure samples of the coal supplied; and tests were made at the works, and also by the Borough Analyst (Mr. T. Fairley, F.C.S.), in the presence of Mr. J. Paterson, F.G.S., of Warrington, on behalf of Mr. Lever; and the results were such as to show that all the noise made about the way in which the Gas Committee were allowing the ratepayers to be swindled to the extent of 2000 tons of coal a year was as great a piece of humbug as was ever spoken in the borough. Mr. Lever never suggested that the Committee did not get the weight of coal they paid for; and as to the results of the tests of the different kinds of coal selected by Mr. Lever and the Committee, they showed them to be capable of producing per ton respectively 11,600 cubic feet of gas of 26½-candle illuminating power, 11,700 cubic feet of 26½-candle, and 11,150 cubic feet of 28-candle. The coal in the second case was selected as worthless; while the third was taken as slack. As bearing upon the Gas Committee's work, he had taken out details showing the improvement made under every head in the year 1888, as compared with the year ending June, 1885. In 1885 they averaged 9036 cubic feet of gas per ton of coal; and in 1888, 9964 cubic feet. The cost per ton in 1885 was 8½s.; in 1888, 8½s. In 1885 they obtained 13¾ gallons of tar per ton of coal; in 1888, 13½ gallons. In 1885, 32¾ gallons of ammoniacal liquor; in 1888, 34½ gallons. In 1885, the gas produced cost 11½d. per 1000 feet; in 1888, 9½d. A severe crisis had been passed through; but in the half year ending June, 1888, the deficit had been brought down to only £1600. They had increased the contract for tar from 11s. to 21s. and 26s. per ton; and as they had made 15,000 tons during the present year, there would be an influx into their coffers of £10,000 or £12,000 without any increased consumption of gas. So that they had seen the last year of their deficits. He had no hesitation in saying that at the end of the next financial year would be seen the beginning of a surplus which would be little short of £10,000 in favour of the ratepayers.

Mr. DYSON seconded the motion, and remarked that the Committee could not have published Mr. Lever's report without the risk of an action for libel.

Mr. GILSTON said the Committee intended to print and distribute the report.

Mr. LAYCOCK asked Mr. Willey whether he had been misreported as saying at a meeting in the South Ward that "they might take it that the ratepayers had for many years been paying for thousands and thousands of pounds worth of coal which they had not been getting?"

Mr. WILLEY said the report was substantially correct. He really said "thousands and thousands of pounds worth of coal, the value of which they had not received." This he adhered to, and was prepared to prove. He was amazed, in going through the books of tests in the Gas Manager's office, to find that the Gas Committee had been passing coal without proper examination, and that from January last at least one-half of the coal passed into stock as equal to sample was below it from 2 to 15 per cent. In some cases it was 20 to 29 per cent. lower than the contract sample. When he questioned Mr. Lupton, the Secretary, he found that such faults were only complained of by letter, but no deduction had been made, except in one case. It was bad and wrong commercially thus to pass inferior coal; and what he said was perfectly true. These things did not come before the Gas Committee. The tests were sent only to the Secretary, who handed them to the Chairman of the Gas Committee, and then the matter dropped. These tests the Committee should have been informed of.

Alderman SCARR said the Lever question had been an unpleasant business for him, because members of the Committee thought he had given Mr. Lever more liberty in examining the coal than he ought to have done. Mr. Gilston looked upon Mr. Lever as a coal dealer wishing to get advantages as a coal dealer rather than as one who had exposed a scandal at Salford. It would have been a fatally unwise thing if the Committee had so regarded him; and the position they occupied that day was owing to the fact that they followed the better course. From what had arisen in connection with these investigations, he had drawn certain deductions; and he should be unfaithful to the Gas Committee and to the town if he did not give them the results of his views. Mr. Lupton, the Secretary, stated to Mr. Lever that certain deficiencies had occurred in coal from one colliery to the extent of 22 per cent. When he looked into this, he found that the tester discovered the coal was not up to the standard on the 4th of October, the test was not made till the 12th, the report was given to Mr. Lupton on the 15th, and the colliery was not communicated with until the 20th. Between the discovery of the discrepancy and the 23rd of October, the Committee received 292 tons of coal. As a commercial man, he was of opinion that this was not business. The moment he found that there was any deficiency taking place in the quality of the goods delivered to him, he stopped the delivery, pointed the matter out, and had it rectified. The matter ought to have been looked into at once. It was not sufficient that a young man should test the coals half-a-dozen times in a year; but caution demanded that a man fully understanding the question should examine every truckload of coal that came to the works. He did not say that there had been any frauds practised at the Leeds Gas-Works; but there had been very great room for frauds. If it was true that 4 per cent. of "hub" was admitted, they were receiving 8000 tons of coal per annum lower than sample. He believed that the inquiry would result in the better management of the gas-works.

Mr. ARNOLD LUTON denied that it was possible, under the conditions for sending coal out, to forward trucks of coal which should be in the nicest degree equal to sample. Coal might be deficient, without any design on the part of the contractor.

Mr. GILSTON, in reply, said it was the practice at the gas-works to pass coal in bulk as satisfactory if it were within 4 per cent. of the value of the sample. The Works Managers had power to send coal to the tester if its quality was at all in question. He himself complained of the neglect referred to by the ex-Mayor (Mr. Alderman Scarr). But between the periods mentioned by him, exception was not taken to a single truck; and to his (Mr. Gilston's) mind this in itself was evidence of the quality of the coal. He dealt with Mr. Ellis Lever as a reformer of abuses, as well as a coal dealer. But that gentleman made two insinuations which disturbed his mind; and if the ex-Mayor had been in his position, he would also have felt that an injustice had been done. He had tried to do his

duty, and no more. As to Mr. Willey's complaint, he could prove that in one year 13 tests were made of a certain supply of coal, which only gave an average of 2½ per cent. below the sample test from which the purchase was made. No contractor would sell coal if every truck were to be submitted to fine chemical tests. The fact that tests had been made at the gas-works for two years, was in itself an incentive to the coal contractors to supply an article similar to that tendered for.

The minutes were then adopted.

BURY CORPORATION GAS SUPPLY.

THE PRICE OF GAS IN THE OUT-TOWNSHIPS.

At the Meeting of the Bury Town Council on the 9th inst., the Mayor (Mr. Alderman Smethurst) presiding,

Mr. EASTHAM, in accordance with notice, moved—"That the resolution of the Gas Committee passed on the 18th of June last, and confirmed by the Council on the 5th of July last, so far as the same relates to fixing the price of gas to consumers outside the borough and in the newly-added areas at 3s. 1d. per 1000 cubic feet, less 2d. for prompt payment, be rescinded, and that the price charged to such consumers be 2s. 7d., less 1d. for prompt payment." He said the original resolution was sprung upon the Council, who had not time to think about it. There was a determined opposition in the outside districts to the enormous difference of 50 per cent. between the price in the added areas and other parts of the borough. The consumers were resorting to oil, which was stated to be cheaper and better than gas, from a feeling of being unfairly treated. After the recent visit to the gas-works, the Manager (Mr. W. Woodward) told them that, in consequence of the reduction in price inside the borough, about 500,000 cubic feet of gas per week were being consumed. The moral was that if they charged the added consumers a reasonable price, the consumption would increase, the loss in the shape of waste and condensation lessened, their income increased, and a larger revenue would accrue. They should treat the outsiders not as foreigners, but as themselves.

Mr. METCALF seconded the motion, not on the ground of price, but of the outsiders being charged 50 per cent. more than those inside the borough. Previous to those districts being brought into the borough, they had gas at an additional price of 6d. per 1000 feet; but now they were charged a greater difference, and there was a strong feeling against this.

Alderman BURROW was sorry the question had arisen, as half the year had already gone. Two quarters' bills had, he said, been paid in most instances; and it would be inconvenient and unusual to rescind a resolution, alter the accounts, and refund the money. He hoped the motion would not be entertained. He wished to have a year's experience of the arrangement. The great increase in the consumption of gas had occurred in the outside district, where the price had not been reduced. The increase inside was 3½ per cent., and outside 9½ up to last month. There were other reasons why no alteration should be made.

Mr. MELLOR said the price was fixed and the estimates of the cost of working based on there being no profit on the works; so that if the motion were passed there would be a loss of 6d. per 1000 cubic feet. They could only meet the deficiency by raising the charge inside by 3d. per 1000 feet, and dropping the price outside a like amount. He asked Mr. Eastham to withdraw his motion.

Alderman PEERS said that if the motion were carried, it would upset the whole calculations on which they reduced the price so that no profit should be made. He was not in favour of an increase in the price to outsiders; but in the inside district they had a water-rate of 2d. in the pound which the outsiders would not pay. They were going to Parliament to get relief from a 10d. rate. Did the added areas contribute to this rate? Not a penny. To show how little the outside people had to complain of, he had a list of the prices charged for gas in the districts round about. The outside people of Bury paid 2s. 11d. net; Radcliffe, 3s. 5d. to 4s.; Accrington, 3s. 1d.; Blackburn, 3s. 5d.; Bolton, 3s.; Burnley, 3s. 3d.; Ramsbottom, 3s. 6d. to 3s. 11d. Where did the injustice come in? [Mr. METCALF: It is not the price. It is the difference between the rates.] There was also a difference between a 10d. and a 2d. rate and the amount paid by outsiders. Inside, the rate was compulsory; outside, people had the option of using gas or not. Yet the Corporation were asked to make gas at a low rate for those who did not contribute towards the expenses of the borough.

Mr. MOSLEY said to rescind the resolution in the middle of the year would be absurd. It was not fair to the Committee to bind them down to charge 2s. 7d. per 1000 feet to outsiders.

Alderman HORRIDGE said that when the price was 4s. per 1000 feet the difference was only 6d., which was enough now. He objected to the water question being mixed up with the gas question. They could not work amicably with the added areas by charging a higher price for gas.

Mr. BENTLEY pointed out that when the Corporation applied for the Local Act of 1885, it was pleaded that the outsiders did not wish to be saddled with the liabilities or assets of the Corporation; they wished to be considered as customers and not as partners. Now, however, as to gas, they wished to be partners. He would allow the added areas to have gas at the same price as insiders if those outside would pay the rates that were paid inside.

The motion was withdrawn.

LYMM LOCAL BOARD GAS-WORKS.

EXTENSION OF THE PLANT.

We learn from a local paper that the alterations in the plant at the Lymm Gas-Works, for the carrying out of which the Chairman of the Gas Committee has been for a long time agitating, have now been completed. In view of this circumstance, it may not be uninteresting to glance at the progress of the undertaking in the past decade. Some ten years ago, the amount of gas consumed daily at this time of the year averaged about 20,000 cubic feet; at present it is something like double this quantity. On certain days last winter, it even reached 50,000 cubic feet in a day; but this can scarcely be said to be the present normal output on short winter days. With double the consumption in ten years, it is only natural to suppose that in the same time there must have been some considerable changes in the apparatus. There used to be but nine retorts; whereas now there are 24 of increased capacity, which allows a margin of five, or occasionally ten, being out of use. In the purification process, after the tar is extracted, the gas passes through the old washer (which remains much in the same position as formerly), after which it passes into an "Eclipse" scrubber-washer, made by Messrs. Clapham Bros., of Keighley. This machine is specially designed to divest the gas of all traces of ammonia. After the gas has entered, it is forced through ten chambers, each of which is packed with wooden balls 1½ inches in diameter, which are kept constantly revolving by a small engine. Each ball has a hole ¼ inch in diameter through it; and by this means the gas is broken up. As the chambers revolve in water, the latter becomes charged with the ammonia in the gas. The gas passes thence into the next chamber, where the process is repeated; and then to the next, until it passes through the tenth and last chamber.

Long before it reaches it, however, there is not a trace of ammonia left. This machine has only been in operation a short time, but is giving eminent satisfaction. The water remains in the first chamber until it registers 5° Twaddell. The gas next passes to the lime purifiers, of which there are four—no additions having been made since the works were erected. Of course they are not adequate to the work required of them; and their improvement is urgently called for. A new station meter, supplied by the Gas-Meter Company, of Oldham and London, was brought into use at the beginning of the present month. It is capable of passing 180,000 cubic feet of gas per day. The storage capacity of the works is another weak point which will have to engage the attention of the Committee. It is only equal to 43,000 cubic feet; and the holder is defective. We may add, in reference to the "Eclipse" washer-scrubber, that Messrs. Clapham Bros. are just now busily engaged upon the manufacture of these machines, having received a large repeat order for two, each of a daily capacity of 4 million cubic feet, and one of 2 million cubic feet, from a gas company who put in one of these appliances about four years ago.

HUDDERSFIELD CORPORATION GAS AND WATER SUPPLY.

At the Meeting of the Huddersfield Corporation on the 9th inst., the Mayor (Mr. Alderman J. Brooke) addressed a few observations to the Council bearing on the work of the various departments during his year of office. Alluding to the gas undertaking, he said the canal and coal used in 1887 was 40,690 tons; in 1888, it was 41,638 tons—showing an increase of 948 tons. The gas sent out and consumed in 1887 was 433,626,000 cubic feet; in 1888 it was 447,900,000 cubic feet—showing an increase of 14,274,000 cubic feet, or 3.29 per cent. The average illuminating power of the gas for the year 1887 was 20.01 sperm candles; in 1888 it was 20.10 sperm candles. The extension of the gas-works this year has been unusually large, involving an outlay of nearly £17,000. This had been necessary in order to make provision for the constantly increasing demand for gas. The new works were now completed. There had also been a new gasholder erected, having a capacity of 1,120,000 cubic feet, and this was now at work. On the 27th of September, the new works were started (the new holder included) in the presence of the Gas Committee, when everything passed off smoothly and evenly, without difficulty or accident, and all had continued in excellent order. There had been an increase of about 400 new consumers during the year; and the mains had been extended by a mile. The whole of the works and mains had been kept in thorough repair and efficiency. The profits from the gas-works this year was £8479 11s. 6d., as against £7714 15s. 6d. in 1887. With respect to the water undertaking, the number of gallons of water supplied for trade purposes inside the borough during the past year had been 360,563,000; outside the borough, 67,144,000 gallons—making a total of 427,707,000 gallons, as compared with 436,609,000 gallons last year. The population supplied inside the borough was 97,280; outside, 35,135—making a total of 132,415, as compared with 129,975 at the same time last year. The number of houses added for water supply during the year was 292 inside the borough, and 196 outside—making a total of 488. The number of meters fixed was 398 inside the borough, and 123 outside—making a total of 521, as compared with 503 last year. The length of mains now laid was as follows:—Trunk mains, 30 miles 44½ yards; distribution mains outside the borough, 115 miles 139 yards; inside the borough, 68 miles 643 yards—making a total of 213 miles 1228 yards. The net water-rental during the year had been £45,447; during the previous year it amounted to £42,122—showing an advance of £3325. The water-works revenue account showed the income for the year to be £1569 18s. 6d. in excess of the expenditure. This surplus had been applied towards reducing the amount of accumulation of deficiencies in previous years; and the balance remaining it was expected would be discharged in about three or four years, if not sooner. All available resources for obtaining water that could be brought to the town deserved the early and anxious consideration of the Council. The present consumption of water was about 3½ million gallons per day. The sources of supply were calculated to yield (say) 4½ million gallons per day, exclusive of compensation water. This left 1½ million gallons daily in favour of supply over demand. If the two reservoirs proposed were made in the Wessenden Valley, they would probably add 2 million gallons per day to the supply, which would amount to 3½ million gallons daily to meet the growing demand. The rate of increase in the demand for the last five years had been about 40 million gallons per annum. At this rate the consumption would overtake the supply in 30 years. He held the opinion that all the surplus water would be utilized long before 30 years had elapsed. Whenever this event happened, were it sooner or later, the prosperity of the town and district would receive a deadly blow. His last words on this important subject were the expression of an earnest conviction that it was incumbent upon the Council to endeavour to obtain, as soon as possible, a cheap, abundant, and practically inexhaustible supply of pure water for domestic and manufacturing purposes, so that the prosperity of the town should be secured for untold years to come.

BURNHAM WATER SUPPLY.—Mr. T. Codrington, C.E., held an inquiry at Burnham, Somerset, last Tuesday, for the purpose of receiving evidence with regard to the application made by the Burnham Local Board to the Local Government Board for sanction to borrow £2000 for works of water supply. It was stated that most of the amount was required for the construction of gullies and trenches. Evidence having been taken, the Inspector visited the pumping station at Brent Knoll.

LONG EATON WATER SUPPLY.—Last Wednesday a special meeting of the Long Eaton Local Board was held to consider the question of a supply of water.—Mr. J. Orchard, J.P., presiding. After a long discussion, it was decided to apply for the necessary powers to procure a good supply of water. Another resolution was passed that the Clerk should watch an effort by an outside syndicate to obtain power to supply water to the Long Eaton district. A deputation was appointed to consult the Nottingham Corporation as to supplying the township with water from their works.

PROPOSED CONSTANT WATER SUPPLY IN WIMBLEDON.—At the meeting of the Wimbledon Local Board on the 7th inst., the Clerk reported the receipt of a letter from the Secretary of the Lambeth Water Company (Mr. S. H. Lonttit) with reference to the proposed constant supply of water to South Wimbledon. The deputation from the Board met the writer in conference on Oct. 10 last, when the Secretary pointed out that Wimbledon being outside the area defined by the Metropolitan Water Act, 1852, the Board of Trade regulations as to prescribed fittings, framed under the Act of 1871, could not be enforced, but that the Company had power under the Water-Works Clauses Act, 1817, and their own Act of 1848, to out off the supply to houses in cases of waste or misuse of water due to inefficient fittings. The Directors would give a constant supply to a part of the district as an experiment; and it would depend on the inhabitants themselves whether it was continued and extended throughout the parish. The Company, however, reserved to themselves the right to revert to the intermittent system should they be unable to satisfactorily check waste. The letter was referred to the Road and Drainage Committee.

THE PRICE OF GAS AND WATER IN LANCASHIRE.

In the JOURNAL for Sept. 25 last (p. 558), we published some particulars in reference to the price of gas in various Lancashire towns, from a return compiled by Mr. J. H. Bailey, the Borough Treasurer of Blackburn. A similar, but more extensive table has now been issued by Mr. Carter, the Treasurer to the Corporation of Preston, from which we take the following figures showing the price of gas per 1000 cubic feet, the charge in the pound for water used for domestic purposes on a house of £15 rateable value, and the total local rates:—

Name of Town.	Population.	Rateable Value.	Charge for Water.	Price of Gas.	Total Rates.
		£	s. d.	s. d.	s. d.
Accrington	31,435	120,872	1 3½	3 1	4 2
Ashton-under-Lyne	39,600	141,426	1 10	2 4	4 6
Barrow-in-Furness	52,000	223,210	1 0*	3 6	3 10
Blackburn	120,000	408,884	1 7-2	2 9½	4 8
Blackpool	20,000	155,117	1 0	2 6	4 2
Bolton	110,000	407,086	1 5½	2 6	4 10
Bradford	224,507	979,864	1 6	2 3	5 4
Brighton	119,983	680,356	0 9	3 1	4 8
Bristol	206,874	984,490	—	—	4 11½
Burnley	78,000	224,966	1 0	2 3	5 1.
Burton-on-Trent	46,500	213,912	—	—	3 11
Cardiff	120,900	681,961	1 2-4	2 6	4 5½
Carlisle	42,000	153,355	0 10½	2 6	3 10
Chester	37,000	161,811	1 8	3 4	4 6
Coventry	50,000	128,279	1 7-2	3 0	6 0
Darlington	57,000	154,119	1 3½	2 0	5 4
Dewsbury	33,000	112,621	1 0-8	3 0	6 3
Gateshead	80,000	242,000	1 4	1 10½	5 10
Halifax	80,000	310,139	1 4	1 9	5 2
Huddersfield	91,419	351,639	1 8	2 7½	4 9
Hull	196,855	677,332	1 0*	2 6	5 8
Lancaster	24,649	93,739	1 4	2 6	3 0
Leicester	143,000	487,393	1 2½*	2 4	6 0
Macclesfield	37,514	94,301	1 3	3 0	5 10
Manchester	377,529	2,435,404	0 9	2 8	4 8½
Middlesbrough	70,000	221,731	1 3*	2 0	5 9½
Newcastle	115,359	823,338	—	—	4 4
Newhampton	60,000	175,868	1 6	2 2	5 4
Norwich	94,000	289,656	1 3	3 4	7 6½
Nottingham	230,000	914,520	1 1	2 4	5 0
Oldham	110,000	574,000	1 6*	2 4	3 6
Plymouth	79,000	270,415	0 9½	1 9	5 4
Preston	103,231	334,174	1 0½	2 9	5 2
Reeddale	72,789	255,293	2 0	2 10	5 3
Sheffield	316,288	1,071,000	1 6	2 2	6 8
Southport	39,000	226,000	1 6	2 10½	3 8
Sunderland	132,000	425,210	1 2	1 8	4 8
St. Helens	57,403	252,552	0 10½*	2 10	4 1
Swansea	77,000	258,000	1 0	2 10	7 0
Wakefield	32,000	139,696	1 3*	2 6	7 0
Wigan	53,000	163,954	1 1	2 9½	7 5
Wolverhampton	81,000	259,847	1 3	2 6	5 8½
York	70,800	236,158	1 0	2 3	4 2

* Charged on gross rental.

METROPOLIS WATER SUPPLY.

According to the returns furnished to the Registrar-General by the London Water Companies, the average quantity of water supplied daily to the Metropolis during the past month was 161,994,888 gallons, against 159,115,975 gallons in the corresponding month of 1887. The number of houses served last month was 744,592, or 218 gallons per house, and 27-9 gallons per head of the population. In October, 1887, the number of houses supplied was 731,508; and the quantity of water allowed for each person 27-9 gallons. Of the entire bulk of water supplied last month, 80,490,057 gallons were drawn from the Thames, and 81,504,831 gallons from the Lea and other sources.

In his report to the Registrar-General on the quality of the Metropolitan water supply last month, Dr. E. Frankland makes the following remarks:—"Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies and by the Tottenham Local Board of Health, was; Kent, Colne Valley, and Tottenham, 0-8; New River, 0-9; Southwark, 1-6; Chelsea, 1-8; Grand Junction and Lambeth, 1-9; West Middlesex, 2; East London, 2-1. The proportion of organic matter present in the Thames water supplied by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies was, as in the previous month, exceptionally small for river water. All the samples were clear and bright. The water principally derived from the Lea, and distributed by the New River and East London Companies, also contained only a small proportion of organic matter; the amount present in the New River Company's supply being less than in any of the other river waters. Both waters were clear and bright. The deep-well waters of the Kent and Colne Valley Companies and of the Tottenham Local Board of Health contained, as usual, only a very small proportion of organic matter; and the Colne Valley Company, by softening their supply with lime before delivery, thereby rendered it also of excellent quality for washing and all other domestic purposes."

In the course of their report to the Official Water Examiner for the Metropolis (General A. De Courey Scott, R.A.), on the composition and quality of the daily samples of water supplied to London last month, Messrs. Crookes, Odling, and Tidy say: "The high quality of the water referred to in September's report [see ante, p. 732] has been well maintained during the past month. Moreover, the analyses of the daily samples are marked by great uniformity of excellence. Thus, of the Thames-derived waters, only 4 out of 130 samples examined by the oxygen process required more than 0-045 grain of oxygen per gallon to oxidize the organic matter; the average of the whole 130 samples being a little over 0-03 grain per gallon. Of the 189 samples examined, 187 were clear, bright, and well filtered."

PROPOSED ELECTRIC LIGHTING SCHEME FOR PADDINGTON.—The Paddington Vestry have resolved to obtain plans and specifications to enable them to proceed with an application to Parliament for a Licence to supply the electric light for public and private purposes throughout the parish.

THE BURSTING OF A WATER RESERVOIR NEAR GENEVA.—It is reported that the accident at Montreux, to which reference was made in the JOURNAL last week, was due to the telephone. The reservoir (which furnished the motive power of the Chillon electric tramway) being so full as to cause apprehensions, the man in charge was telephoned to in the words, "Ne mettez plus d'eau"—i.e., "Put no more water." He did not catch the first two words, and consequently turned on more water; the result being that the reservoir burst, with loss of life and great damage to property. Perfect security, however, now prevails.

LAMBETH WATER-WORKS COMPANY.

THE HALF-YEARLY REPORT OF THE DIRECTORS.

The report of the Directors of this Company for the six months ending Sept. 30, 1888, which will be presented at the half-yearly general meeting of proprietors on the 27th inst., states that, notwithstanding a falling off in the charges for road-watering supplies by meter (mainly attributable to the past wet season), and for water for use in building operations to the extent of £617, there has been an increase of £1397 15s. in the water-rents, &c., as compared with the corresponding period of last year. On the other hand, although the item of storage, in consequence of the repairs to one of the Molesey reservoirs, is £639 more, and the payments to the Thames Conservancy and for rates and taxes are increased by £250 and £329 respectively, the total expenditure is £61 less than in the summer months of 1887. During the six months reported upon, 1122 houses and other supplies of water, estimated to afford an annual water-rental of £2813 10s., were connected with the Company's works; as against 1154 houses, yielding a rental of £3084, in the six summer months of 1887. There was expended on capital account during the half year ending in September, £6934 19s. 8d.; making, since the passing of the Metropolitan Water Act, 1871, a total outlay of £730,177 13s. 11d. on new works. The surplus transferred from the revenue account to the dividend and interest account is £69,197 15s. 11d. After payment of interest on debenture stock, there is to the credit of the latter account an available sum of £68,869 16s. 10d., out of which the Directors recommend the distribution of the maximum dividend, at the rate of 7½ per cent. per annum on the shares issued under the Company's Act of 1856, and a dividend at the rate of 9 per cent. per annum on all the other share capital of the Company (less income-tax). These dividends will, it is estimated, amount to £62,203; and consequently a balance of £6666 will remain to be carried forward, as against £5916 last year. Constant supply is now given to 44,769 houses, &c., in all of which the Board of Trade regulations as to fittings have been complied with. The whole of these houses are regularly inspected by the Company's officers; and the Directors express satisfaction at finding that while the supply has remained constant, without any interruption, in all the divisions of the district, there has been no increase in the consumption of water as compared with the intermittent system. They are about to make some experiments in Wimbledon, with the view of giving constant service to all the houses supplied by the Company in that parish. Under the Lambeth Water-Works Act, 1886, all debenture stock authorized by that Act to be created must be issued under auction clauses, and at the end of three years after such issue a certain sum must be set aside out of the profits, in addition to the interest on the stock itself, for purchasing and extinguishing the share capital of the Company. As the time is approaching when it may become necessary to raise some of this debenture capital, the Directors desire to obtain the sanction of the proprietors to create and issue, by auction or tender, the £150,000 of debenture stock authorized by the above-named Act, with 4 per cent. interest.

THE USE OF OIL FOR PUBLIC LIGHTING AT NEW SOUTHGATE.—A correspondent of a local paper complains bitterly of the inefficient lighting of New Southgate by oil. He says: "Some two years ago the Friern Barnet Local Board professed to light up this neighbourhood; and it has proved a total failure. There is scarcely a night passes that one-half of the oil-lamps are not blown out, and those that are alight only serve to make the darkness more visible. I suppose we have the very worst lamps for street lighting that can be found."

CHELTSEY GAS COMPANY.—The annual general meeting of this Company was held last Thursday—Mr. J. Bartholomew in the chair. The Secretary (Mr. J. Moir) read the report of the Directors, which showed that the profit would allow of the declaration of an additional ½ per cent. dividend, to which the shareholders were entitled owing to the price of gas having been reduced 2d. per 1000 cubic feet. The excellent results of the past year's working have influenced the Directors to again lower the price as from the 1st ult.; thus benefiting both consumers and shareholders. The increased consumption of gas will, it is thought, necessitate the erection of another holder in the spring of next year. The Chairman, in moving the adoption of the report, said there was much cause for congratulation at the continued success of the undertaking. The motion was carried, and the dividend declared. After payment thereof, and debiting the insurance account with £119 in addition to that of last year, there will be left a balance of £1188. The retiring Directors and Auditor having been re-elected, a unanimous vote of thanks was accorded to the Manager and Secretary for their exertions on behalf of the Company. A similar compliment to the Chairman and Directors closed the proceedings.

GARFORTH WATER SUPPLY.—Last Wednesday, Mr. A. Taylor, one of the Local Government Board Inspectors, held an inquiry at Garforth, with reference to an application of the Tadcaster Rural Sanitary Authority, whose district includes Garforth, for authority to borrow £3000 to enable Garforth to procure a supply of water from the Corporation of Leeds. Hitherto Garforth, whose population numbers about 2300, has drawn its water from wells, tanks, and pumps, all of which, from one cause or another, are regarded as unsatisfactory. The total outlay of about £3000, for which water could be conveyed from Leeds, can be met by a rate of 7d. or 8d. in the pound upon the property in Garforth, and about one-fourth of this amount upon land. It is thought, however, that in the course of time the receipts from water-rents will make the scheme self-supporting. In support of the application, Dr. Wilson, the Medical Officer of Health for the district, produced several analyses of the water now being used by the people, which were not calculated to induce those who are alive to the importance of pure water to rest content with existing arrangements. In opposition to the scheme, it was contended that there is plenty of water in Garforth at present, and that more can be obtained by sinking additional wells. The matter now awaits the Inspector's report.

HEYWOOD GAS AND WATER WORKS.—A special meeting of the Heywood Town Council was held last Thursday, to determine upon the expediency of promoting next session a Bill to extend the time for the construction of the Ashworth Moor reservoir and other works, to provide for the compulsory purchase of the gas and water annuities issued under their local Acts. The Town Clerk stated that by the Act of 1877 the Local Board obtained power to construct a reservoir and works at Ashworth Moor. By that Act they had to purchase the land and other easements in five years from its passing, and by another section the works were to be constructed within 12 years. The Corporation, as successors to the Board, purchased the land and easements within the period named, but had not constructed the works. Last year they determined to apply for power to extend the time for their construction by Provisional Order; but the Local Government Board had not power to grant the Order. The Council were consequently driven to the last year; and the only way to get an extension of time was to apply to Parliament. This was the main object of the Bill. He explained the nature of the application in regard to the annuities, and said another matter was the borrowing of money for water and other purposes—principally water; the amount to be determined hereafter. The necessary resolution was passed.

NOTES FROM SCOTLAND.
(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday.*

The strike at the Leith Gas-Works in one sense still continues—the men who struck are still out; but, in another sense, it may be said to be at an end, because the Commissioners have advanced the wages paid in the works to practically the figure asked by the men. It is difficult to withhold sympathy from the men. They were lured into making the demand which they did; and when it was refused, they struck. No sooner had they gone out, than the Commissioners conceded sufficient to satisfy them; but stipulated, in offering the increase, that they would only take on the men they wanted. This was announced to the men on Monday; and along with the announcement, there was published a prominent advertisement offering the increased wages for men to work in the Leith works. A meeting of the men on strike was held on Monday, at which it was resolved that “no man start work unless he be put on the same footing as the Edinburgh men, and every man reinstated to the position he held before the strike.” This resolution was reported to the Assistant Manager at the works, who undertook to lay it before his superiors. Next day some of the men presented themselves at the works, apparently in violation of the above resolution, but were told that their places were filled up, and that, if they were wanted, they would be sent for. This implied that a full staff had been secured; and the only hope of the men who are out lies in the expectation that the new men, being for the most part unacquainted with the work, will soon be found to be unfit, and that the old hands will then be called in. In this they were strengthened by statements that retort-lid explosions were frequent, doing damage to plant; and they concluded that the Manager would soon find it to be unprofitable to keep on the new hands. I confess I am not so sanguine as the men. Their places have been filled up; and the Commissioners have taken the precaution, in order to avert the probability of future difficulties, to require the new hands to sign articles for one month. This, for one thing, prevents the new men being dismissed in order to make room for the old. Then the Commissioners have strengthened their position by conceding to the pipelayers and outdoor labourers terms which place them practically on a level with their brethren in Edinburgh, and by similarly treating the mechanics inside the works, in whose case the working week has been reduced from 56 to 51 hours without any decreased rate of pay. By this means, disaffection will be prevented from spreading; and whether or not the works can be carried on to the same profit or with the same convenience, the Commissioners are committed, and cannot go back. It does seem hard that the men who have forced this improvement should not take any benefit by it; but, on the other hand, there is a good deal to be said for the position taken up by the Commissioners. The origin of the strike must be laid on the shoulders of the “garrulous minority” of the Board. The value of these electioneering speeches is to be seen in this, that not one of the speakers has taken a single public step to support the men. But the men took their remarks in earnest, and attempted to force the Commissioners to a concession—a very foolish step, when it is remembered that the Commissioners had remitted the whole question of wages to a Committee to consider. Had the men been well advised, they would have waited for the report of that Committee; and they would probably have received what they asked for. It is a curious medley of rights and wrongs, in which both sides must bear a certain amount of blame, and probably neither will have any advantage. The men, as a body, have lost their employment; while the Commissioners have secured a staff of men who, for some time, cannot be expected to do their work so well. I understand the Commissioners take the view that, if they are to pay the increased wages, they must have a superior class of men to those who were content to work at the lower rate. In ordinary circumstances, this might have been accepted. As it is, I am afraid it can only be regarded as a species of salve to their conscience—an excuse to be put before the public, and which may go down with them, but which will not receive much credence at the hands of all who exercise their reflecting faculties.

The first meeting after the elections of the Arbroath Gas Corporation was held on Monday. I suppose Provost Anderson has found it awkward to have to deal with opposition both in Committee and at the public meetings of the Board; and the Committee of Management which he proposed to appoint did not, as formerly, include all the members of the Corporation, but only two-thirds of them. He had endeavoured, he said, to select representative gentlemen on both sides of the question which at present chiefly occupies their attention. His efforts in that direction did not please Mr. Michie and Mr. Sandemson, both of whom are opposed to the extension of the gas-works. These gentlemen moved that the whole Board be appointed, as before; but only themselves voted in support of it. The Provost's list was thus adopted; and, whether he intended it or not, he has succeeded in excluding the chief members of the opposition from the Committee. Henceforth the movers in the new scheme will not require to reveal their hand to the opposition before playing.

A furious gale has been raging in Scotland for the past two days, doing great damage to property. At Cowdenbeath, in Fife-shire, the newly-erected oil-gas works have been completely wrecked by the fall of the chimney of the works. The stack, about 40 feet high, went crashing through the roof of the works, and smashed the retorts and fittings. Meantime the gas supply has been stopped. It is proposed to re-construct the works on a more extensive scale. In Edinburgh an old feature has been intensified by the storm. About ten years ago Lord Provost Falshaw announced, at a public meeting, that nearly one-third of the public lamps required to be renewed annually, on account of the destructive force of the wind experienced in the city. It is reported to-day that 54 lamps were destroyed by the fury of the gale during last night, and that the previous night the number which collapsed was nearly 40—making about 90 in all. Another effect of the severe weather has been the giving way of a bank owing to the heavy rains, by which about 15 feet of the main pipe supplying water to a portion of the town of Alyth were displaced, and the water supply was stopped.

By the opening of the Forth Bridge, the town of Queensferry, at present a veritable “Sleepy Hollow,” will have a chance of improving its position. Success in this will depend on local effort; and it is satisfactory to note that the Police Commissioners are taking “time by the forelock,” and endeavouring to have matters tidied up before the influx of expected settlers. Besides looking into sanitary affairs, an extensive scheme of water supply is all but arranged for; and now, in addition, the question of assuming the control of the gas supply has been hinted at. The matter came before the Commissioners on Monday, when Mr. C. Carlow, the Gas Manager, wrote stating that the rates for street lighting charged by the Gas Company were quite inadequate, and asking that they be increased. At present 12s. 6d. is paid for lamps which are extinguished at 10 o'clock, and 17s. 6d. for lamps which are alight all night. On the motion of the Provost, it was agreed to raise the rate by 2s. 6d. per lamp, if the ten o'clock lamps be kept burning on Saturday night till eleven o'clock. Some of the members urged that the Commissioners should themselves supply the gas—a proposal not very well defined, but which, in a small town like

Queensferry, could only mean the acquisition of the Company's property. The matter was not taken up; but it may be heard of again.

The town of Buckie was recently created a burgh; several villages being incorporated in the process. One of the advantages to the local Gas Company of municipal government has already emerged, in a communication from the Police Commissioners, which was laid before the Easter Buckie Gas Company on Friday of last week, requesting them to extend their mains to the two villages of Gordonsburgh and Janstown, the streets of which the Commissioners propose to light. The Directors of the Company resolved to accede to the request, doubtless in the expectation of being able to secure a large increase of customers among the residents.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday.*

The vexed question of the public lighting of the district of Craignenk, which is part of the burgh of Wishaw, again came before the Police Commissioners of that town at a special meeting held last Monday. The Committee previously appointed for the purpose of making the necessary inquiries regarding the matter, reported that, of the house proprietors written to, only six had replied; and of them, only three had agreed to connect their properties with the gas-mains that might be laid for the street lighting. Certain recommendations were made by the Committee as to the laying of the mains, which would have a total length of about two miles; the cost, as estimated by Mr. McNair, the Gas Manager, being about £668. A somewhat keen discussion took place on the matter; but eventually the recommendations of the Committee were adopted.

The lighting of the common stairs within the Burgh of Rothesay seems to be in a most unsatisfactory state, judging by the remarks made at the monthly meeting of the Town Council on Monday last. Mr. MacKinnon inquired what steps had been taken to put the regulations in force regarding the lighting of these stairs. Provost Thompson replied that the matter was being dealt with by the Superintendent of Police, by whom a list of stairs still unlit had been made up, which would shortly be brought before the Lighting Committee. He proceeded to say that the question of lighting the stairs was before the Committee last year; but that, as there was a probability of the new Police Bill for Scotland becoming law this session, it was thought better to try and work on for another year, as they had been doing. The Bill referred to proposed to give power to charge the lighting of the common stairs to the owners of dwelling-houses; and eventually the whole arrangements for lighting would be in the hands of the Burgh.

Regarding the street lighting of the Royal Burgh of Rothesay, a Scotch-American, now temporarily resident in the town, attempts, in a letter to one of the local papers, to throw some “light” on the subject. Being a great admirer of Rothesay, he thinks it might get on much faster and better if it had more of the “go-aheadism” of the Americans; and he enthusiastically suggests that the beauty of the lovely crescent bay (a miniature Bay of Naples) and its sloping hillsides would be much increased if they were lighted with the brilliant electric light instead of a dingy (?) gas. Not only, he remarks, is every first and second rate town in the States illuminated in this way, but many twentieth and thirtieth rate towns are so lighted. Great Falls (which is the nearest town to his own sheep farm in Montana) is, he says, a place of only 1500 inhabitants; and yet it has been lighted by electricity for years. He speaks of the difficulties which the Electric Lighting Act is said to place in the way of the general adoption of the electric light in British cities and towns; but it is evident that he does not know all the facts of the case, one of the most important of which is the very low price at which coal gas can be supplied compared with the cost of the electric light. This letter affords the Editor a text for some remarks, which he concludes in these words: “Now that the embargo foolishly placed by Parliament on the adoption of the electric light is about to be removed, all enterprising towns will, no doubt, be setting about its adoption. There is in Rothesay a water power wasting into the sea from Loch Fad more than sufficient to develop electricity enough to light all the dwellings and streets of the town; and it would be a feather in our cap if we should manage to be the first town in Scotland to adopt this great improvement in lighting.” The writer does not seem to be aware of the effort made by the municipal authorities of Greenock within the past three years or so to turn electricity to account for lighting the public streets—an effort which proved decidedly unsuccessful, even though an excellent supply of water power was used, which was obtained almost without any expense.

At a meeting of the Ardsrossan Police Commissioners held last Monday, it was agreed to adopt the recommendation of the Gas Committee to accept an offer by Messrs. Laidlaw, Sons, and Caine, of Glasgow, amounting to £2124, for some important extensions and alterations to be made at the gas-works.

Towards the end of last week, the important mining village of Dreg-horn, near Kilmarlock, had its streets lighted with gas for the first time, amidst great rejoicing from the people generally. The village has made great progress in public improvements within recent years; one of them being the introduction of gas into the dwelling-houses, which took place about ten years ago.

The shares of the Partick, Hillhead, and Maryhill Gas Company were in demand on the Glasgow Stock Exchange last Tuesday at 80s. per share; but sellers held out for 82s. 6d., and no business was done. They changed hands on Friday at 80s. per share; and at the close of the market buyers were offering 77s. 6d.

Yesterday's pig-iron market closed with Scotch warrants at 41s. 2d. cash, buyers; Cleveland, at 33s. 8d.; and hematite iron, at 43s. 11d.

Quietness has been the rule in the coal trade this week; but prices remain firm all round. The wages of the miners are now being generally advanced where the increase had not previously been conceded.

CHECKING WASTE OF WATER AT SHREWSBURY.—At the meeting of the Shrewsbury Town Council on the 9th inst., the Borough Surveyor and Water Engineer (Mr. W. Chapple Eddowes) presented a report, in the course of which he gave the results of the adoption of the Deacon meter in certain districts of the city. When the supply was intermittent, the average consumption before the inspection of the fittings was 81,450 gallons in 12 hours, or 27.15 gallons per head. After the first inspection and repair, it was 57,450 gallons, or 19 gallons per head; and after the second inspection and repair, 51,450 gallons, or 17.15 gallons per head. The total saving was 30,000 gallons, equal to 10 gallons per head per day. When the service was constant, the average consumption per day before the inspection of the fittings was 146,641 gallons; after the first inspection and repair, it was reduced to 98,641 gallons; after the second inspection and repair, to 86,641 gallons—the consumption per head being 48.88, 32.88, and 28.88 gallons. The total saving effected was 60,000 gallons, or equal to 20 gallons per head per day. The constant supply was, therefore, reduced almost to what the intermittent supply was prior to the repairs. The detection of the waste had been effected solely by the meters.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Nov. 17.

Sulphate of Ammonia.—The market is again stronger, due to the further progress of the upward movement in nitrate; but it will be noticed that sulphate values do not by any means advance in the same ratio as nitrate prices, the rapid inflation of which is already making consumers dubious about their ultimate maintenance. On spot, nitrate has been put up, within a week's time, nearly £1 per ton (to 11s. 6d. per cwt.), which indicates a rise of about £2 10s. per ton since the beginning of September. It would be very difficult to find sufficient arguments for this rise, as even any statements on paper cannot show that there will be a famine in the spring; nor is there any reason why spot values should be advanced to an absurd level, when there is no agricultural demand, nor will there be for months to come. It is said that stocks are low in the United Kingdom. But there is very little wanted for present delivery; and it may serve holders, here for instance, to dole out their 4000 to 5000 tons stocks—they could not sell much if they would. Cargoes, Oct.-Nov. sailing are now quoted at 11s. 6d. (the spot price). Nitrate can be bought readily at 11s. 3d. from second hands; and indeed these re-sales, showing in many cases handsome profits, may eventually play havoc with the market. From this cursory glance at the nitrate market, those interested in sulphate can form their own opinions. Attention will have to be given to the fact that sulphate has barely advanced £1 per ton since September; and it will be noticed that the difference in the respective values of the two commodities is only about £1 per ton. This difference ought to be increased, one way or the other, to place the respective articles on their proper basis, or we may see them again on an equality, as they have been for two successive springs (1886 and 1887), and the autumn of 1885. The sulphate quotations at the close stand at £12 5s. (buyers), £12 7s. 6d. to £12 10s. (sellers) f.o.b. Hull; Leith and Liverpool about 2s. 6d. less.

LONDON, Nov. 17.

Tar Products.—With the exception of pitch, which is quoted a little higher, all the products continue at about the same value as last week. Considerable activity exists, and stocks are undoubtedly low. The following prices have ruled during the week:—Tar, according to position, 17s. 6d. to 22s. 6d. per ton. Benzol, 90 per cent., 3s. 2d. per gallon; 50 per cent., 2s. 6d. Toluol, 1s. 7d. per gallon. Solvent naphtha, 1s. 3d. per gallon. Crude naphtha, 30 per cent., 1s. 1d. per gallon. Light oil, 3d. per gallon. Creosote, 2d. per gallon. Pitch, 17s. to 20s. per ton. Carbolic acid (crude), 8s. 9d. per gallon. Cresylic acid, 10½d. per gallon. Tar salts, 15s. per ton. Anthracene, 30 per cent., "A" quality, 1s. 5d. per unit; "B," 1s. 3d. **Ammonia Products.**—Sulphate, if anything, is a little quieter; but buyers are, all the same, willing to book forward business at an advance on to-day's value. Considerable shipments are being made; and stocks are low. The selling price during the week has ranged between £12 2s. 6d. and £12 5s. per ton. Prices of other products are about—Gas liquor (5° Twaddell), 8s. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 2d. per lb. Carbonate of ammonia, 3½d. per lb. Muriate of ammonia, brown, £18 per ton; white, £25. Sal-ammoniac, £30 per ton.

[From the *Chemical Trade Journal*, Nov. 17.]

Sulphate of Ammonia.—From some quarters the market has been reported quieter; but the fact remains that £12 5s. was paid at Hull on Monday last for prompt delivery. It is quite true that the market to-day is not as earnest as it was a week ago, but that is in a measure due to a fearfulness that prices might run away under small stocks and a good demand, if too strong a desire for purchase was now expressed. It is now understood that many users are fearful of a scarcity in the spring and consequent high prices, and that it may not be possible to purchase when it is required if a mild winter intervenes and early spring planting is possible. Beckett and outside London makes stand at £12 5s., and Leith £12 3s. 9d. per ton.

Tar Products.—Benzoles are a little firmer; and sales have just been made over the remainder of this year at prices showing an advance on that quoted last week. At these prices also it is rumoured that some business has been done for next year. For 90's benzol, the prices ruling to-day may fairly be stated as 3s. 2d. to 3s. 3d.; while 50/90's are fetching 2s. 6d. to 2s. 7d. All other products remain much the same as in our last report. Anthracene is firm at 1s. 3d. for "B" quality, and 1s. 5d. for "A," on the basis of 30 per cent. Pitch is now a fairly good market, and seems likely to be so during the whole of the winter.

THE SWANSEA CORPORATION AND ELECTRIC LIGHTING.—At the meeting of the Swansea Town Council last Wednesday, Mr. Martin moved the adoption of the minutes of the Special Gas Committee, which stated that the Surveyor had reported the result of his visits to various places where public and private lighting is effected by electricity; and, in accordance with his suggestions, it was recommended that tenders be invited for the lighting of a portion of the borough (which was defined). He said the present cost of lighting this area was £539 13s. 8d. per annum; and the Surveyor estimated that to light it with electricity would cost an additional £175 per annum, or 30 per cent. more, while the total increase in illuminating power would be raised from 3288 to 44,400 candles. The Surveyor was directed to supply each member of the Committee with a plan showing the proposed position of the electric lamps in the area referred to. It was decided to invite tenders for lighting by electricity the streets specified. The cost, he said, would be certainly greater; but there would be a considerable increase in illuminating power. On this ground alone he had no doubt the town would be glad to have the alteration. The minutes were adopted.

DISPUTED METER REGISTRATION.—At the Sale Petty Sessions on Monday last week, Mr. J. Richardson, Solicitor, of Sale, appeared in answer to an adjourned summons, taken out by the Shelford Gas Company, for the non-payment of £4 18s. 4d. on account of gas supplied to him. He admitted liability to the extent of £1 12s.; and this amount he had paid into Court. The matter really in dispute was the accuracy of the registration of the defendant's meter, which was one that had been on view at the Manchester Exhibition. The meter had been tested on two occasions—once for the Company and once for the defendant—and had been found correct. Mr. Richardson maintained that the charge was excessive. He said the average for the past 20 years had been about £1 11s. 6d. for the half year; and this fact he considered to be of more value, as evidence, than the indication of a meter. It was contended, on behalf of the Company, that, under the Gas-Works Clauses Act, the meter index is to be taken as *prima facie* evidence of the quantity of gas consumed; and as the meter had been tested and found to be correct, they were entitled to be paid for the gas shown to have been passed through it. In the result, the Bench decided that the amount paid into Court was sufficient discharge of the claim, inasmuch as the Company's meter inspector had noticed the unusually large consumption for the period in question, and had remarked that there must be something wrong. They also allowed defendant his costs.

PADIHAM WATER SUPPLY.—Last Saturday week, an extraordinary meeting of the Padiham and Hapton Local Board was held, to consider the propriety of promoting next session a Bill to extend the time for the completion of the water-works authorized by the Padiham Local Board Act, 1882; to construct a compensation reservoir, and other works in connection with the water undertaking of the Board; to enable the Board to borrow further capital for the above purposes; to extend the district so as to include in the present gas and water limits of the Board the rest of the township of Padiham (not included in the Board's district), and part of the extra-parochial township of Ightenhill Park. Mr. Ingham proposed a resolution couched in the terms of the notice. Mr. Monk, in seconding, said they asked Burnley to supply them; but Burnley would not listen to them. If they could have bought water cheap enough, they would not have gone in for works of their own. They found, however, they could not do better than start a scheme; and they entered into a proposed expenditure of about £45,000, but it might run up to very near £80,000. The resolution was agreed to.

PONTEFRAC TOWN WATER SUPPLY.—On Wednesday, the 7th inst., Major-General C. Phipps Carey, R.E., held an inquiry, on behalf of the Local Government Board, with reference to an application of the Pontefract Town Council to borrow £23,152 for works of water supply. There was a large attendance of the ratepayers of the borough—many in favour, and others against, the water scheme, which proposed to bring a supply from Roall, near Selby. The Inspector made detailed notes of the whole scheme, which has the support of the Mayor, and many members of the Council, and which, if carried out, is intended to supply Knottingley and other places on the way. It was pointed out that at Knottingley the inhabitants are in many parts drinking water taken from the River Aire, and within a short distance of the outfall of sewage into the river. One speaker held that the Roall water was suitable for all manufacturing purposes; the towns of Birmingham, Nottingham, Leicester, and other places being supplied from the red sandstone. Others spoke strongly against the Roall scheme; and held that the water at present used is good, as proved by the death-rate, and that only an auxiliary supply is needed. The opponents of the scheme prayed that the Inspector would recommend to the Local Government Board that it should be postponed, in order that other districts might be surveyed, with the view of obtaining an additional supply only. At the close of the inquiry, the Inspector said, from the evidence he had heard, a better supply of water was needed; and he would report the matter at once, so as to have the question settled. He then visited the wells and the surrounding district.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.
(For Stock Market Intelligence, see ante, p. 882.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.					£ s. d.
GAS COMPANIES.								
590,000	10	12 Oct.	10½	Alliance & Dublin 10 p. c.	10	17½-18½	..	5 13 6
100,000	10	"	7½	Do. 7 p. c.	10	12½-13½	..	5 11 1
900,000	100	2 July	5	Australian (Sydney) 5½% Deb.	100	110-112	..	4 9 3
100,000	20	30 May	10	Babia, Limited	20	24½-25½	+½	7 16 10
200,000	5	14 Nov.	7½	Bombay, Limited	5	7-7½	..	5 0 0
40,000	5	"	4	Do. New	5	5-5½	..	5 9 1
380,000	Stock.	29 Aug.	11½	Brentford Consolidated	100	223-228	..	5 3 1
125,000	"	"	8½	Do. New	100	164-168	..	5 4 2
220,000	20	13 Sept.	10½	Brighton & Hove, Original	20	43-45	..	4 13 4
320,000	20	28 Sept.	11½	British	20	43-45	..	5 0 0
50,000	10	13 Sept.	11	Bromley, Ordinary 10 p. c.	10	19-21	..	5 4 9
39,000	10	"	8	Do. 7 p. c.	10	13-14	..	5 14 3
328,750	10	14 Nov.	8	Buenos Ayres (New) Limited	10	14-15*	..	5 6 8
200,000	10	2 July	6	Do. 6 p. c. Deb.	10	110-112	..	5 7 1
150,000	20	10 Aug.	7	Cagliari, Limited	20	25-27	..	5 3 8
550,000	Stock.	12 Oct.	13½	Commercial, Old Stock	100	259-264	..	5 5 9
130,000	"	"	10½	Do. New do.	100	209-214	..	5 0 5
121,324	"	28 June	4½	Do. 4½ p. c. Deb. do.	100	123-128	..	8 10 3
557,320	20	14 June	12	Continental Union, Limited	20	44-46	..	5 4 4
242,680	20	"	12	Do. 7 p. c. Pref. '72	14	29½-30½	..	5 10 2
200,000	20	"	9	Do. 7 p. c. Pref.	20	36-38	..	4 14 8
75,000	Stock.	28 Sept.	10	Crystal Palace District	100	205-215	..	4 13 0
234,060	10	27 July	13	European, Limited	10	25½-26½	..	4 18 1
120,030	10	"	13	Do. New.	7½	18-19	..	5 2 7
354,060	10	"	13	Do.	5	12-13	..	5 0 0
5,468,000	Stock.	29 Aug.	13	Gaslight & Coke, A, Ordinary	100	247-251	+2½	5 3 6
100,000	"	"	7	Do. B, 4 p. c. max.	100	100-105	..	3 16 3
665,000	"	"	10	Do. C, D, & E, 10 p. c. Pf.	100	259-264	-1	3 15 10
30,000	"	"	5	Do. F, 5 p. c. Pf.	100	125-130	..	3 16 11
60,000	"	"	7½	Do. G, 7½ p. c. do.	100	152-157	..	4 0 2
1,300,000	"	"	7	Do. H, 7 p. c. max.	100	167-172	..	4 1 4
463,000	"	"	10	Do. J, 10 p. c. Pf.	100	258-263	..	3 16 1
1,031,150	"	14 June	4	Do. 4 p. c. Deb. Stk.	100	119-122	..	3 5 7
234,850	"	"	4½	Do. 4½ p. c. do.	100	125-130	..	3 9 3
650,000	"	"	4	Do. 6 p. c. do.	100	175-178	..	3 7 6
3,600,000	Stock.	14 Nov.	10	Imperial Continental	100	204-207*	..	4 16 6
75,000	5	14 June	5	Malta & Mediterranean, Ltd	5	5-5½	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	113-115	..	4 6 11
541,920	20	14 June	6	Monte Video, Limited	20	20-21	..	5 14 3
150,000	5	30 May	0	Oriental, Limited	5	9-9½	..	5 5 3
60,000	5	28 Sept.	7	Ottoman, Limited	5	6-7	..	5 0 0
166,870	10	27 July	4	Pará, Limited	10	5½-6½	..	6 3 1
People's Gas of Chicago—								
420,000	100	2 Nov.	6	1st Mtg. Bds.	100	104-107	..	5 12 1
500,000	100	1 June	6	2nd do.	100	95-100	..	6 0 0
100,000	10	12 Oct.	10	San Paulo, Limited	10	15½-16½	..	6 1 2
500,000	Stock.	29 Aug.	15½	South Metropolitan, A Stock	100	297-302	-5½	5 2 7
1,350,000	"	"	12	Do. B do.	100	229-234	-1	5 2 7
141,500	"	"	13	Do. C do.	100	245-255	..	5 1 11
550,000	"	28 June	5	Do. 5 p. c. Deb. Stk.	100	138-143	..	3 9 11
60,000	5	29 Aug.	11	Tottenham & Edm'ton, Orig.	5	11-13	..	4 4 0
* Ex div								
WATER COMPANIES.								
717,467	Stock.	28 June	9	Chelsea, Ordinary	100	260-265	..	3 7 11
1,720,560	Stock.	12 Oct.	7	East London, Ordinary	100	197-202	..	3 9 9
700,000	50	14 June	9	Grand Junction	50	123-127	..	3 13 2
708,000	Stock.	10 Aug.	10½	Kent	100	270-275	..	3 16 4
1,043,800	100	28 June	9	Lambeth, 10 p. c. max.	100	255-260	..	3 9 3
406,200	100	"	7½	Do. 7½ p. c. max.	100	200-205	+2	3 13 2
200,000	Stock.	28 Sept.	12	Do. 4 p. c. Deb. Stk.	100	117-120	..	3 6 8
500,000	100	27 July	14½	New River, New Shares	100	345-350	..	3 9 3
1,000,000	Stock.	"	4	Do. 4 p. c. Deb. Stk.	100	123-127	..	3 8 0
902,300	Stock.	14 June	6	S'thbk & V'xball, 10 p. c. max.	100	172-177	+8	3 7 10
126,500	100	"	6	Do. 7½ p. c. do.	100	160-165	+3	3 12 9
1,155,066	Stock.	14 June	10	West Middlesex	100	267-272	+2	3 13 6

THE TUNBRIDGE LOCAL BOARD AND THE WATER-WORKS.—A Committee of the Tunbridge Local Board recommend that body to purchase the works from the Water Company for the sum of £30,000.

PROPOSED LIGHTING OF ABBEY WOOD BY OIL.—The Plumstead Board of Works have decided to light the district of Abbey Wood by oil instead of gas, providing they can effect an agreement with the Erith contractors on the same terms as those in existence there.

MONTE VIDEO WATER COMPANY.—From an available balance of £31,901, the Directors of the Monte Video Water Company, Limited, in their annual report, propose a dividend of 5 per cent., and an addition of £12,000 to the special reserve fund; carrying forward £2391.

THE AUXILIARY WATER SUPPLY TO LIVERPOOL.—At the meeting of the Water Committee of the St. Helens Corporation on Wednesday last, the Deputy Town Clerk reported that on the previous Monday he received an intimation from the Liverpool Corporation to discontinue the auxiliary supply of water furnished by them for the past few months.

PROPOSED FURTHER REDUCTION IN THE PRICE OF GAS AT ROCHDALE.—It is reported that the Rochdale Corporation Gas Committee will consider, at a meeting to be held to-morrow, the suggested further reduction in the price of gas. It is said the members of the Gas Committee are unanimous in favour of a reduction; but undecided as to the extent to which the charge should be decreased.

NEW JOINT STOCK GAS AND WATER COMPANIES.—The Market Rasen New Lighting Company, Limited, was registered on the 2nd inst., with a capital of 4500 shares, of £10 each, to acquire the undertaking of the Market Rasen Gas Company, and to carry on the business.—The Pocklington Water Company, Limited, with a capital of £3000, in £5 shares, has been formed to supply the town of Pocklington, in the East Riding of Yorkshire, and the adjoining and neighbouring parishes and districts, with pure spring water; and generally to carry on the business of a water company.—The Coal and Coke Fuel Company, Limited, has been formed with a capital of £30,000, in shares of £10 each, to acquire the exclusive right to use, sell, and deal with certain inventions known as "Improvements in the manufacture of fuel from coal slack and similar substances, and in the distillation of coal tar and similar substances."

ALEXANDRIA WATER COMPANY.—The Directors of the Alexandria Water Company have declared a dividend of 2½ per cent. for the half year ending Sept. 30.

REDUCTION IN PRICE.—The Directors of the Chichester Gas Company announce that after the 1st of January next the price of gas will be 4s. 3d. per 1000 cubic feet; being a reduction of 3d. per 1000 feet.

MONTE VIDEO GAS COMPANY, LIMITED.—The Directors of this Company have declared an interim dividend of 12s. per share, free of income-tax, in respect of the half year ended June 30 last; being at the rate of 6 per cent. per annum.

ELECTRIC LIGHTING AT BARNET.—A correspondent sends to the *Barnet Press* the following figures as to the comparative cost of gas and electric lighting in that town:—Electric light: 74 lamps at £5 8s. = £399 12s. Gas: 100 ordinary lamps at £2 18s.; two lamps at £16; and two at £10 = £342. He gives them to show that the contractor has not succeeded in "replacing gas by electricity at a similar cost," which, he says, he undertook to do.

THE PRICE OF GAS AT KNARESBOROUGH.—The Knaresborough Gas-Works were purchased for £2000 by the Improvement Commissioners in the year 1846 from the late Mr. John Malam, of Hull. On the Commissioners becoming owners of the works, the price of gas to private consumers was reduced from 10s. to 8s. 4d. per 1000 cubic feet; in the year 1850, to 7s. 6d.; in 1853, to 5s. 10d.; in 1855, to 5s.; afterwards to 4s. 2d. and 3s. 4d.; the present price being 2s. 6d. The Manager (Mr. W. Stansfield) reports that during the last half year there was an increase of 653,200 cubic feet in the sale of gas.

THE USE OF THE DIVINING-ROD AT HASTINGS.—The Hastings Board of Guardians have decided to proceed to a practical test of the recommendations of Mr. Mullens, the "diviner," whose experiments with the divining rod in searching for water on the site of the new workhouse a couple of months ago caused considerable interest not only in that town, but throughout the country, and were recorded in the *JOURNAL*. For this purpose they have accepted a tender of about £1000 for the sinking of a well and the making of headings, in accordance with the plan mapped out by Mr. Mullens.

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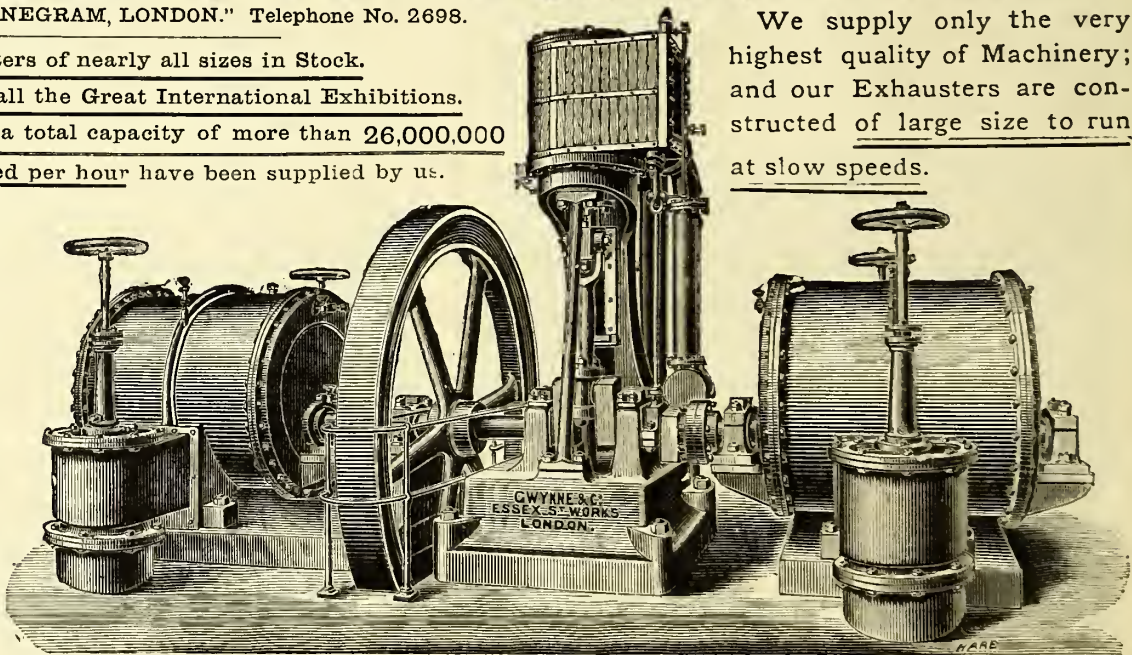
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THE Directors of the Hornsey Gas Company invite APPLICATIONS for the COLLECTORSHIP of one of the Divisions of their District. The Collector would be required to find Security to the amount of £250.

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* * See Advertisement on Page III. of the Wrapper of this week's issue.

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prevailing system should be abandoned in favour of some other course which they recommend on their own authority, such as it is, without proving its acceptability. The world is not to be moved in this way; but a few hare-brained folk may be disturbed. We have no respect for an "F.R.S. Ed.," without figures, in connection with a matter of which figures are the very essence. Mr. Thomson must either go further and prove his case, or rest under the imputation of having published a mass of mere babble.

MR. W. MOONEY ON GASHOLDER GUIDING.

IN another column will be found the second part of Mr. W. Mooney's contribution to the *American Gaslight Journal* respecting the question of gasholder framing. The first part of Mr. Mooney's article, which we reproduced some weeks ago, consisted of a review of the various suggestions that have been offered on this subject in the columns of the JOURNAL and before The Gas Institute. It seemed serviceable to bring these points together; and therefore we reprinted Mr. Mooney's citations, correcting them by reference to the text, as they had (as the author now acknowledges) been hastily put together during a busy season. We supposed that the author intended to use this mass of material as the foundation for some useful suggestion of his own; and consequently awaited with some interest the continuation of his article. Unfortunately, it cannot be said that Mr. Mooney has much advanced the question by his treatment of it. Attentive perusal of the second portion of his communication, in which any originality of suggestion or acuteness of criticism would be looked for, reveals nothing but the most superficial observations, not particularly well expressed. Thus, when he states in his third paragraph that "the point at which the holder would buckle or break in Mr. Webber's holder would be on the leeward side," he seems to imply that buckling and breaking are synonymous, whereas in point of fact the buckling would be on the leeward side, and the breaking (*i.e.*, tearing of the sheets) would be on the opposite or windward side of the supposed holder. Mr. Mooney's remarks in the same and following paragraph upon Mr. Gadd's system, and the advantages of tangential rollers, are not at all impressive; and, whatever he may think, English engineers are not in the habit of discussing points of gasholder construction in vulgar slang, nor do they consider such language conclusive. The single constructive contribution which Mr. Mooney brings to the discussion is a revival of Joshua Horton's proposal, patented in 1851, to fix guide cantilevers upon the grips of the lower lifts of a telescopic holder instead of erecting them upon the ground. This is the plan that has been recorded as tried without success at the Pigott Street (Blackfriars) gasholder station. There is no advantage in it; for if we must have guide-columns, these may as well be erected on the ground as carried upon the grips of the holder. Mr. Mooney is evidently unable to grapple with the problem of guiding a holder from the base, or he would not ask such a question as this: "Why will not a holder depending on single rollers at the bottom have a greater tendency to bind than one having two or more series of rollers?" How can a single tier of rollers possibly "bind"? Then, again, what does Mr. Mooney mean by stating that dispensing with the girders connecting the tops of the guide-columns is the first step in the direction of dispensing with guide-framing, and especially that it is a step which can be easily and safely taken, in order to save "6 per cent. of the whole weight of iron in a double-lift holder?" Did he never hear of guide-columns actually snapped off near the base by their own vibration in the wind during erection, and before their tops could be steadied by the connecting girders? He is leading the gas manager straight to disaster with this suggestion. It is quite clear, as we have already observed, that Mr. Mooney has no grip of the question which he professes to discuss. It is thus not worth while to follow him in his remarks upon the housing of gasholders, which is essentially a question of climate. It is very funny, however, to read "that there is no limit, within reasonable bounds, to the size of a holder that might be covered." After noticing this fine specimen of an American breed of the genuine old Irish bull, we have only to add that, as Mr. Mooney was doubtless actuated by the desire to be useful to gas managers in thus entering into the public discussion of an admittedly difficult and interesting subject, it is to be regretted that he did not make himself a little more sure of his ground before offering criticism and advice, to which the objection distinctly applies that "where true it is not new, and where new it is not true." He means well; but must be taken with caution.

Water and Sanitary Affairs.

WHAT is everyone's business is, in the general way, no one's business; and, therefore, in the matter of the continued pollution of the Thames, inaction yet prevails. Such a man as Lord Randolph Churchill, who is still a political Free Lance, might well take this question in hand. But for his Lordship's zeal, the rectification of the scandalous irregularities which prevailed at the Metropolitan Board of Works would never have been brought about; and here, in connection with the water supply of London, is a condition of things, existing and threatened, which has a far more serious import, and may be productive of infinitely worse consequences, than those caused by the malpractices in Spring Gardens. Peculation is bad enough; but poison is worse. Only the other day, addressing a meeting at Paddington, Lord Randolph Churchill declared that there are at the present time several sanitary questions which cry aloud for legislation. We submit that the question of river pollution is one of them, and not the least in importance, although it had no place in Lord Randolph's list of public grievances. We apprehend that, with a man of such quick perceptions, it is only necessary that the subject should be brought to notice, in order that its paramount importance may be immediately appreciated. His Lordship reminded his Paddington audience of Lord Beaconsfield's legislative motto, uttered twenty years ago—"Sanitas sanitatum, omnia sanitas." We accept the motto. The great drink question is, as Lord Randolph urged, an important one; and there are plenty of people to look after it. Again, it may be, and doubtless is, the duty of the State to take care that the humbler classes of society shall be enabled to live "under conditions which do not violate all the principles of cleanliness, of health, of decency, and of morality." These are the subjects which, in the opinion of the member for Paddington, should occupy the attention of the present Parliament; and it is obvious that they cannot be adequately dealt with unless, incidentally, the question of the purity of the London Water Supply is also taken into consideration. Cleanliness and health involve, it should be remembered, the existence of a sufficient supply of pure and wholesome water. Of the sufficiency of the supply placed by the Water Companies at the disposal of the Metropolitan public, there cannot be any reasonable doubt; and if, in the future, that supply should be less free from contamination than it has been, the blame must not be laid at the door of the Companies. In common fairness, let it be borne in mind that at the present time the London Companies jointly contribute no less than £18,000 annually for the express purpose of ensuring the purity of their main source of supply. Their part of the bargain is punctually and ungrudgingly fulfilled. But the question is whether the other contracting party—that is to say, the Thames Conservators—are in a position to carry out their statutory functions in the matter. If the decision in the Staines case holds good, and if Weybridge and Shepperton are to be allowed to "go and do likewise," it is only too clear that the Conservators cannot furnish the necessary *quid pro quo*. To use a legal phrase, the Companies would seem to be paying away their money for a consideration that has failed. And yet, come what may, millions of the inhabitants of London must continue to receive their water supply from the Thames.

The Metropolis, it will be remembered, receives its water through the agency of eight Companies. The Southwark and Vauxhall Company obtain their supply from the Thames at Hampton; as also do the West Middlesex and Grand Junction Companies. The Lambeth Company draw theirs from Molesey; and the Chelsea Company have recourse to the river both at Ditton and Molesey. In addition to these, the East London Company may, when necessary, abstract from the Thames at Sunbury a daily quantity not exceeding 10 million gallons. These are the data quoted in the late Col. Sir Francis Bolton's valuable work on "London Water Supply" (last edition); and we believe they are perfectly correct. Formerly the aggregate quantity authorized to be taken from the river by the foregoing Companies was 110 million gallons a day; but under an agreement entered into between five of the Companies and the Thames Conservancy Board less than two years ago, the maximum quantity was increased; and at the present time, for the purpose of meeting public requirements, these Companies, together with the East London (which retains its original

limit of 10 million gallons per diem), may collectively take 180 million gallons from the Thames during every twenty-four hours. The quantity actually taken does not reach the authorized maximum; but, nevertheless, it is, and must continue to be, enormous. How should it be otherwise when the aggregate population supplied with water by the London Companies reached in the early part of the present year 5,446,579? We cite these particulars merely for the purpose of showing the magnitude of the system of Metropolitan Water Supply, and the pressing need to safeguard it from contamination. It was the intention of the Legislature to confer upon the Conservancy Board wide and ample powers. The Act of 1866 vested in them "the River Thames, the Conservancy of the "Thames and Isis from Staines in the County of Middlesex to "Cricklade in the County of Wilts." The range of their jurisdiction is, therefore, very extensive, and the trust they have to fulfil proportionately great. Yet the recent decision of Justices Field and Wills would seem to show that the powers of the Board cannot be properly enforced; and it is for this reason that we have urged, and still urge, that fresh legislation is peremptorily called for.

DEATH OF THE REV. RICHARD OKES, D.D.—We regret to learn of the demise of the Rev. Richard Okes, D.D., Provost of King's College, Cambridge, on Saturday morning, after a brief illness. The deceased gentleman was born at Cambridge, in December, 1796; and therefore would have completed his 92nd year in the course of a few days. Dr. Okes took a keen interest in the affairs of his native town. He was one of the promoters of the Cambridge University and Town Water Company; and Chairman of the Board of Directors until 1887—a period of 29 years—when he retired. The Company, as is well known, has proved a great commercial success. Dr. Okes was also a Justice of the Peace for the borough.

THE APPROACHING COMPLETION OF THE VYRNVY WATER-WORKS.—Latest advices as to the progress being made with the Vyrnwy Water-Works scheme of the Liverpool Corporation, under the direction of the Engineer (Mr. G. F. Deacon, M. Inst. C.E.), give the interesting information that matters have so far progressed that it is intended this week to close the valves upon the discharge pipes passing through the Vyrnwy masonry dam, so far as is necessary to stop the River Vyrnwy, except the compensation water to the Rivers Vyrnwy and Severn. The Bishop of Bangor—in consequence of the lamented illness of the Bishop of St. Asaph—will consecrate the new church to-day (Tuesday); and immediately afterwards the old church and the Powis Hotel will be removed. The water behind the masonry dam now extends for about two miles up the valley; but this, we understand, is merely due to the late exceptional rainfall.

ANOTHER SOUTH AFRICAN GAS-WORKS UNDERTAKING.—Mr. T. Newbigging, M. Inst. C.E., left England for South Africa last Friday to fulfil an engagement entered into under the auspices of Messrs. Davis and Soper, of Bury Street, St. Mary Axe, the London Agents for the Cape Town Corporation. The object of Mr. Newbigging's visit to South Africa is to inspect the native coal and test it, with a view of ascertaining its suitability or otherwise for gas-making purposes; to report as to the desirability of erecting gas-works for the supply of illuminating gas to Johannesburg, the capital of the Transvaal; to determine the size of the works, and to estimate their cost, and to select a suitable site. He will also have to settle the diameters and lengths of the main pipes for distributing gas throughout the town; and advise as to whether the combination of electric lighting and gas lighting would be advantageous and desirable. Mr. Newbigging will also possibly have to go to Pretoria—the seat of the Government.

A DEEP SPRING.—A correspondent writes to *The Times* as follows:—"A Company is at present carrying on works at Seltzer Spring, Spring Avenue, Saratoga, with a view of utilizing its waters for the purpose of liberating and storing, in liquid form, the carbonic acid gas which it contains in large quantities. Mr. Oscar Brunler, who is superintending the works, has made a startling discovery in connection with the spring. The latter was discovered about three years ago by Dr. Haskins, who put down the drill to a depth of 500 feet. At this depth an abundant supply of water was found flowing from a crevice in the rock bottom. Recently, in order to ascertain the depth of the spring, Mr. Brunler sounded it with a line and plummet; but, instead of resting at 500 feet, the weight sank the whole length of the line—900 feet. Other soundings have since been made (the weight used being a piece of 1-inch gas-pipe filled with lead, and weighing 34 lbs.), until a depth of 3300 feet has been reached, and yet without touching the bottom or any obstacle. It will be impossible to take further soundings until instruments specially designed for the purpose have been made. Mr. Brunler admits that the line may have been carried away by some powerful current; but he holds to his belief in the existence of a subterranean sea of greater or less extent, and of there being some connection between it and the ocean. In other words, Saratoga is over a vast water-filled cavern, the roof of which is about 500 feet thick. Should the existence of a subterranean sea be established, it would dispose of many theories and scientific speculations as to the source and course of the mineral springs of Saratoga."

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET. (FOR STOCK AND SHARE LIST, see p. 950.)

THE markets in general have been very heavy and dull during the past week on the Stock Exchange; and prices nearly all round have sustained more or less of a fall. The prominent cause is still to be found in the condition of the Money Market. "Goschens" have fallen even lower; and were repeatedly done on Wednesday at 96½—the lowest yet touched. Still, the tendency at the close of the week was rather better; and some markets had made a slight recovery. The Gas department has been only moderately active. The open stocks of the Metropolitan Companies have continued their improvement, and show a marked rise from their recent depression. In Gaslight "A" the quotation is 3 better; and all transactions throughout the week have been done at good steady figures. Very little has been done in South Metropolitan "A"; but the "B" has been in good demand, and exhibits an improvement of 3½. Commercial shows no change at all. Some of the preferences of Gaslight, and the debentures of both Gaslight and South Metropolitan, have slightly receded. This is quite in sympathy with the general tendency of the week, which has been to depress first-class securities, mainly through adverse monetary influences. Suburbans have been very quiet, but are firm and unchanged. Alliance and Dublin is ½ better. Foreign undertakings offer little for remark. The only variation is a fall of ½ in Buenos Ayres. Continental Union is going to appropriate a 1 per cent. dividend—to wit, 13 per cent. on the old and new shares, and 10 per cent. on the preference. This will raise the number of 13 per cent. paying companies to four—viz., Gaslight, South Metropolitan, European, and Continental Union. Only the Commercial exceeds this rate. The Water department has been much more active, and some advances in quotation have been effected; New River showing well to the front.

The daily quotations were: Fairly good business in Gas on Monday, with a marked tendency to improve. Gaslight "A" rose 1½; South Metropolitan "B," 2; and Imperial Continental, 1. Water was pretty active; but prices were not remarkably good. Tuesday brought a further improvement in Gas; Gaslight "A" gaining another 1½, and Alliance and Dublin old, ½. Water was quieter; and the only change was an advance of 1 in buyers of Southwark ordinary. Business in Gas was less on Wednesday; but prices continued satisfactory. Neither in Gas nor in Water was there any change of quotation. On Thursday, Gas was good and firm generally. South Metropolitan "B" was done at 235—the best of the week—and rose 1½. Buenos Ayres was ½ weaker. Water was quiet; but New River and Southwark 7½ per cents. rose 2 each. On Friday there was less business doing in Gas. Gaslight "C," "D," and "E," fell 2; "J," 3; and the debentures, from 2 to 3 each. South Metropolitan debentures also fell 3. Water was active; and New River rose 1 more. On Saturday Gas generally was firm; and Gaslight 4 per cent. debentures recovered 1. Water continued its activity, but made no further change.

ELECTRIC LIGHTING MEMORANDA.

A MUNICIPAL ELECTRIC LIGHT STATION FOR PARIS—PRICES FOR ELECTRIC LIGHTING AT THE PARIS EXHIBITION—MR. WILLIAM THOMSON ON ELECTRICAL SUPPLY—PROGRESS OF THE WESTINGHOUSE COMPANY.

WHEN French officialdom undertakes work a little out of the ordinary line, it is not exempt from the liability to make mistakes and be robbed, which is the heritage of all Governments; but it at least takes care to blunder and waste money with great formality. An example in point is supplied by the proceedings of the Paris Municipality in connection with their electric lighting scheme. It has been recorded in this column how after most elaborate inquiry by a Special Commission, the Municipality some time ago decided to invite tenders from electricians willing to take up concessions for the lighting of portions of the city according to prescribed terms. These conditions, it scarcely need be said, are very stringent; but it is nevertheless reported that offers have been made for the best districts. Meanwhile the Municipality have resolved to retain one of the districts under their own control, and to undertake the lighting of it, presumably by way of establishing a check upon the operations of the electrical contractors elsewhere. The great step of inviting tenders for the erection and equipment of this municipal lighting station has been taken. The motive power to commence with is to be six 140-horse power high-speed steam-engines, supplying energy for three distinct systems of distribution. The first system will include a service of 500 incandescent lamps and 140 arc lamps in the markets; the second group contains about 1000 incandescent lamps required for lighting the buildings adjoining the markets; and the third system is for the supply, by an alternating current, of from 2000 to 3000 incandescent lamps over a length of about 2 kilometres of the neighbouring streets. The tenders will be examined by two Special Commissions—one to deal with the electrical and the other with the steam plant. Parties tendering must manufacture the whole of the plant in France if possible; but the Commission have power to make a dispensation in favour of the contractor, if it can be shown that certain articles cannot be manufactured in that country—to such an extent have Free Trade principles penetrated the French mind! It is not stated when the Municipality expect to start their electric lighting station; but working

by Commissions is usually extremely slow, and not safer from error in the end than any other system of control. As we have already remarked, however, if the Paris Municipality, should after all get into trouble and lose money over their electric lighting scheme, they will have the satisfaction of reflecting that everything was done in the most orderly and formal manner.

There is to be a great deal of electric lighting at the Paris Exhibition next year. A Syndicate has been formed for supplying arc and incandescent lamps to exhibitors for the lighting of their stalls, in addition to the ordinary lighting of the buildings. It is reported that the charges for this service, calculated upon the full period of 900 hours of lighting during which the Exhibition is expected to be open, are to be as follows:—For a 16-candle power lamp, 60 frs.; for a 10-candle power lamp, 40 frs.; for a 500-candle power arc lamp, 500 frs.; and for a 1000-candle power lamp, 1000 frs. Power will also be supplied at the rate of 50 c. per horse-power per hour up to 500, and 40 c. beyond. These rates cannot be regarded as low; but, on the other hand, they are not excessive, considering the place and the circumstances. Motor power is generally costly in Paris, for a variety of reasons.

Mr. William Thomson, F.R.S.Ed., &c., has written a long letter to the Manchester papers, dated from the Royal Institution Laboratory, upon the future of coal gas and electricity. This is not the place for an examination of the writer's gas theories, but a few words may be devoted to what he has to say respecting electric lighting. He arouses his readers' attention by roundly declaring that "we are on the eve of a revolution in the supply of energy to the houses of the people." Further examination of the letter results in the discovery, embedded in much vague verbiage, of another passage of similar purport—"Electrical engineers were not in a position, until a few months ago, to introduce electric light into houses to compete with gas at its present price in Manchester. Now this can be done." After this amazing statement, instead of showing how the change referred to has been brought about, the writer wanders off again; and it is only near the end of his letter that he attempts to explain himself. He states once more "that although electricity could years ago be economically produced to compete with gas at present Manchester prices, it could not have been economically supplied to houses, because the electric current could only have been carried along very thick copper conductors, the cost of which would have been too great. This difficulty has within the last few months been satisfactorily overcome." And after this triple introduction Mr. Thomson merely hints that he is alluding to the transformer system of distributing high potential currents by means of wires of small section. Nobody who did not happen to know something of the subject would imagine, from this manner of introducing it, that the wonderful advance in electrical distribution spoken of by Mr. Thomson has been on trial for many years in all parts of the world. We altogether fail to see what justification the writer can show for his assertion that the transformer system of distributing electricity has "within the last few months" placed electric lighting in a better position as regards gas than it previously occupied. In making such an assertion he is simply misleading the people of Manchester. Irrespective, however, of the era when his favourite system came into successful operation, how can Mr. Thomson maintain that by its aid electric lighting can be supplied in Manchester at a price that will enable it to compete with gaslight, when the most experienced of all the users of the system—the Grosvenor Gallery Company, whose business lies in the most favourable quarter of London—charge for their services a price equivalent to gas at three times the London rates? Statements of this kind, made on his own authority by a writer with a string of capital letters after his name, only impress those who are ignorant of the facts, and who yet retain some faith in the disinterestedness and reliability of all men of scientific eminence. They do no good even to the cause to which the advocate is committed, because the most superficial inquiry addressed to those actually concerned in the business elicits the truth, which knocks the pretty story to pieces.

The Westinghouse Electric Light Company of America have recently taken a long stride in the way of aggrandisement, by absorbing the Consolidated Electric Light Company of New York. The Consolidated Company were owners of the Sawyer-Mann incandescent lamp patents, the right to the use of which now passes to the Westinghouse Company, and renders them much more independent of outside assistance. The consideration for the amalgamation is the payment of interest on the Consolidated Company's capital at the rate of 4 per cent., which amounts to the sum of £30,000 a year. After certain outstanding debts are cleared off, the payment is to be increased to 6 per cent. In addition to this the Westinghouse Company agree to pay a royalty of 1c. on every Sawyer-Mann lamp sold, which is expected to bring the dividend of the Consolidated proprietors up to 12 per cent. Accordingly, they regard the arrangement as distinctly better for them than their previous independent existence, when dividends were always uncertain and seldom high.

HINTS TO GAS CONSUMERS.—Messrs. James Milne and Son, of Edinburgh and Glasgow (Milne, Sons, and Macfie, of London), have issued a neat little pamphlet intended for distribution among gas consumers. The book contains readable general information respecting gas, besides instructing consumers on the subject of improved burners and means of regulating consumption, whereby they may in reality reduce their gas bills and obtain better lighting; and so escape the deceptions of the impostors who find an easy prey in the discontented user of bad burners.]

SOUTH AFRICAN LIGHTING ASSOCIATION, LIMITED.

IN the JOURNAL for the 6th inst., we noticed the registration of a Company under the above title, with a capital of £50,000 in £10 shares. It has been formed for the purpose of carrying out certain agreements entered into by Mr. Corbet Woodall, C.E., on behalf of a Syndicate, for the acquisition of the Port Elizabeth gas undertaking, and the lighting of King William's Town; also for lighting with gas, or gas and electricity combined, other towns with which negotiations have been opened, if these negotiations result in contracts being entered into.

South Africa at present possesses only two gas-works in operation—viz., those at Cape Town and Port Elizabeth. Both are, and have been prosperous, and have paid good returns to the shareholders. At Port Elizabeth, we understand, that these profits have averaged more than 15 per cent. for years past; but a large proportion has been wisely applied in reduction of capital, which now stands at £20,000. This undertaking has been purchased by the Syndicate for £30,000, which is not more than the value of the assets of the Company appearing in their balance-sheet. A reduction of 2s. 6d. per 1000 cubic feet was made last year in the price charged for gas; but while this will reduce the immediate profits, it will no doubt naturally stimulate the consumption. At King William's Town a provisional agreement has been entered into, giving the Association the exclusive right to lay mains in the streets for a term of 25 years, at the end of which time the Corporation may purchase on arbitration terms. King William's Town should afford abundant business to pay a dividend on the small capital proposed to be spent there. In both these towns there is considerable business done in wool pressing and packing; and for these purposes gas-engines are much in request. It is also confidently anticipated that in a climate where the sun through nearly the whole year provides more heat than is needful for comfort, gas cooking-stoves will be readily preferred to wood or coal fires. The Association contemplate providing electric light in such places as demand it; the motive power being gas. The heat of the climate is such that a demand for the coolest light obtainable is natural, especially in such places as public halls and theatres—probably no better ventilated in South Africa than they are at home.

South Africa has been a country of alternate periods of prosperity and adversity very sharply defined; but in spite of these fluctuations, the gas companies have steadily prospered. The recent development of the gold-fields has given considerable stimulus to the trade of the country; and its great natural advantages will doubtless make it increasingly attractive to emigrants of the better class, having intelligence and some capital. Such progress is well marked out by the increased demand for gas, which enables the price to be reduced, and thus again the consumption is stimulated. In South Africa the abundant supply of cheap and efficient Kafir labour, while shutting out the European unskilled labourer, is a great help to traders and manufacturers.

The Association is happy in its first Directors. They are Mr. D. Ford Goddard, Assoc. M. Inst. C.E., Mr. James Mansergh, M. Inst. C.E., and Mr. W. Woodall, M.P. Mr. Goddard is well known to our readers as formerly Engineer, and now a Director of the Ipswich Gas Company. The name he bears has for years been honourably associated with gas lighting. Mr. Mansergh is one of the most eminent Engineers of the day, and a member of the Council of the Institution of Civil Engineers. Few men have had larger experience in the valuation of such property. Mr. W. Woodall, though better known by his association in recent years with political and educational work, had an early training in gas management, which will aid him in the service of the Association. As to the gentleman under whose advice the Association has been launched, it is quite unnecessary to say anything to readers of the JOURNAL in recommending Mr. Corbet Woodall's skill and judgment. But it should be stated that he has recently visited the Colony, and has formed a very high opinion of the prospect there is for the profitable employment of capital in gas-works enterprises there; and no better presage is needed for the ultimate success of the undertaking now under notice.

THE IRONMONGERS EXHIBITION.

THE Ironmongery Exhibition at the Agricultural Hall is one of many annual fixtures of the kind, intended, it may be supposed, to display to interested members of the trades concerned the novelties and improvements which mark the passage of time in all progressive industries. It is several years since we noticed this particular kind of exhibition in the columns of the JOURNAL, and therefore we consider that the time has come for another examination of what may be called the ironmongery side of the business of gas lighting, with a view to discovering what progress, if any, could be signalized in this department of trade. The managers of the show have given it the now hackneyed title "International;" but habitual frequenters of this class of exhibitions are too well accustomed to the matter-of-course use of this descriptive prefix to allow their expectations to be unduly aroused by it. Now-a-days a stand of American clocks and another of German lead pencils form sufficient justification for calling any British bazaar "International." But this by the way. We notice that in the introduction to the catalogue, the General Manager (Mr. Harry Etherington) claims for this show the position of first of a series, in which all branches of the ironmongery and metal trades are to find complete representation. We are unable to name any particular feature in which the present exhibition differs from its precursors; but, of course, Mr. Etherington may know better. All that we can say

upon the point is that there is nothing apparent in the show, either regarded as a whole or taken piecemeal, which would lead an ordinary visitor to think it better or worse than the general run of such manufacturers' and merchants' bazaars. It is quite possible that this is the first of a series, as Mr. Etherington declares. But the fact is ironmongery, gas-fittings, and the general hardware trades run so far on the one hand into building materials, and on the other into furniture—also the names of annual exhibitions—that this class of commodities seems to be always on show somewhere; and this consideration takes off from the novelty of the present exhibition.

If for no other reason, however, we are constrained to notice the exhibition on account of the inclusion in the catalogue of an introductory article (the writer of which has thought fit to withhold his name) upon coal gas as adapted for lighting, cooking, and trade purposes. Unless we are very much mistaken, the author of this very praiseworthy little essay is himself engaged in gas making; for the matter of his remarks has a distinctly professional flavour. If anything is to be said by way of fault-finding, it may be that the writer has devoted too much of his limited space to the description of gas-works processes, in which the visitors who may be supposed to patronize an exhibition of ironmongery cannot be expected to take any very considerable interest. So little is popularly known about gas making, however, that the determination of the author to make use of his opportunity for disseminating a little reliable information upon the subject, is not to be lightly complained of. That such a technical paper should find admission into the catalogue is a proof of the desire of the managers of the exhibition that their enterprise should instruct their patrons in some things not generally known, as well as benefit them in the way of trade. We cannot speak too highly of the little article as a whole. After telling comprehensively and accurately how gas is made, stored, distributed, and measured, it shades off naturally into detailed comments upon gas utilizing appliances—not confining its explanations to goods actually exhibited; and after making mention of the comparative excellences of gas and electric lighting, ends with some appropriate hints to consumers respecting the choice of fittings, burners, globes, and stoves. It is a pleasure, as great as it is rare, to find trustworthy information concerning gas lighting and the other ordinary uses of gas in a publication of this order; and we most heartily congratulate the General Manager of the exhibition upon the wisdom he displayed in finding room for such sound matter, as well as the writer upon the use he has made of his opportunity.

As though not to be charged with partiality, immediately after the article on gas the catalogue has another on electricity and its uses. This also is a neatly-written little essay; and we should not be surprised to learn that it came from the same hand that wrote the article on gas, because, while very fair and comprehensive, it leaves out of account many things that a professional electrician would have been certain to mention, and is also phenomenally devoid of boasting and prophecy. If it had but contained a single estimate of the cost of electric lighting, showing it to be cheaper than gas, or had finished with the frank declaration that the days of gas-lighting are numbered, and that the electric light is to be "the light of the future," we might have thought differently; but the absence of such statements impels us to declare the opinion that the article was not written by an electrician. Its usefulness is not imperilled on this account; indeed, it is much more reliable than the great majority of electricians' papers.

We have devoted a good deal of space to the discussion of these features of the catalogue; and our excuse must be that, in point of fact, the catalogue is almost the best thing about the exhibition. Not that there are not some particularly interesting exhibits. For example, the first object that strikes a visitor upon entering the hall is the stand of the British Gas-Engine Company, Limited (Atkinson's patent engines), where several of the latest forms of these remarkable motors are shown in operation. The arrangement of the working parts of these engines has been altered since their action was described by Mr. Denny Lane to The Gas Institute in 1885; and they now look more like the general type of reciprocating engines. One of them is driving a dynamo supplying incandescent lamps, which are very steady. Messrs. J. E. H. Andrew and Co., Limited, also show some "Stockport" gas-engines—one being specially adapted for working a hydraulic lift, and another driving an exhibit of Brush arc lamps. Messrs. Dick, Kerr, and Co. show a collection of "Griffin" gas-engines, also supplying power for electric lighting, pumping, ventilation, &c. Messrs. Hartley, Arneux, and Fanning, of Stoke-upon-Trent, show an "Albion" silent gas-engine of their own manufacture. It will thus be perceived that, notwithstanding the abstinence of some well-known gas-engine makers, these machines are fairly represented at Islington.

There are several exhibitors of gas fires and heating-stoves, some of which are distinctly more curious than useful. Among the exhibitors of this class of goods may be named Messrs. C. Wilson and Sons, Messrs. T. Fletcher and Co., the L. W. Leeds Stove Company, Limited, Mr. F. Siemens, Messrs. Greenall and Co., Messrs. J. Wright and Co., Messrs. Freeman, Emery, and Co., and Messrs. Arden Hill and Co. Besides these firms, whose specialities in this line are well known, there are others who strive to tempt the public with a variety of fanciful stoves in which the power of the gas consumed is supposed to be magnified by different devices. Great use is made of coloured glass, vitreous ware, and polished brass in some of these productions. In gas-cooking stoves, which are shown by Messrs. Thomas Fletcher and Co., Messrs.

Charles Wilson and Co., Messrs. Arden Hill and Co., and Messrs. E. Siddaway and Sons, there is nothing novel to remark; but we observed a noteworthy addition to the resources of consumers of gas and oil in the stand of the Wanzer Company, Limited, who show some really remarkable lamps and heating-stoves for gas and oil. In these stoves the heat of the oil or gas flame—for the principle is identical in both cases—is applied to a circulating hot water and steam warming system; the idea being that the air admitted to the room passes in contact with these steam-pipes, and condenses the steam into water, which falls down to the boiler and is heated over again. Of course, it is impossible to form a correct notion of the true utility of such arrangements without proper tests; but so far as its application to oil heating-stoves is concerned, the principle seems to be a decided advance. The Wanzer Company also show a peculiar petroleum lamp, burning without a chimney. It is claimed that these lamps are perfectly safe, and may be thrown down while alight without danger of explosion. The necessary draught for burning the oil without smoke is produced by a fan driven by clockwork, and requiring to be wound up occasionally, like the spring of the old-fashioned moderator lamps. These lamps burn very well; but one of the chief advantages claimed for them is that, owing to the absence of a chimney, they can be used for cooking as well as lighting. For this purpose a light wire framework, standing on the body of the lamp—which, it should be stated, is all of metal—supports a steel cooking-pot capable of being converted into an oven. A 3-inch flame of petroleum, such as these lamps are capable of giving at their best, is very hot, and quite powerful enough to do the cooking required for a small family. The arrangement may be found very handy in small households, especially in the country, and certainly does not help to favour the idea that gas is the only friend of the poor man; but, of course, the lamp has its limitations. Such as it is, however, the Wanzer exhibit struck us as one of the greatest novelties of the show.

There is not much to be said about the gas burners and fittings. Mr. F. Siemens has the best display of regenerative lamps; but Messrs. H. Greene and Sons show their governors, Brönners' burners, and the Westphal regenerative lamps, which are also used to light Messrs. Fletcher's stand of gas-stoves. Messrs. Greenall and Co., of Manchester, also exhibit a lamp of the same character—Marsh's patent. Considering the numbers of this class of gas-lamps that are patented weekly, it is strange that so few novelties of the kind are found at exhibitions. Gas-governors are also shown by Mr. A. E. Beck, Messrs. H. Harrison and Co., Mr. J. Parkinson, and Messrs. Weir Bros. There is a sprinkling of those catchpenny gas-burners and toy fittings always to be found in such places; but they are not offensively prominent.

MID-SUSSEX WATER COMPANY, LIMITED.—By an advertisement which appears in another column, our readers will see that the Directors of this Company (the formation of which was mentioned in the JOURNAL last week) are inviting applications for the 6000 shares which, as already stated, they purpose issuing, out of the 7000 into which the entire capital is divided. The Company's district covers a large area, comprising Hayward's Heath, Cuckfield, Lindfield, Balcombe, and portions of Wivelsfield and Ardingly, in which a good supply of water is greatly needed. The neighbourhood of the three first-named places is of a superior residential character; and the building of first-class houses and villas will no doubt be stimulated by the existence of such a supply of good water as the Company will be prepared to furnish. The site for the works (which have been designed by Mr. Jabez Church, M. Inst. C.E., and are being carried out by Messrs. J. and H. Robus) has been well selected for procuring an abundance of water, which will be supplied by gravitation. It is expected that the works will be ready by September next. The Chairman of the Company is Lieut.-Gen. Sir John Stokes, K.C.B.; and the other members of the Board are gentlemen whose names are known to most of our readers. The field of operations seems to have been well chosen; and, with good management, the undertaking should not be less successful than others of similar character and extent.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.—The seventy-sixth quarterly meeting of this Institution will be held at the Victoria Hotel, Manchester, on Saturday next, under the presidency of Mr. Thomas Duxbury, of Darwen. The business before the meeting includes the election of President for the ensuing year; an alteration of rules, to enable two Honorary Secretaries (instead of one, as at present) to be appointed; and the adjourned discussion on two papers read at previous meetings. Mr. James Dalgliesh's paper, on "Oil and other Illuminants, and their Effect on Gas Consumption," will first be discussed; and afterwards Mr. T. Newbigging's paper (read at Doncaster three months since), on "Gas-holders without Upper Guide-Framing." A paragraph appearing elsewhere mentions that Mr. Newbigging has left England for a professional engagement in South Africa; and so he will not be present at the meeting. It is understood, however, that Mr. Gadd—to a description of whose invention the paper was mainly devoted—will be present; and, with the consent of the meeting, will reply to the discussion on Mr. Newbigging's behalf. After the transaction of this business, should time permit, the attention of the members will be asked to the subject of "The Presence of Water or Moisture in Coal, and its Effects"—a paper bearing this title having been prepared by Mr. Newbigging, and left with the Honorary Secretary (Mr. Harrison Veevers) for presentation to the meeting.

THE DISPOSAL OF RESIDUAL PRODUCTS.

For every material or product in the market, there is a certain value, representing what it is worth to the purchaser. This may be called its intrinsic value; and although it may occasionally happen that the purchaser, through ignorance, pays more than the intrinsic value, as a general rule he gives rather less. The influences of competition, both amongst buyers and sellers, tend to keep the price very near to the actual value, and a trifle under, in general, rather than over it. It is the business of every manufacturer or producer to see that he secures as nearly as possible the intrinsic value of his commodities; and it does not follow, from the fact of it being actually secured in the open market, that the original seller is successful in this respect. Astute speculators may have got the market into their own hands; a cumbrous system of middlemen and agencies may have been established; or the consumer may live in another quarter of the globe, thus causing a great expense for carriage. Since the consumer will not pay more than the intrinsic value of the article bought, all expenses in the way of carriage, commission to dealers, &c., may be regarded as coming from the pocket of the original seller. Take the case of any product—let us say, coal—having an intrinsic value of 20s. per ton. The consumer will not pay more than 20s.; so that if the cost of conveying it to him is 5s., and it is not sold directly to him, but through middlemen who expect to make 5s. per ton profit, it follows that only 10s. is left for the producer. So it is obviously to the advantage of the seller to supply the user direct, without the intervention of middlemen or agents, and also to find a customer as near as possible—next door if he can—so as to save the expense of carriage. Of course, there are cases where it is possible to make the consumer bear a proportion or the whole of the carriage and of the agency expenses, or where the intrinsic value of the article varies in different localities. But the enterprise of the age tends to reduce these. If coal is costly in any particular locality, by reason of heavy charges for carriage, &c., endeavours are made to find it in the immediate neighbourhood, or else to light upon a substitute, such as wood, petroleum, &c.

Whatever may be the exception to our argument, it certainly applies to the residual products from gas undertakings; and the present time, when coke and tar show signs of rising in value, is opportune for returning to the consideration of a subject which has repeatedly occupied attention in these columns—viz., How to dispose of these residuals to the best advantage. In connection therewith, attention may be directed to the two papers on "Coke," by Mr. C. Gandon, Engineer of the Crystal Palace District Gas Company, and by Mr. C. E. Jones, of Chesterfield, respectively, which were read at the 1887 meeting of The Gas Institute. The utterances of Mr. Gandon are especially interesting, because it is known that the Crystal Palace Gas Company were among the first to give proper attention to the disposal of residuals. Mr. Gandon points out one remarkable fact. Taking the prices of coal in different towns, and comparing them with the price of coke in each case, he finds that, weight for weight, coke sometimes returns 120 per cent. on the price of the coal, whilst under other circumstances only 40 per cent. can be obtained. Assuming a fixed value of 10s. per ton for coal the price realized for coke ranges from 4s. to 12s., according to circumstances. This wide variation cannot be accounted for, since it may fairly be expected that the intrinsic value of coke would be regulated by that of coal. If we assume a fixed intrinsic value for the one, we should expect the same for the other. The calorific value of coke is about equal, weight for weight, to that of coal; and it possesses some advantages and some disadvantages as compared therewith. We do not know of any circumstances, except to a limited degree, that should unduly inflate the demand for coke in one locality, or depress it in another. In the case of a large production—as, for example, at the Beckton Gas-Works—the expenses of carriage, &c., must be expected to operate against the Company to some extent. A correspondent in these columns has pointed out the real state of the case—viz., that, as a general rule, the prices realized for coke are far below its intrinsic value as fuel. Instead of receiving nearly the equivalent of the intrinsic value, the producer gets a small proportion only—the remainder being divided between the consumer, the cost of carriage, and the middlemen, dealers, &c. In many towns an analogous state of things prevails with regard to tar and sulphate of ammonia.

One of the departments which come under the charge of a gas-works manager is that of the sale of residuals. Obviously, his duty is to dispose of them to the best advantage. The recent fall in the values of tar and ammonia has directed attention to this department: and probably the advance in the value of coke is in some part due to the endeavours that have been made to develop a local trade for it, so that it might to some extent compensate for the deficiency on the other residuals. The chief thing is to get into direct communication with the consumer. If a local demand does not exist, the question of creating it should be carefully considered. Many difficulties may have to be encountered, and rapid progress in the direction of the entire disposal of all the residuals by retail trade may not be possible. But by perseverance in turning to account any means that offer—remembering that even a small demand is not unworthy of notice, as it helps towards the desired end—substantial progress may soon be made. Notwithstanding all that has been written on the subject, there is still much to be done, in many districts, in the way of introducing coke as an article of household consumption; in pushing the use of tar for pavements, for artificial asphalt, as a preservative paint for rough woodwork, and for many other purposes; and in bringing sulphate of ammonia before the notice of agriculturists.

When any of these materials are disposed of to a customer at a distance, there is the cost of carriage to be met, the burden of which comes chiefly upon the seller. If the sales are conducted through the agency of middlemen or dealers, the result is not only a present but also a prospective disadvantage to the sellers. The dealer's profit must be paid out of the transaction; and there is also a tendency to allow him to get a certain control of the trade, which he will not hesitate to use to his own advantage in the future. In respect to all classes of gas-works residuals, these two points have not been sufficiently appreciated. Especially there have been signs of gradual encroachment in allowing the dealers to obtain a command of the trade. It usually happens that gas engineers have so many engagements in connection with the several details incidental to the manufacture, distribution, and sale of their gas, and in meeting the demands of a continually increasing business, that the residuals market is of necessity left to take its own bearings. They are only too glad to get rid of surplus stock to dealers at any reasonable price. They find it more convenient to dispose of the products in large parcels by contract, than to sell them out in small lots by retail. Yet it is evident that considerable benefit will follow careful attention to the possibilities of developing home retail trade. This may be easily proved by examining the published accounts of those gas-undertakings of which the managers are known to have given due regard to the point now under consideration, and by comparing with the general average the returns realized for residuals per ton of coal carbonized. We do not hesitate to say that if this department received the attention it deserves in every case, the large range of variation that was observed by Mr. Gandon would be materially reduced.

The plan of fixing a moderately high retail price, and of disposing of the surplus at a much lower rate in order to keep the stocks down, may do very well so long as the bulk of the products are sold off by retail. But when the "surplus" becomes an important proportion of the whole, matters are not so favourable to the seller. The dealers acquire sufficient command of the trade to be able to bring various influences to bear with a view to their own advantage. Their interest is to buy cheaply and sell dearly; and they have no inducement to study the advantage of the producer, but rather the reverse. If a large quantity of surplus coke has been so disposed of, the gas manager may find his own coke brought into competition with his retail trade. Instances could be cited where, with a retail price of 12s. per ton at the works, the surplus had been sold to merchants at 8s. per ton, and the merchants had actually competed with, and secured a share of, the gas-works retail trade at (say) 11s. Coal merchants are glad to take large coke contracts, under some circumstances, at barely remunerative rates, in order that they may be able to keep together a coal-supply connection. This disadvantage has been recognized, and sought to be met by a stipulation that the coke supplied at the cheap rate is not to be offered for sale in the district of the producer. But such a proceeding is simply protecting oneself at the expense of one's neighbours. It is in effect saying: "Go and injure the retail trade of some other gas undertaking; it does not matter to me so long as you leave mine alone." And so we come to the edifying prospect of two towns, situated (say) 50 miles apart, where large quantities of "surplus" coke from A are delivered to, and sold by dealers at B, at the same time that "surplus" coke from B is being forwarded for sale at A. There are many small towns where, if left to themselves, the limited production of coke could be disposed of at, let us say, 15s. per ton. But a practically unlimited supply is brought in by the coal merchants from a large gas-works anywhere within a radius of 50 miles, and offered at a lower figure—perhaps 10s.; and consequently the local production must be disposed of at an equally low rate. The owners of the small works are, in fact, forced to sell at prices fixed by the coal merchants. These circumstances seem to point to the desirability of a mutual understanding between gas undertakings on the subject of the price of coke.

Let us now briefly review the circumstances of the production of gas-works residuals. In the first place, it cannot be limited or restricted in any way. So long as the demand for gas increases, the production of coke, tar, and ammonia will also be increased, whether they are worth much or little in the market. Sometimes it has even been necessary to pay for the removal of tar and ammoniacal liquor. If a manufacturer of any article—nails, for instance—finds he has accumulated a larger stock than there is any immediate demand for, he can limit the production for a time, and so reduce his stock. But gas engineers cannot resort to expedients of this sort. A second consideration is that gas-works are a permanency, and not a temporary undertaking that will be closed in a year or two. Under such circumstances, it is necessary to look beyond the mere disposal of the products at the best price obtainable for the time being. The policy of shipping off large quantities at cheap rates may result in some temporary advantage; but if this is purchased at the expense of a permanent prejudicial effect on the market at large, it may be bought too dearly. On the contrary, a policy of an opposite character may be the wiser—viz., to bear some temporary loss, in order to put the market on a firmer or better basis, with a view to future business. The policy followed in the disposal of residuals should certainly be based on the two considerations of illimitable and of permanent production.

In this connection, apart from wholesale and retail considerations, a large number of small customers are greatly preferable to a few large ones. In gas undertakings where the sale of

residuals is entirely confined to a few dealers or large consumers, some little sacrifice may judiciously be accepted, if necessary, in order to make the change. Suppose two undertakings, each selling 10,000 tons of coke per annum, but the one disposing of this quantity to ten large customers, who may either be dealers or *bonâ fide* users, and the other having a circle of a thousand customers. The ten large customers would be in a continual state of activity, seeking for every opportunity of beating down the price. They might even come to some sort of understanding between themselves. In any case they would be continually on the look-out for cheaper quotations from neighbouring towns, or possibly for other fuels, such as anthracite. The practical result would be that they must be continually supplied at the lowest price in the neighbourhood; and if one or two of them were lost, the effect would be very marked, and even disastrous. With the small consumers the case is very different. So long as they are supplied with a good article at a fair price, they go on continually from year to year. The loss of a few of them is not felt; and, on the average, the demand is more likely to keep regular. Unless driven to it by exorbitant charges, they are not likely to look about for cheaper quotations elsewhere. Therefore, even if the result of establishing a retail trade was a temporary loss, it might be worth incurring; but, as a matter of fact, not only is the market put upon a firmer and more durable basis, but an actual improvement in returns is at once obtained.

The various courses that commend themselves in the establishment of a retail local trade, have been so frequently set forth that they need not be repeated here. A great deal depends upon the commercial instinct and ability of the manager, or, in large works, of the person who may be appointed to the control of this important department, in being able to utilize to the utmost the peculiar circumstances under which he is placed. The methods followed in developing any business have a strong family likeness. Perhaps there may be competition of a special character to be encountered. In coal districts, coke manufactured from small coal and waste at the pits may perhaps be offered for sale in large quantities; and it is preferable to gas coke for some manufacturing purposes—being harder in texture and not so liable to decrepitate. Special circumstances, of course, call for special means. But, speaking in a general way, there are two important items to be considered—How to get orders; and how to execute them promptly and satisfactorily when secured. As regards the first, every kind of advertising may be resorted to—such as the columns of local papers, the backs of gas bills, circulars, and posters, or even special arrangements in the way of sending out agents to solicit orders. The amount expended in advertising will, of course, depend on the quantity of products to be sold, and the extra custom that may be reasonably expected to result. Indiscriminate advertising may do no good; for it is just as easy to waste money in advertising as in any other way. The object of advertising is to bring the article offered for sale prominently before the attention of probable buyers who are not likely to be attracted to it in any other way; and successful advertising consists of something more than the mere distribution of orders with a lavish hand, and trusting to chance for the result. Care must be taken, too, not to stop at getting the orders. The convenience of customers should be studied in every possible way. They should be able to secure prompt delivery—either in their own conveyances at the works, or by the company's vans at their residence or place of business, as may be preferred—and that in quantities large or small according to requirements.

SULPHATE PLANT FOR MILAN.—Mr. Henry Simon, of Manchester, has just received instructions from the Continental Union Gas Company, to erect, at their Milan works, one of his most improved plants for the continuous distillation of liquor in the manufacture of sulphate of ammonia.

THE AMYL-ACETATE LAMP.—At the last meeting of the Society of German Gas and Water Engineers, the Photometric Committee presented a report in which the advantages of the amyl-acetate lamp as a standard of light were dwelt upon. Before coming to any decision on the subject, however, it was resolved to communicate with the Physikalisch-technische Reichsanstalt, with a view to carrying out some experiments on the relative luminosity of this light and other standards at present in use.

THE ELECTRIC STREET LIGHTING EXPERIMENT AT BARNET.—Alluding to this matter in their last week's issue, the *Electrical Review* states that its representative, on a recent evening, was "fortunate, or perhaps it would be nearer the truth to say unfortunate, enough to witness the Barnet electric light installation in all its glory;" and he is able to assert that the lighting was in no respect superior to that of ordinary gas-lamps. Continuing, our contemporary says: "The filaments were in various stages of incandescence (the light from several being decidedly inferior to gas); and as the number of lamps in circuit falls short by some dozens of the number of displaced gas jets, we can only conclude that if the illumination witnessed by us represents the normal state of the Barnet streets, the inference is obvious. We have no desire to make matters worse than they are; but we do think that it is decidedly bad policy to blind one's self to actual facts as they exist. We therefore feel that our contemporary [the *Electrical Engineer*] showed somewhat bad taste in attributing to the gas journals and the local press, a desire to disparage the installation generally. Surely gas journals can give their honest convictions; and we find that they are not invariably behindhand in bestowing praise even to electric lighting, where praise is due."

Notes.

PRESERVING EXPOSED IRONWORK.

Mr. John Heald, the proprietor of the machine-works at Crockett, Contra Costa County, California, has for some years past been experimenting with a view to preserving exposed iron-work, and has demonstrated some things respecting this important matter that may be of great value. Mr. Heald some years ago had occasion to move a gasholder at Vallejo, and happened to notice on the old plates, which were badly corroded, that the "shipping marks" on the sheets were perfectly preserved. This led to the examination of other cases of the kind where marking had been done on ironwork; and also to experimenting with turpentine and white lead as a first coating to prevent rust. It was found that, when surfaces are coated with finely ground lead, thinned with spirits of turpentine, no corrosive action or scaling takes place, even when heavy coats of paint are afterwards put on the outside. Mr. Heald says that common paint mixed with oil is too thick to penetrate or close the imperfections of the surface and penetrate beneath the scale where it exists, thus leaving places for corrosion to begin beneath the paint. With turpentine and white lead mixed thin, the very pores of the iron are closed. The interstices, to so call them, are too minute to receive the body which oil gives, but are closed by the thinner compound. This is the theory, says *Iron*; but that is of no consequence so long as the fact is known. The process will be an important one for iron vessels, above water at least. The wash can be quickly put on, and will dry in a short time.

THE DANGERS OF WATER GAS.

In a paper read by Herr C. Hartmann at Düsseldorf, before a meeting of the Union of Sanitary Engineers, he stated that water gas, as ordinarily made, contained at least 30 per cent. of carbonic oxide, as compared with from 3 to 10 per cent. in coal gas. According to Pettenkofer, air containing 0.2 per cent. of carbonic oxide is fatal to life, whilst air containing about 0.7 per cent. of coal gas is slightly poisonous. As, however, coal gas can be detected by its smell when from 0.01 to 0.02 per cent. is present, there is a margin of safety; but this is not the case with water gas. While admitting that water gas might be used with due precautions for industrial purposes in which many other poisonous substances were already employed, Herr Hartmann was strongly opposed to its use for domestic lighting. In proof of his assertion that it is dangerous, he adduced the following table of deaths in New York from poisoning by water gas and coal gas respectively:—

	Water Gas.	Coal Gas.
1880	14	1
1881	18	3
1882	22	2
1883	20	0
1884	19	2
1885	18	0
1886	35	1
1887	27	0
1888 (January and February).	7	0
	180	9

THE ADULTERATION OF COAL TAR NAPHTHA.

In the course of a communication on this subject to the *Chemical News*, Mr. Thomas T. P. Bruce Warren says that the naphtha used by india-rubber manufacturers is generally obtained from the crude products of gas-works. There is no doubt, however, that a great deal is obtained in the "carbonizing processes" used in preparing coke for smelting operations; but this does not appear in commerce under a distinct name, although such naphtha is not unknown. Generally, Newcastle or cannel coal, or mixtures of these, are used in making coal gas; and hence the tar met with will vary more or less, and consequently the naphtha. The process of destructive distillation will thus introduce a variation in the composition of the naphtha recovered from such tar. Petroleum products are, therefore, now largely mixed with coal-tar naphtha; the advantages being that their greater volatility enables the spreading machines to be driven at three or four times the speed, while the diminished cost is greatly in its favour. If it is desired to test the mixture, the iodine absorption of petroleum and its commercial products, as compared with naphtha obtained from Newcastle coal, or mixtures used in gas-making, will readily reveal the fraudulent admixture of petroleum; and it is thus important in the fractional distillation of such a mixture, to examine each product separately.

THE VALUATION OF SPONTANEOUSLY FIRED COAL.

In a recent number of *Engineering*, it is recorded that about 5000 tons of semi-bituminous coal, stored in brick houses in America, took fire spontaneously about the middle of last September. When the fire was discovered, it was evident from the appearance of the smoke curling upward from different places on the top of the pile of coal, that the whole mass was alight. The deposition of sulphur on the surface of the heap, condensed from the fumes, presented the appearance of a yellow dew. The method adopted for ascertaining the amount of the loss in this instance to be made good by the fire insurance company was to have a sample of the coal analyzed, when it was found to be composed as follows:—Carbon, 76.50; hydrogen, 3.98; mineral matter, 12.13; sulphur, 1.48. The calorific value of the coal, as computed from this analysis, was found to be 13,594 thermal units per pound. Other samples were taken from the oblique face of the heap after one,

half of it had been removed. These samples gave an average composition for the coal of: Carbon, 74.13; hydrogen, 3.95; mineral matter, 13.18. The computed calorific value was 13,230 units per pound, or a loss of 2.68 per cent., which was taken to represent the depreciation in the value of the coal by heating. A sample of partially coked coal, which represented an average sample of the coal actually injured by the fire so as to make a notable change in its appearance, showed upon analysis the following percentage composition:—Carbon, 65.77; hydrogen, 1.36; mineral matter, 26.13; sulphur, 0.82. The calorific value of this sample was ascertained in the same way as before to be 10,409 thermal units per pound, or 12.7 per cent. less than that of the uninjured coal. The compensation paid was assessed upon these data. The cause of the fire was the presence of iron pyrites, which is the only dangerous form of sulphur in coal; for sulphur combined with organic matter is not liable to spontaneous changes. Ordinary analyses of coal fail to show the dangerous kinds, because they are made upon samples representing an average of many specimens; whereas the danger of spontaneous combustion is due to the greatest concentration of iron pyrites in one or more spots rather than to the diffusion of sulphur through the mass.

Communicated Article.

PIPE EXTRACTORS.

By "MAINS."

When it is necessary to remove a small line of pipes for the purpose of laying a larger main, an expeditious method of taking out the old pipes must be adopted. The system described in the JOURNAL for Sept. 18 last (p. 508) is not "new," and I doubt if there are any mainlayers now actively engaged in this work who have not resorted to the plan as there described, which will answer the purpose for small mains; but it becomes much more useful if the clip is made sufficiently heavy and strong, and provided with two 1½-inch round thread screws for forcing the joint, with a steel pointed set screw for fixing the clip more firmly to the pipe. A

Fig. 1. PLAN OF PIPE IN TRENCH

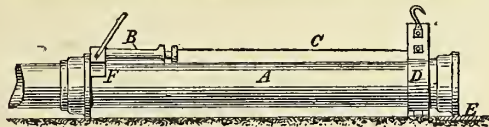


Fig. 2.

forcing clamp C (fig. 1) is commonly used by mainlayers; and the spanners or bars for working the screws S S' may be 3 ft. 6 in. long. If the clip should slide, place a wood skid at the back, bearing against the shoulder of the next socket. A loose clip B placed against the socket receives the ends of the screws. The clip is made large enough to allow the lead joint to be drawn with the spigot. This forcing clamp will be found especially useful for removing hydrants when repairs are required.

An ordinary bottle jack will push off all small pipes as usually constructed with the common spigot and socket joint; but if the joint is made with a recess (a most unnecessary contrivance), it is best to be provided with hydraulic jacks. A more efficient system is mostly adopted for larger mains, and will be found to disconnect the pipes more quickly, and is handier to work. Of course cutting out joints has been abandoned by experienced mainlayers for a long time; but melting out the joints may be effected cheaply and expeditiously in outlying districts, where fire and smoke would not be objected to. This may be done in the trench, or by cutting out long lengths and lifting them out of the trench by derricks.

Having a clip to fit each size of pipe, the apparatus shown in fig. 2 will be found sufficient to extract all sizes of water and gas mains. Referring to the illustration, A is the pipe to be extracted; B, a 20-ton hydraulic jack; C, a wood skid or packing piece; D, a strong pair of iron clips hinged underneath, with two bolts on top, the upper one to carry a shackle to be used in lifting the end of the pipe if required; E, greased iron plate for pipe to slide on; F, iron packing the same thickness as the lead joint, to allow the latter to come away with the spigot.

Some may assert, after all that may be said for the practice of drawing the joints of old mains, that very little is to be saved; but if the main is 12 inches to 24 inches in diameter, and a number of pipes require removing, it will be found a very expensive work to cut out the joints, or to cut and break the pipes, when hydraulic jacks will do the work more expeditiously, and leave the pipes and fittings intact for another job. The same appliances are also found most useful for changing the old fire-plugs for the new hydrants now being fixed in the City of London and elsewhere.

DEATH OF MR. J. R. CAPRON, F.R.A.S.—We regret to have to record the death, on the 12th inst., of Mr. John Rand Capron, who was for about twenty years a Director, and for a considerable portion of this period the Chairman, of the Guildford Gas Company. The deceased gentleman, whose removal was rather unexpected, was in his 60th year.

Technical Record.

THE GASHOLDER GUIDE-FRAMING QUESTION.

AN AMERICAN REVIEW OF THE DISCUSSION.

[In the issue of the *American Gaslight Journal* for the 2nd inst., Mr. W. Mooney, C.E., concludes (presumably for the present) his review of the discussion on the question of the possibility of dispensing, wholly or partially, with the guide-framing of gasholders. The first portion of the communication appeared in the preceding issue of our contemporary, and was reproduced in the JOURNAL for the 30th ult.; and we now give the author's concluding remarks, which will be found to contain an expression of his individual views on the subject.—ED. J.G.L.]

The first fruit of the controversy which has extended to such length was Mr. Livesey's experiment; and this has been followed by Mr. Gadd's invention, a full description of which, by Mr. Newbigging, was read before the Manchester District Institution of Gas Engineers on the 25th of August.* Mr. Gadd's invention introduces an entirely new principle; the whole of the guide-framing being done away with, and the holder securely guided from the bottom curb. Briefly stated, the invention for dispensing with the usual guide-framing consists in placing the channel or other guides within the tank, at an angle like the thread of a screw instead of in the vertical plane. The guide-rollers of the bottom curb, as they work in the channels or rails provided for them, give a helical or screw-like motion to the holder as it rises and descends in the tank.

Notwithstanding that Mr. Newbigging appears to accept Mr. Gadd's invention as the key to dispensing with guide-framing, it seems to the writer that the conditions are much the same as in Mr. Webber's idea; that is, the whole structure must depend on the bottom curb and rollers for support, and the holder must be made stiff enough to withstand the force of the wind, however strongly it may blow. The point at which the holder would buckle or break in Mr. Webber's holder would be on the leeward side, at the point of contact with the upper roller or guide-wheel (about 5 feet above the water-line); and in Mr. Gadd's system this point would be just at the water-line. With radial and tangential rollers well fitted to the tank guides, Mr. Webber's holder would be as firmly held at the bottom as Mr. Gadd's would be by his spiral system of guides. It is a question whether the added weight to the holder, necessary in any system dispensing with all or nearly all of the guide-framing, will not be as costly as the guide-framing it displaces, with the risk added.

Much stress is placed on the use of tangential rollers, in addition to the usual radial rollers; but, unless they have very wide channels to run in, there would be very great danger of these breaking on the windward side of the holder when the holder was pushed against the opposite guides. The idea that holders can be adjusted so nicely that all the wheels shall fit tightly against the rails at all times, smacks very strongly of what our English friends call "rot." The tendency on our side of the water is to build holders of large diameter with from three to four lifts, but with an abundance of guide-framing.

The various writers whose opinions have been given in condensed form differ on the subject of the wind pressures to which holders are exposed. There can be no limit to the force which the wind may exert against any object; there being no reason why the greatest known or recorded pressures may not be surpassed in the future. The writer has seen the path of a hurricane in the West where every house and tree had been swept away; and nothing in the shape of a gasholder could possibly have withstood such a force. But we know that gasholders do withstand very severe gales without damage. There must be some reason why gasholders are not blown away in high winds; and the following theory, not original with the writer, may account for it. In America, it is well known that we have many square wooden structures on high foundations, without anchors or other means of security. If the wind had full play against the side of such a structure, it would seem impossible for it to withstand it. We know, however, that it is rare that such a thing happens, although thousands of buildings are exposed to the full force of the wind. The theory is this: The air in the space enclosed in the triangle formed by the vertical side of the structure, the ground line, and the hypotenuse connecting the extremities of these lines, forms an elastic air cushion, which receives and yields to the force of the blast—transmitting but a small portion of the force to the structure.

As to the distribution of the force of the wind, and its effect on a gasholder, there seems to be also a difference of opinion; the point in dispute being whether the holder is pushed along horizontally, or whether the wind exerts an overturning force against it. If the pressure of the wind is equal over the whole exposed height of the holder, it will be pushed against the guides on the leeward side. Whether it would not be capsized if the guide-framing were out of the way, is a problem which the experimenters will be apt to solve for themselves in the future. The tendency no doubt is to overturn the holder, as it is a top-heavy, floating, and consequently unstable body; and this is only prevented by either the rollers clutching the guide-rails, or (in the future, when guide-framing has become obsolete) by the rigidity of the holder carrying the strains down to the tank. In some respects a gasholder

* See ante, p. 373.

resembles an inflated balloon, which has to be held down, previous to its aerial flight, by numerous guys; a slight wind being sufficient to cause it to plunge and sway in an alarming manner.

In this connection it seems proper to call attention to the system of guide-framing of gasholders invented by Joshua Horton, in 1851.* Whether this system was ever tried is not known to the writer; but, in view of what has already been done, in the way of dispensing with lofty guide-framing by Mr. Livesey, and the confidence with which he and other eminent English engineers express their belief in eventually changing completely the present system, a description of Mr. Horton's invention, and some proposed improvements upon it, are here given.

In a double-lift holder the guide-framing is carried up to one-quarter of the height of the upper section; and the guide-wheels at the top and bottom of the lower section roll against the guide-rail in the usual manner. Securely fastened on the top of the grip of the outer section is a column, extending half way up the side of the inner section; the base of the column being secured on the grip by a leg on the outside of the outer section. According to the description of the patent, the column is a combination of wood and iron. The columns are tied together by a T-iron. [The author then proceeds further to describe, by the aid of diagrams, Mr. Horton's invention, as well as his own improvement thereon.] The objection to this system is the added weight to the lower section; but this would be equally the case with any system dispensing with exterior guide-framing, particularly with Mr. Gadd's spiral system. The grips and cups would perhaps have to be made a trifle wider and heavier, to afford a better footing to the standard guiding the inner section.

It is no proof of the failure of Mr. Horton's system that no example of it exists now. Many good inventions have been condemned without a fair trial; and improvements now in common use have obtained recognition only after years of struggle and poverty on the part of the inventor. This system would fulfil the stated requirements of most of the engineers engaged in the discussion before described. The strains in the upper section would be transmitted to the tank guides, and the inner section would always be sustained for one-half its height. The standard on the tank wall could be a very light lattice column, extending from the top of the tank wall to a point not far above the top of the lower section, and carrying a guide-rail extending from the top of the column to the bottom of the tank. The system could be applied to a three-lift holder as well as any other, provided the lifts were of unequal heights, to admit of securing the column on the grip.

Holders to dispense with exterior guide-framing must, no doubt, be strengthened, particularly in the bottom curb. The sides could also be stiffened by diagonal or spiral bracing, consisting of light angle-irons placed about 2 feet apart. These need not be carried over the vertical legs, but could be secured to them and to the sheets. These braces would prevent the blowing in of the sides of the holder, so often seen in high winds.

It is well known that a holder, with short lifts in proportion to its diameter, will bind or get jammed much easier than a holder having longer lifts. Different authors give different proportions for height and diameter; but it is generally agreed that the height should not be less than one-quarter of the diameter. As the holder itself does not touch the guide-framing, except at the points of contact of the wheels and guides, it is evident that the farther apart these points are, the easier will the holder rise and fall. The example of a drawer sliding into a desk will illustrate this. If the drawer is long and narrow, it slides in easily without binding; but let it be short and wide, it will stick, first on one side and then on the other.

Now, in view of this well-known fact, why will not a holder depending on single rollers at the bottom have a greater tendency to bind than one having two or more series of rollers? A three-lift or a four-lift holder towering (say) 100 feet or more in the air, unsupported anywhere except at the bottom, and that only on the outer edge, will be a grand sight to the engineer; but it will be a long time, and by many short steps, that this desired system will be attained.

That much may be done in the matter of dispensing with lofty guide-framing is not only possible but probable; but the question of how much or how little will not be solved for some time yet. The first step—dispensing with the girders connecting the tops of the columns—no doubt can be easily and safely taken; and as they are about 6 per cent. of the whole weight of iron in a double-lift holder, the saving will be felt at once. Beyond this it will be wisdom to go slowly and by short steps.

When it is considered that the holder is the storehouse or reservoir from whence the consumers are supplied, and when the consequences of any failure in the supply are suggested and thought over, it looks as if there was no portion of the plant where experimenting would be more dangerous. Small companies, having but one holder, should certainly have that one guarded by every known means. The wrecking of that holder, or its partial destruction, would be disastrous in the extreme.

Here it may be well to put in a plea for covered holders. This subject comes under the general title to this article, as holders enclosed in buildings need very little or no guiding; and if the guide-framing can be dispensed with anywhere, here surely is the place. In the severe climate of America, with its blizzards and snowstorms, covered holders are perhaps more of a necessity than

in the milder climate of England. It may be argued against the use of enclosed holders that only smaller sizes can be economically covered. But very large ones have been enclosed on the Continent; and by using a dome-shaped roof, it would seem that there is no limit, within reasonable bounds, to the size of a holder that might be covered. The Providence (R.I.) Gas Company have several holders covered with domes; the largest covering a holder 136 feet in diameter. Colonel F. S. Benson, the well-known Engineer of the Nassau Gas Company, of Brooklyn (N.Y.), in a paper read before the Society of Gas Lighting in 1877, having for its title "Covered Holders," gave the advantages of this system at length. No doubt, if the matter rested entirely with the engineer, whose anxieties and trials are little known to the powers above him, many more holders would be covered; and the engineer would have that portion of his troubles mitigated.

One of the writers on the subject under consideration mentions the absurdity of using architectural columns for the guide-framing of gasholders. In this he is right, as the use of a column, where no structure is to be supported upon it, is ridiculous, to say the least; but that is not all. The ancients, who invented the orders of architecture, established a certain proportion between the diameter of the column and the height—the height varying in the different orders as follows:—Corinthian, height = 10 diameters, Ionic = 9, Tuscan = 7, and Doric = 8; and these proportions have proved to be the best. When we consider the height of a three-lift holder, surrounded by a frame with Tuscan columns, with the height exceeding 50 diameters, we can see what disproportionate things they are. In this city [New York] and its immediate vicinity may be seen examples of Gothic columns in clusters three tiers high, single Tuscan and Corinthian columns, and various nondescripts, equally out of proportion, but all used for the guide-framing of gasholders. The height of the absurd in this matter is reached in the framing of a holder at the Point Breeze station of the Philadelphia Gas-Works. This is probably a relic of the early days of gas lighting in America. The tank has a stone wall reaching 10 or 12 feet above the ground level, with enormous buttresses supporting the columns. These columns consist of four cast-iron standards to each, having at the base a spread about 10 feet square, and tapering to the top, where there is a room, formed within the enclosure made by the four standards, having glazed windows on all sides, and covered with a roof over all. The object of these enormous columns, as well as the rooms at the top, is a question as obscure as the use of the pyramids of Egypt; and, in fact, is a question for the antiquaries to solve. The rooms might possibly have served for the temporary banishment of refractory stokers, in the same way that sailors are sent to the masthead for petty breaches of discipline.

The use of cast iron for columns or guides is fast becoming obsolete; and very properly, as many accidents have happened from its use. At the present time, when wrought iron can be obtained in every variety of shapes, there can be no excuse for the use of cast iron, except for caps, bases, rollers, &c.

The author, in conclusion, explains that his criticisms, &c., were written at odd times during a busy season; and this will, he says, to some extent account for their disjointed character. He counsels his readers, in the matter of dispensing with the guide-framing of gasholders, to follow Pope's advice—not to be the first to try what is new, nor the last to lay aside what is old.

DOWSON'S WATER GAS PLANT.—For the last six months, says *Industries*, a Dowson gas plant has been in use at the works of Messrs. Spicer Bros., paper manufacturers, Godalming, Surrey, in connection with two "Otto" gas-engines, of 30 and 40 horse power respectively. The result has been so satisfactory that the firm have just ordered from Messrs. Crossley Bros., Manchester, two more engines each of 80-horse power. Messrs. Spicer are also preparing to use the Dowson gas in their paper-drying cylinders, instead of steam.

CONNECTING LIGHTNING CONDUCTORS WITH GAS AND WATER MAINS.—At the last meeting of the Society of German Gas and Water Engineers, held at Stuttgart, Herr Fischer made a communication on the above subject, based on a pamphlet published by Dr. N. H. Schilling. This gentleman came to the conclusion that "the connection of lightning conductors with gas and water pipes is neither necessary, nor for practical reasons advisable in the interests of gas and water works." Statistics show that houses provided with such piping do not incur greater risk from lightning; on the contrary, it probably acts as a protection. In only very few instances have pipes inside houses been struck; and the damage done was very slight. In those cases the damage concentrates itself on those points which lie on the shortest line between the outer wall and the piping. The gas and water pipes are only exposed to danger from lightning (1) when the lightning passes to it from a neighbouring lightning conductor, and this can generally be traced to defect in the conductor; (2) when the packing of the piping consists of a bad conducting material—e.g., india-rubber or wool, the use of which should therefore be avoided. The piping should not be connected with the conductor, as it is sometimes interrupted when repairs or a new arrangement of pipes is being carried out. Besides, the danger should not be forgotten to which workmen are exposed when repairing these pipes during a thunder-storm. A Committee was subsequently appointed to discuss the subject in conjunction with the Elektro-technische Verein and the Verband Deutscher Architekten und Ingenieure.

* Attention was called to Mr. Horton's patent (No. 13,436 of 1851) in a letter addressed to the JOURNAL for May 17, 1887, by Mr. W. Mann.

THE NEW HOLDER OF THE CONSOLIDATED GAS COMPANY OF NEW YORK.

A recent number of the *Scientific American* contained some particulars of the new holder which the Consolidated Gas Company of New York are erecting between Fifteenth and Sixteenth Streets in that city. As this is the largest holder in America, our readers will doubtless be interested in the following description of it, for which, as well as for the accompanying illustrations, we are indebted to the above-named publication.

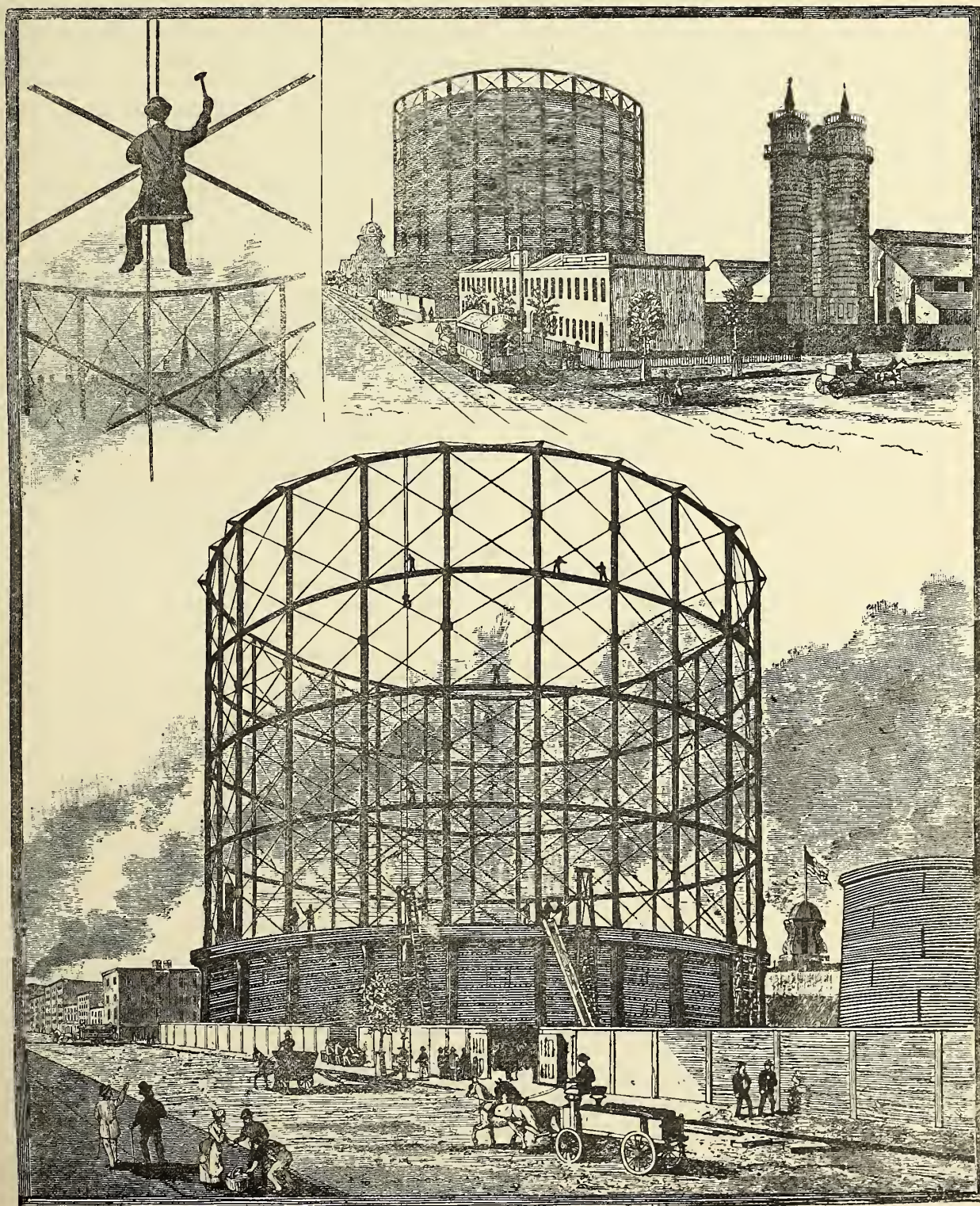
The problem presented was the erection of a holder of the largest attainable capacity upon a piece of ground which was not only limited in area, but which was of the most unstable character at any great depth below the surface. To have made the usual excavation, and built within it a brick tank, would have entailed very great expense. The upper stratum of earth was made ground, composed of dumpings from all parts of the city, underneath which quicksand was liable to be found at all places. For these reasons it was decided to dispense with the brick tank, and to build an iron one resting practically on the surface of the ground. In order to economize depth, the holder, as will be seen, is a three-lift one.

The ground where the tank stands was levelled off by excavation to a depth of about 8 feet; and about a thousand 12-inch piles, 40 feet long, were driven over an annular area lying mostly within, and corresponding to the general circumference of the tank. This left in the centre a circular area without piling. Two feet of concrete were then laid; and on this the bottom plates of the tank were placed. The entire foundation is 200 feet in diameter.

The tank is of wrought iron. The plates at the lowest course

are $\frac{7}{8}$ inch thick, and are laid double, so as to give $1\frac{1}{2}$ inch thickness of metal; they are arranged to break joints. Where two plates abut, a strap of iron with six rows of rivets is carried over the joint. For each of these butt joints there is one strap, either inside or outside the tank, according to the locality of the joint. As the sides rise they diminish in thickness. The tank is 192 feet in diameter, and 42 ft. 9 in. deep. Around the top a box girder is carried which forms the curb; and upon this rest the 24 standards. These are made of iron channel bars, and are tied together by lattice girders, of which several courses surround them. Between the girders diagonal bars extend, crossing in the centre of the panel. At their crossing they are secured, so as not to strike against each other in stormy weather. Special trussing is used at the top, to resist any outward thrust that may be brought to bear upon the standards. The framework rises 125 feet above the curb, or about 150 feet above the level of the street.

The holder, as already stated, is in three lifts, each about 41 feet high. On its upper curb, each lift carries 24 roller brackets, provided with both radial and tangential rollers; this being, it is believed, the first application of this combination in America. The radial rollers are the larger and more securely fastened; the tangential rollers, which are comparatively small, being treated as subsidiaries. The crown is stiffened circumferentially by a box girder contained within the holder. The outer circle of top plates and the upper circle of side plates form two of its sides. A horizontal circle of plates within the holder forms the lower element; and the open side is filled with lattice trusswork, so as to allow the gas free access. The crown is provided with internal radial



trusses, extending to a central king-post, which carries their inward ends when the holder is empty.

The general structure is based on recent English practice. The old style of columnar frame is departed from; and the securely braced uprights, with horizontal and diagonal bracing, recall to mind the framework of the great Birmingham holders, full particulars of which were given in Vol. XLVII. of the JOURNAL. The capacity of the holder is 3,250,000 cubic feet. The inlet and outlet pipes are 30 inches in diameter. The illustrations convey a very good idea of the size of the structure, the erection of which has so far been unattended by accident.

REGENERATIVE GAS-ENGINES.

The next step in the direction of increased economy of fuel in gas-engines will most probably be, says *Engineer*, the utilization of the waste heat of the exhaust gases. The other important sources of loss—viz., radiation, and absorption of heat by the water jacket—may be regarded as unavoidable with motors of the present prevailing types. Engines have, no doubt, been proposed which dispense with the water jacket altogether; but there seems to be little probability of such machines coming into practical use. It is also significant that the most successful gas-engine builders appear to regard the method of external refrigeration as a necessary evil, and make no serious attempt to do away with it. Putting aside, then, the losses due to radiation and conduction (amounting in all to something like 66 per cent.), we have about 17 per cent. of the total heat of combustion converted into available power, while an almost equal quantity of heat passes away in the exhaust gases without performing any duty. In the Atkinson cycle engine, the quantity of heat carried off by the jacket is only about 19 per cent.; the heat converted into work is nearly 20 per cent.; and the heat carried off by exhaust is over 50 per cent. In gas-engines of good construction, the escaping gases have a temperature of about 500° C.; and if we assume the maximum temperature to be 1500° C., the theoretical efficiency would be 0.56. Now if we suppose the temperature of the exhaust gases to be usefully lowered to, say, 140° C. with the same initial temperature, the theoretical efficiency would rise to 0.76, with a corresponding gain in actual efficiency. It is not practicable to reduce the final temperature by further expansion of the gases in the cylinder; so that some form of regeneration affords the only means of a closer approximation to the conditions of maximum efficiency. The employment of regenerators with engines using town's gas is, for obvious reasons, out of the question; but for the rapidly increasing number of motors burning producer gas, the application of the regenerative system must lead to a large saving of fuel. Atkinson and Otto engines working with Dowson gas are at present using less than 1.5 lbs. of coal per indicated horse power per hour, as certified by their users, who can have no reason for understating their fuel consumption. In some cases it is said to be as low as 1.1 lbs.; and it may be safely assumed that gas motors using generator gas can be worked with an hourly consumption of 1.25 lbs. of coal per horse power—particularly if the engines are specially designed for burning generator gas, as ordinary engines have features which, though advantageous when gas of high calorific power is used, lead to considerable loss when fuel gas is substituted. Rankine estimated that 90 per cent. of the heat in the exhaust of air-engines might be retained for use by means of a regenerator. If we suppose, in the case of a gas-engine working in near proximity to the producer or generator, that 75 per cent. of the exhaust heat could be returned to the producer by means of a suitable regenerator, the fuel consumption would be reduced to less than 1 lb. per indicated horse power per hour—a result certainly worth striving for. The regenerative apparatus required is simple and inexpensive, and would require practically no attention, as the temperature of the exhaust gases is low enough to permit the use of continuous conducting regenerators. Gas generators working with cold air use about 5 per cent. by weight of steam with the air blast; and the percentage of combustible in the gas averages 40 per cent., with more than 50 per cent. of nitrogen. A hot air supply drawn from a regenerator would insure the decomposition of a larger proportion of steam; thus enriching the gas, and reducing the volume of useless nitrogen.

In a recent number of *La Nature*, instructions are given for the electric deposition of black iron upon ornamental metal articles, such as gas burners and fittings, to give all the appearance of highly finished wrought-iron work. Fine metallic iron, such as is prepared for rubbing parquetry flooring in France, and called *paille de fer* (iron-straw), is dissolved in commercial hydrochloric acid to saturation, which is shown by the appearance of a deposit at the bottom of the bath of liquid. A fiftieth part (by weight) of arsenious acid is added; and the whole is briskly agitated. The solution is not completed and ready for work until the whole of the latter constituent, which dissolves slowly, is completely absorbed. Articles to be treated are to be placed in connection with the negative pole of a battery and plunged into the bath; the anode being composed of old files and pieces of gas-retort carbon. Articles made of copper and brass blacken directly; but those of iron would be attacked and dissolved by the bath. It is therefore necessary to previously nickel them. In this way a brilliant deposit is obtained which is called black nickel. As the iron-electrode deposited by this process would quickly lose its colour upon exposure to a damp atmosphere, it is necessary to protect it by a colourless spirit lacquer.

THE RATHMINES AND RATHGAR TOWNSHIP WATERWORKS.

At the Meeting of the Institution of Mechanical Engineers, held recently in the Lecture Hall of the Institution of Civil Engineers, No. 25, Great George Street—Mr. C. COCHRANE, Vice-President, in the chair—a paper describing the above-named works was read by Mr. A. W. N. TYRRELL, M. Inst. C.E.

The author stated that the idea of controlling and utilizing the head waters of the River Dodder originated with the late Mr. Robert Mallet, who in 1846 was instructed by the Commissioners of Drainage for Ireland to investigate the feasibility and conditions of constructing reservoirs on some part of that river, "for the combined purposes of providing an unfailing and increased supply of water power to the millowners occupying the stream, and contingently of controlling the floods, which at frequently recurring intervals prove so destructive to property situated on its banks." After a lengthened investigation of the question, Mr. Mallet recommended the construction of a large impounding reservoir in the upper part of the Glensmoel Valley, by an embankment 1025 feet in length and rather more than 100 feet in height. The reservoir was to have a water surface of 142 acres, with a content of 227,843,645 cubic feet and a drainage area of 6070 acres. Nothing further, however, was done in the matter. Subsequently, in 1860, when an improved supply of water for the city of Dublin was under consideration by Sir John Hawkshaw, the Royal Commissioner appointed to investigate the subject, Mr. Mallet brought forward a project for procuring the supply from the Dodder. It was, however, rejected, for two reasons: Firstly, because the quantity of water procurable from the district would not be sufficient for Dublin; and, secondly, because, in order to obtain the quantity which it was stated the district would supply, it would be necessary to impound the whole of the water from the drainage area of 9½ square miles, about two-thirds of which is covered with peat, and excepting in very dry weather produces water more or less coloured thereby.

In 1877, the supply of water to the Rathmines and Rathgar township from the Grand Canal at Gallanstown being deemed unsatisfactory, a provisional agreement was arrived at between the Water Committee of the Corporation of Dublin and the Rathmines and Rathgar Township Commissioners, by which the former body were to supply the township from the city mains with an average of a million gallons of water daily for an annual payment of £2281 5s.; and any further quantity up to 1½ million gallons daily at the rate of 1½d. per 1000 gallons. This agreement not being ratified, the Rathmines Township Commissioners called in Mr. R. Hassard, M. Inst. C.E., to advise them as to the feasibility and cost of procuring an additional supply of water from the higher levels of the Canal, and as to obtaining an independent supply from the Corporation reservoirs at Stillorgan, supposing an arrangement as to price could be agreed on. In sending his report, Mr. Hassard laid before the Commissioners a project by which a supply of water might be obtained by gravitation from the tributaries of the Dodder draining into the Glensmoel Valley; and from this project the undertaking, since carried out, does not materially differ.

The principle of construction adopted was that known as the "separation" system, which has been carried out at Manchester, Halifax, and other places. The upper part of the Dodder drainage-ground, having an area of 4340 acres of granitic formation, is covered with peat, as already stated; but immediately below this district there occurs an area of about 3250 acres, free from peat, partly of granitic, but principally of metamorphic and silurian formation, producing water of great purity. It was evident, therefore, that if the water from the peat-covered area could be intercepted, and passed by or through the lower district without mingling with that to be obtained from the latter, a supply of excellent water could be secured for the use of the township. This arrangement has been carried out. The water, as taken from the streams in dry weather, contains about 4 grains of solid matter per gallon, and is of about 5° of hardness. A more desirable water it would be difficult to procure. The drainage area at its summit at Kippure Mountain attains an altitude of 2473 feet above Ordnance datum—giving an average inclination from the head of the upper reservoir of about 1 in 10; and the sides of the valley are in many places of steeper slopes, rendering it necessary to construct the flood channels of unusual size and capacity, as the rainfall is large, and during storms flows off the bare hillsides very rapidly. The watercourse for conveying the waters of the Dodder, the Cot Brook, and the Slade Brook, from the peat-covered district past the upper reservoir, is capable of carrying off 120,000 cubic feet of water per minute, or 27½ cubic feet per minute per acre of drainage; and the overflow weirs of the reservoirs are each 200 feet in length. The streams and springs on the western side of the valley, adjacent to the upper reservoir, are conducted into it by culverts passing underneath the artificial watercourse; and in the lower part of the valley the waters from the Ballinasorney and Ballymaico Streams, distant respectively 1½ and 2 miles, are intercepted, the direction of their currents reversed, and the water conducted back into the upper reservoir by catchwater conduits constructed along the hillsides. The Piperstown stream on the eastern side of the valley is carried across it by a syphon pipe 2 feet in diameter, passing through the lower reservoir, and delivering into the catchwater conduit on the western side.

It was at first intended to construct a reservoir of large storage capacity in the lower part of the valley, for impounding the water from the peat-covered district, and from this reservoir to give out not

only the amount of compensation water due to the lower district of 3250 acres, but in addition a largely increased supply for mill-owners' use, for which it was proposed to tax them per foot of occupied fall, as has been done in other places. The mill-owners objecting to this, it was arranged during the progress of the Bill through Parliament that the water from the upper district should be diverted past both reservoirs, excepting at such times as the volume of the stream flowing from it exceeded 1500 cubic feet per minute, which is as much as the mills can use; and that the Commissioners should have power to impound all water in excess of this flow. With this object, works and gauges have been provided which ensure that 1500 cubic feet per minute must pass down for mill-owners' use before any water from the upper district can flow into the reservoirs; and from the weir immediately above the lower reservoir the 1500 cubic feet per minute secured preferentially to the mill-owners is conveyed partly by an open conduit, and partly by a line of iron pipes 27 inches diameter, laid through the reservoir and terminating in the old course of the river below the reservoir embankment. Consequent on this arrangement, the lower reservoir has been constructed of much less extent and capacity than originally intended.

There was nothing very unusual in the construction of the works; the two embankments being formed in the ordinary way, with slopes of 3 to 1 on the inner and 2 to 1 on the outer faces. At both, however, there occurred on the eastern side of the valley veins and deposits of sand and gravel, extending for a considerable distance into the hill, and rendering it necessary to follow them in by headings driven one over another, and filled with concrete; the ground being too steep for open trenches. This operation was one of considerable difficulty, owing to the loose nature of the sand and the quantity of spring water met with. The lower heading at the upper embankment was extended 120 feet into the hillside, until the deposit of sand had been completely cut through and a wall of hard blue clay reached. Into this clay the heading was carried sufficiently far to ensure a sound junction being effected between the concrete filling and the impervious material at its termination. From the floor of the lower heading a trench was then sunk to a depth of 32 feet, when the hard clay was reached; and the whole was refilled with carefully rammed concrete. After this the next heading was proceeded with, and filled up with concrete in the same manner; and so on until a height of 84 feet from the bottom was attained, when the work was completed by a short length of open trench. The headings being only 5 feet in height and all heavily timbered, this part of the work was necessarily very slow and tedious, greatly retarding the progress of the upper reservoir embankment, and consequently the final completion of the works. The upper reservoir has an area of 57 acres, and contains 357 million gallons, its embankment being 70 feet in height at the deepest part; the lower one has an area of 80½ acres, and contains 160 million gallons, its embankment having an extreme height of 55 feet.

The eduction tunnels, through which the River Dodder was diverted during the progress of the embankments, are constructed in the solid ground on the western side of the valley, and entirely below the puddle trenches. They are in each case 11 feet in diameter, having a sectional area of 100 square feet; and with the exception of the central plugging, which is of brickwork, are built entirely of rubble masonry backed with concrete. The outlet towers are placed in close proximity to the fore-bays of the tunnels, and are reached by foot-bridges from the embankments. There are three openings in the outlet tower of the upper reservoir, through which the water is drawn off at different levels for the township supply; and from the base of the tower, extending through the eduction tunnel to the valve chamber, are laid two lines of pipes—one of 24 inches diameter for emptying purposes, and the other of 16 inches diameter for the supply of the township. A second emptying-pipe, 18 inches in diameter, is inserted in the plug, and discharges into the lower reservoir below the weir at the mill-owners' slot-gauge. From the outlet tower of the lower reservoir are laid two lines of pipes, of 27 and 24 inches diameter. The larger forms a junction with the line of 27-inch pipes laid through the reservoir; and the smaller extends through the eduction tunnel and valve-chamber to the mill-owners' gauge-basin below.

For township use the water can be drawn off from the upper reservoir at three different levels, as already stated; and, after passing through a gauge-basin, is conveyed by a line of 15-inch pipes, 4½ miles in length (with two intermediate relief-pits on its course) to a service reservoir at Ballyboden, distant about 2¼ miles from the township, at an altitude of 325 feet above Ordnance datum, and 175 feet above the highest part of the township at Tereure. From this reservoir, after passing through copper wire gauze screens, the water is conveyed to the township by a line of 18-inch pipes laid in the public roads. The water for mill-owners' compensation is drawn off from the lower reservoir, and, after passing through a gauge-basin, is delivered into the old course of the river immediately below it. The preferential supply of 1500 cubic feet per minute from the upper district is diverted past the lower reservoir by a weir placed across the old river bed, and is then passed through a slot-gauge which is capable of delivering the stipulated quantity with a mean head of 9 inches, this being the height of the crest of the adjoining weir.

The works were designed to secure a supply of 3,000,000 gallons daily for township use, and 2,100,000 gallons for mill-owners' compensation. From the register of rainfall on the site of the works, it has been ascertained that, at the termination of the unprece-

dent drought of 1887, which extended from May 23 to Oct. 31—a period of 161 days—there would have been in stock more than fifty days' supply for both township and mill-owners' use.

The works were designed and carried out by Mr. Hassard, in conjunction with the author; the contractors being Messrs. Falkiner and Stanford, of Dublin.

In the course of the brief discussion which followed the paper, Mr. MARTIN said that when the Institution held their meeting in Ireland, he had the pleasure of seeing the works which had been described by Mr. Tyrrell; and he was much interested at the way in which the difficulties were overcome in their construction. To the general members of the Institution, the author's very complete description of these works would be of great service. The problem, or rather the great difficulty, with which the Engineers had to contend was to carry a large quantity of water that was not fit for use in the town over the very area that was wanted for gathering good water. This, he considered, had been very ingeniously contrived, as Mr. Tyrrell had shown. When inspecting the works, he did not quite see why there should be a weir to raise the water into the main channel at all; and he did not also see why there should be a hole through the weir.

Mr. MAIR thought that Mr. Tyrrell and Mr. Hassard ought to be congratulated upon such a result as was shown in the paper—viz., that after 161 days' drought, there remained in stock in the reservoirs 50 days' supply. He presumed the water from the upper district—the peat area—was taken away by a separate channel altogether, and not allowed to flow down. As to the quantity of rain that fell into the reservoirs, he should think the rainfall there was very excessive.

Mr. TYRRELL, replying to the last speaker, observed that the water flowing off the upper district—the 4000 acres—was entirely unsuitable for the township supply, and was diverted past the upper reservoir by means of an artificial channel, and discharged into the lower reservoir. This channel would have to deal with floods of considerable magnitude; and it had been designed to carry off floods at the rate of 120,000 cubic feet per minute, which was equal to 27½ cubic feet per acre of drainage per minute, or at the rate of 27 inches of rain in 24 hours. The population of the township was 30,000; and the works would give 3 million gallons of water per day, which, at 30 gallons per head, would suffice for three or four times the existing population. As to the culverts through one of the weirs, these culverts were placed in the weir to carry off the ordinary flow of the river; and at times of heavy rainfall, when a large quantity of water was running down the channels, it would pass over in the usual way. The rainfall in this district was no doubt excessive. On the occasion, however, of the heavy flood to which he had referred, there was only about 1½ inches in Dublin.

The CHAIRMAN mentioned that he had seen it authoritatively stated that the average rainfall in Dublin was 25 inches.

A vote of thanks was accorded to the author of the paper, who acknowledged it in appropriate terms.

At next Friday's Students' meeting of the Institution of Civil Engineers, two papers are to be read—on "The Covered Service Reservoir of the Southampton Corporation," by Mr. E. T. Hildred, and "On the New High-Level Storage Reservoir for the Grand Junction Water-Works Company at Hanger Hill, Ealing," by Mr. Herbert Ashley.

A TEST for the detection of commercial saccharine in articles of food has been discovered by Herr E. Bernstein, and described by him in the *Zeit. für Anal. Chemie*. It is based on an observation of Remsen's, that when a minute quantity of saccharine is heated in a test-tube with a little resorcinol and some strong sulphuric acid, the mixture becomes yellow, then red, and finally deep green; sulphur dioxide being at the same time disengaged with effervescence. On cooling, the solution is diluted with water, and an excess of alkaline hydroxide added. The liquid now appears red by transmitted light, but has a strong green fluorescence. A milligramme of saccharine will yield 6 litres of fluorescent solution. In applying the test to articles of food, the substance is slightly acidified, preferably with phosphoric acid, and is then extracted with ether; the evaporation of the ether leaving the saccharine sufficiently pure for the reaction. Any fat present is removed by petroleum spirit before the extraction with ether.

THE Committee on Science and the Arts of the Franklin Institute of Pennsylvania notify that they are empowered to award the Elliott Cresson gold medal and the John Scott legacy premium and medal (\$20 and a copper medal) for meritorious discoveries and inventions tending to the progress of the arts and manufactures. The first-named medal was founded by the legacy of Elliott Cresson, of Philadelphia; and its award was placed in the hands of the Committee, who decided to bestow it for some discovery in the arts and sciences, for the invention or improvement of some useful machine or new process, for some combination of materials in manufactures, or for ingenuity, skill, or perfection in workmanship. The John Scott premium and medal was founded in 1816 by John Scott, a merchant of Edinburgh, who bequeathed to the City of Philadelphia a considerable sum of money, the interest of which should be devoted to rewarding ingenious men and women who make useful inventions. The premium is not to exceed the above-named sum, and the medal is to be inscribed "To the most deserving." The Secretary of the Institute (Mr. W. H. Wahl) will furnish any required information on the subject of these medals.

Register of Patents.

PIPES EMPLOYED IN THE MANUFACTURE OF ILLUMINATING GAS.—Firth, A. F., of Brighthouse. No. 16,631; Dec. 3, 1887. [8d.]

This invention relates to such metal pipes as in the manufacture of illuminating gas are exposed to considerable heat; the object being "to render such pipes more durable by preventing actual contact between the flame, or heated gas, and the pipe."

For this purpose the patentee employs, in combination with iron pipes, fire-clay, formed into segmental slabs or clips, two or more of which enclose the diameter of the pipe; while for such lengths of the pipe as are not supported, the blocks are flanged and secured to each other by bolts. The butt joints of the several lengths are also provided with projecting and cavity locking pieces. For curved portions of the pipe, the ends of the slab are cut at an angle, or on a radius line. The blocks or slabs can be of any convenient length and thickness; and they afford facilities for repairs by replacement of one or more slabs at any point where the ones previously used are defective or destroyed. As an alternative, the iron pipe may be encased in fire-clay, first thoroughly well tempered and worked, and afterwards steadily and evenly "fired."

PUMPS FOR GASES AND AIR.—Clark, E. B. Ellice, and Chapman, L., of Connaught Mansions, Westminster. No. 16,986; Dec. 9, 1887. [8d.]

This invention has for its object so to construct pumps—especially such as are used for pumping gases or air—that their action is much facilitated, as no inlet-valves have to be lifted against their own weight or stiffness, as has hitherto been the case. The piston of the pump, according to the present invention, works in an inner cylinder or liner, which is of less diameter and less length than the main cylinder of the pump. The inlet-pipe to the pump opens into the space between the liner and the cylinder. The outlet-valve is in the cylinder covers or ends, which are so situated as to be within the space included in the diameter of the liner. When the piston commences its stroke, the liner moves with it, until its forward end bears on the forward end of the cylinder, whereby an annular or circumferential opening is left between the rear end of the liner and the rear end of the cylinder; and thus the pump draws in at the rear side of the piston, through the space between the liner and the cylinder, and into the interior of the liner at the rear of the piston by the continued movement of the piston in the liner, the contents of the liner at the forward side of the piston being at the same time expelled through the outlet-valves. When the piston makes its back stroke, the liner moves back with it a distance sufficient to leave a similar annular or circumferential inlet opening between its forward end and the forward end of the cylinder, and to cause the rear end of the liner to bear on the rear end of the cylinder; and the same operations are repeated at the end of the cylinder the reverse of those already mentioned, and so on during the working of the pump.

PUNCHING, RIVETING, AND SHEARING MACHINE WORKED BY GAS.—Pinkney, C. W., of Smethwick. No. 639; Jan. 14, 1888. [8d.]

This invention consists in constructing and arranging the parts of gas-worked punching, riveting, and shearing machines so that they may work more efficiently than heretofore.

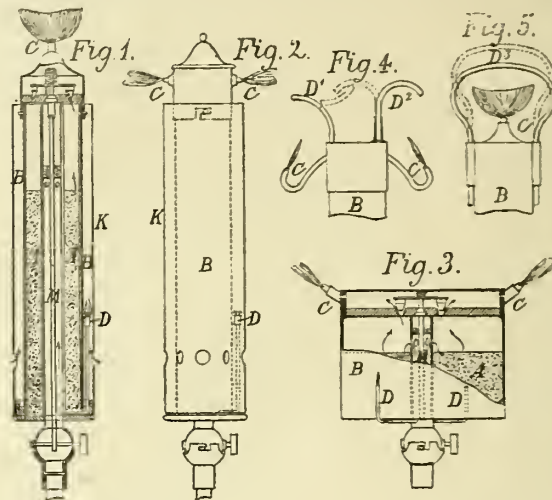
The principal or motive piston in a punching-machine and the charging-piston are fixed in the same hollow cylinder. The motive piston is uppermost; and its piston-rod passes out of the top of the cylinder and works in a tubular guide on the cylinder cover. The piston-rod of the charging-piston passes out of the bottom of the cylinder. The piston rod of the motive-piston is connected with the long arm of the lever, the short arm of which carries the punch. The long arm passes through an opening in the tubular guide, in which the piston-rod of the motive-piston works; and its rounded end takes into a slot in the piston-rod. By the ascent of the motive-piston, the short arm of the punch lever is forcibly depressed upon, and punches the article to be punched. The lower or charging piston is operated in the following manner:—To the lower protruding end of the piston-rod of the charging-piston, a cranked lever is jointed; the two arms of the lever being situated at a distance apart on a shaft. They are inclined to one another at an angle of about 50°; the fulcrum being at the angle formed by the junction of the two arms of the lever. The upper end of the short arm of the lever is jointed to the lower end of the piston-rod of the charging-piston; and the fulcrum on which the lever turns is carried by a sliding-block, which works in a horizontal guide on the base of the machine. The long arm of the lever terminates in a handle, by which the workman operates it. By depressing the long arm of the lever, the sliding-block, carrying its fulcrum is moved in its horizontal guide; the short arm of the lever approaching nearer and nearer to the vertical position as the long arm is depressed. When the long arm has been fully depressed, the sliding-block is brought to the end of the guide in which it works; while the short arm of the lever is vertical and in a line with the piston-rod of the charging-piston. The piston is then in its highest position; and the force of the detonation cannot communicate any motion to it. In the normal state of the parts of the machine, the motive-piston is at its lowest position—that is, a little lower than the middle of the cylinder; and the charging-piston at its highest position—that is, nearly in contact with the motive-piston. In the side of the cylinder immediately opposite the space between the pistons when they are in their normal position, is an opening, at which the mixture of inflammable gas and air is introduced, and at which the exhaust gases are expelled.

The action of the apparatus is as follows:—The parts being in the normal positions described, the workman raises and pushes over the long arm of the lever. The charging-piston is thus depressed; and the detonating mixture is thereby drawn into the cylinder below the motive-piston. The detonating mixture being cut off, the workman reverses the motion of the lever; and in that way raises the charging-piston, and compresses the detonating gaseous mixture between itself and the stationary motive-piston. When the compression has so far proceeded that the elastic force of the gaseous mixture exceeds the downward pressure of the motive-piston and its piston-rod, the piston rises, and causes the punch to descend and rest upon the plate or article to be punched. The charging-piston is supported firmly in the manner already described. The detonation is then effected, and raises the

motive-piston; thereby effecting the punching of the article. The gaseous mixture being ignited under pressure, detonation is effected by the heat of a red-hot tube. The exhaust-valve is operated by a hand-lever.

CARBURETTING GAS.—Doms, L., of Vienna. No. 13,147; Sept. 11, 1888. [6d.]

According to this invention naphthalene is used in the form of "cartridges" or compressed cylinders made of naphthalene-powder; and the gas-lamps in which they are employed are like candles. By this means it is claimed that the disadvantages arising from the melting and casting of the naphthalene are obviated; and moreover, owing to the form of the lamps employed, they can be more conveniently arranged on gas-brackets or chandeliers, and the flames do not throw any shadow downwards.



As shown in figs. 1, 2, and 3, the naphthalene contained in the receptacle B is evaporated by the heat of the burner D. Gas is introduced into the upper part of B; and after it has mixed therein with the naphthalene vapours, it passes to one or more burners C. Instead of using a flame D for heating the receptacle B, bent metal rods D¹ D² D³ can be used (as illustrated in figs. 4 and 5), which rods will conduct the heat of the flame to the receptacle B placed below. In order to enable the bent rods to be moved out of the reach of the flame, they are either hinged or pivoted as in fig. 4, or arranged to slide as shown in fig. 5.

For regulating the admixture of the naphthalene vapours to the illuminating gas, the regulator represented in figs. 1, 2, and 3 is used. By the perforated piston adapted to be displaced in the gas-admission pipe, the openings for admitting the gas to the receptacle B can be closed; and by means of valves, the discharge of the gas impregnated with the naphthalene vapours is regulated, whilst another valve controls the discharge of the unmixed gas. The displacement of the piston and valves is effected through the medium of a cam, which, on being turned, causes the rod carrying the piston and the valves to move upwards against the pressure of a spring.

APPLICATIONS FOR LETTERS PATENT.

- 16,624.—HELLMANN, J., "Improvements in gas-burners." Nov. 15.
- 16,633.—RIVETT, T., "Improvements in the machines known as gassing frames, and employed for gassing yarns or threads." Nov. 16.
- 16,636.—GRIMSTON, G. S., "Improvements in self-generating gas burners for burning oils or other combustible liquids, and arrangements for supplying or feeding the same." Nov. 16.
- 16,652.—PRICE, A. R., "Regulating or controlling the supply of gas to burners of any description used for the consumption of gas." Nov. 16.
- 16,822.—WALKER, B., "Improvements in ovens or gas cooking ranges." Nov. 20.
- 16,841.—BRIERLEY, S. H., "Apparatus for raising or lowering gas-lights from a distance." Nov. 20.
- 16,927.—HUTCHINSON, R. R., "Improved method of generating gas from hydrocarbon oils, and apparatus therefor; applicable to kilns, furnaces, or the heat chambers or flues of steam boilers." Nov. 21.
- 16,958.—DOWSON, J. E., "Improvements in apparatus for use in the treatment of gas." Nov. 21.
- 16,970.—THWAITE, H. A., "Improved methods of producing combustible gases and in apparatus therefor." Nov. 22.

PATENTS WHICH HAVE BECOME VOID.

[AFTER THE FOURTH YEAR.]

- 9931.—THORP, T., "Registering the illuminating power of gas."
- 10,430.—RICHARDS, N. G., "Gas-burners."
- 10,512.—COTTON, W., "Water-meters."
- 10,675.—BREWER, E. G. (Dery), "Carburation of gas."
- 10,771.—PEEBLES, D. B., "Gas-governors."
- 10,772.—FLOSKY, R., "Gas-burners."
- 10,790.—DEMPSTER, J., "Extracting tar, &c."
- 10,897.—WRIGHT, J. F., and another, "Cooking-ranges, &c."
- 10,910.—PEARSON, H. W., "Water-meters."
- 11,175.—PIETZ, C., "A gas-burner attachment."
- 11,202.—COATES, J., "Extracting benzole from gases of coke ovens."
- 11,335.—CAHEN, M., "Gas for heating purposes."

ADVANCE IN THE PRICE OF COKE.—One of the Birmingham newspapers reports that a great advance has recently taken place in the price of coke, and that ironmasters are becoming alarmed. Derbyshire cokes, which six months ago were 7s. per ton, have rushed up to 11s. 6d. and 12s. Best Welsh cokes have advanced 2s.—making furnace sorts 14s. 6d. delivered in Staffordshire; and foundry, 21s. North Staffordshire have advanced 1s. 6d.; making furnace 14s. Gas cokes have risen 25 per cent. It is stated that this is due to the scarcity of slack, through the colliers working short time, and ironmasters competing for the diminished coke supplies.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

MR. ELLIS LEVER AND SALFORD GAS AFFAIRS.

SIR,—In one of your recent issues, I had pointed out to me an extract from one of my speeches during the municipal contest in Pendleton, Salford, bearing upon the now famous "Salford Gas Scandal." By that report, you will find I was one of the "young" members of the old Gas Committee, and that I interested myself in obtaining all possible information to enable me to take a useful part in the letting of the contracts in 1886.

I gather from the "letters" and "interviews" of Mr. Ellis Lever, that because he was not fortunate enough to get an order, he denounces everybody connected with that Committee as either fools or rogues. But so far as I am concerned, I refuse quietly to be considered either; and in justification of the action of the Committee, I shall be glad if you will publish the following further particulars.

In a letter to the *Manchester Examiner*, dated Sept. 26, 1888 (summarized), Mr. Lever says: First, he has been boycotted for nearly ten years by the Salford Gas Committee because he ventured to tell them they were being defrauded. Secondly, That the coal and cannell used in the gas-works is notoriously bad; being charged with poisonous impurities.

As to the first charge. It is true Mr. Lever has not had an order for some years; but his tenders have always been considered along with others. On the last occasion, he offered Bestwood cannell at 12s. 6d.; but as Hucknall was offered at the same price, it got the preference. The two collieries join each other; and the Gas Committee had good reasons for making the choice they did. Other offers were made at the same time; but his prices were not so favourable as those whose tenders were accepted.

There is no denying that there does exist a prejudice against Mr. Lever at Salford. It is not forgotten that, during Mr. Hall's management, Mr. Lever was sending in cannell at 37s. 6d. per ton—a much higher price than any other firm—nearly all of which had to be stacked; but the more recent transactions will be fresher in the remembrance of those concerned.

In the year 1876, Mr. Lever offered by tender to deliver cannell from either Hucknall or Bestwood colliery. It was resolved by the Gas Committee to order from him 20,000 tons at 13s. 6d. Mr. Lever accepted the order; but was unable to deliver, and letters received from both collieries subsequently stated "that Mr. Lever had no authority to offer either of these cannells, neither could he deliver them if he got any orders." The Gas Manager and Committee, instead of boycotting Mr. Lever as he richly deserved, arranged to allow him to substitute an order for 24,000 tons of coal, which he delivered.

The next order Mr. Ellis Lever got was in 1877—conditions and deliveries stated in tender. The delivery times, Mr. Lever did not comply with. He sent large quantities when not required, and when large deliveries were required he did not carry out his contract; so that other contractors were asked and delivered extra supplies. One of these was Mr. E. G. Wrigley (who is not one of Mr. Lever's closest friends). Mr. Lever failed in his deliveries about one-third, or between 7000 and 8000 tons. What he did send in was not all as contracted for. His contract was for Shirland cannell; yet more than one class of cannell was substituted—one being found 2s. per ton inferior, and another 1s. 4d. inferior—so that the Committee, on the information of their Manager (which was proved to be reliable), stopped further deliveries on the contract.

Does it not look more likely that Mr. Ellis Lever has been his own boycotter?

As to Mr. Ellis Lever telling the Committee they were being defrauded. He has often been requested to meet the Committee, and substantiate his charges; but hitherto he has failed to do so.

As to the second point, "That the coal and cannell used in the gas-works are notoriously bad; being charged with poisonous impurities." A portion of the cannell used is from the same pits from which Mr. Lever supplies Manchester, and none of the cannell used in Salford is inferior to that which he delivers to Manchester. As to coals, Salford buys the best gas-producing coals in the market. The new Gas Committee are so satisfied with the quality of coals that they have reduced the cannell, and increased the coal, in their manufacture of gas. Had the coals been bad, more cannell would have been required, instead of less. The purity of gas does not altogether depend upon the material used; but it is a question of purifying. It matters little what the quality of the material may be, so long as the purifying process is complete. The illuminating power does depend upon the material used, and during the late management there was very little fault to be found with the candle power of the gas they produced.

The new management have chosen to make gas after the Birmingham school—more coal and less cannell; but this is a question of policy not honesty. Coal may make as much gas per ton as cannell; but it has not the illuminating power, and costs more to purify. The consumer, to have the same light, must increase his burners, and consequently his gas bill; while the profits of the Committee go up nearly 7½d. per 1000 cubic feet.

Mr. Ellis Lever has also made the following statement, or is reported to have done so, to an interviewer from the *Pendleton Reporter*—viz., "That he offered to supply the Committee; and had they taken his tenders, it would have saved the ratepayers £25,000." Having the tenders in my possession, I find the following are the facts:—The Gas Committee required 50,000 tons of coal each year for three years. Mr. Lever offered only 10,000 tons of coal for two years—that is, he offered 20,000 tons, where the Committee wanted 150,000 tons. As to price, his quotation was 9s. 6d. per ton. In no single instance was any tender at 9s. 6d. considered. The average price paid by the Committee was 8s. 8d. per ton; and the gas-producing power and residuals of the average purchases are equal to Mr. Lever's coal offered. The Committee thus saved £6580, by not giving Mr. Lever the order, even if he *could* have delivered it. Of cannell the Committee wanted 40,000 tons each year for three years. It so happened that this was what Mr. Lever had to offer. But the average price of Mr. Lever's was 13s.; and the Committee bought a much superior average at 12s. 9d.—thereby saving

£1500, or a saving altogether of nearly £8000, instead of a loss of £25,000.

When Mr. Lever made this statement I wonder if he had calculated that it is nearly 2s. per ton on the whole 270,000 tons purchased. A margin of from 2s. to 3s. per ton for profit and lubrication to the fortunate contractors is very comfortable. Perhaps Mr. Lever is used to it.

Mr. Lever's charges against individuals and corporate bodies are very numerous and grave. He evidently does not live in a glass house, hence he can safely throw stones, besides working through agencies divers and dark. Will Mr. Lever answer the following?

1. Is not Mr. Fox, who has distinguished himself at Halifax, in your employ?
2. Have you ever paid tips or commissions to gas officials?
3. Have you not paid such to Mr. Samuel Hunter, as well as to Manchester Gas-Works officials?
4. Did not both yourself and your daughter, Mrs. Church, offer to Mr. Hunter and family the use of your Colwyn Bay house free of charge, prior to the letting of the last contracts—1886? Also did you not offer him a large commission if he would secure you an order from his Committee?
5. Did you not pay Mr. Hunter a sum of money to withdraw his former action against you in the Civil Court, besides sending a cheque to the Wesleyan Chapel at Pendleton, where Mr. Hunter attended?
6. Is it not true that where you have made charges against either the Gas Manager or the Committee, Mr. E. G. Wrigley has been supplying that Committee? and that the origin of all the troubles in Salford was the refusal of Hunter to work with you, and against Mr. Wrigley?
7. Is it not your candid opinion that Mr. Hunter would not now have been in prison if he had kept friends with you and done as you wished him?

Albany Square, Pendleton, Nov. 23, 1888.

JAMES WARD.

THE POSITION OF GAS INSTITUTE MEMBERS.

SIR,—Upon reference to the rules of The Gas Institute, I infer that any member wishing to retire therefrom must give notice of his intention of so doing before the 1st of January in any year, or he will be held liable for his subscription for the next year. In August last, a circular was addressed to the members, asking them to refrain from resigning, as an extraordinary meeting would be held in the course of the autumn. The Council having since resolved not to hold such meeting, but to let matters, *re* Bray, stand over to the June meeting of next year, I should like to know in what position the members now stand as regards such notice of resignation as above stated.

I do not intend paying my guinea subscription, and expenses in travelling several hundred miles to participate in such disgraceful proceedings as have of late years taken place, to the discredit of the Institute. Cannot Mr. Bray be induced—now that the (to him) obnoxious members have resigned, and he being still declared a member—gracefully to promise not again to refer to a matter which has been distasteful to most of the members, and thus restore the harmony which formerly prevailed at these annual gatherings?

Nov. 22, 1888.

A PROVINCIAL MEMBER.

GASHOLDER CONSTRUCTION.

SIR,—My admittedly novel proposal for gasholder construction having received so much attention from the gas world, it may seem to some that I need not trouble to object to any little inaccuracies of description thereof. When, however, it comes to a comparison of my invention with another proposal, the suggestion for which it is admitted was taken from my own, I think it only right that inaccurate expressions of the more important kind, whether arising from bias or carelessness, should be put right.

In your summary of the meeting of the Southern District Association, appearing in the *JOURNAL* for Nov. 13 last, you say that "Mr. Livesey in turn demonstrates that the effect of Mr. Gadd's *long* spirals, going a *long* way round the tank, may be gained," &c. The italics are mine, and serve to show how the art of judicious tautology may be employed, so as to create an unfavourable prejudice. The inclined guides I propose to employ in practice, and have illustrated in my models, can in no sense be called "*long*" spirals, neither do they go a "*long*" way round the tank. As a matter of fact, an inclination for the rails of 45° forms a very short or quick spiral indeed; while one of 60°, of course, is shorter still, and goes a very little distance along the circumference of the tank.

With regard to making exceedingly short spiral guides in alternate directions, as I explained at the meeting, I had experimented with such to a modified size. I had not shortened the spiral to the extent proposed by Mr. Livesey, although I confess I am at a loss to see how very short spiral or inclined guides—being a matter of degree only—can form a new invention after spiral guides in alternation, or whatever size, have once been employed for the same object. If a holder turns on its central axis, and at the same time is raised or lowered, it will take some kind of spiral motion; and *inclined* guides of some description must be used. Perhaps we shall see presently some person proposing to reduce the length of the inclined guides for alternate motion to a still greater extent, and thereby making a supposed departure from Mr. Livesey's proposal. On this head I may fall back on the old adage that, "Imitation is the sincerest form of flattery."

I see, by the letter which appears in this week's *JOURNAL* (p. 897), that Mr. H. E. Jones thinks there is extreme liability to jam when the holder is flattened by side wind pressure. I find it difficult to quite realize the precise meaning Mr. Jones wishes to put on the word "flattened." Of course, if the holder were flattened to the extent of producing a major diameter greater than the diameter of the tank, it certainly would jam; and so I opine would any gasholder. Has this ever occurred? Short of this catastrophe, general or local flattening—supposing such to be possible—would not interfere, provided the bottom ring remained, with the rise and fall of a holder constructed in accordance with my invention.

Mr. Jones has also a difficulty as to submergence of the rollers; but are not all bottom rollers submerged? Nevertheless, I can assure Mr.

Jones that my rollers are not very particular about adjustment; and an inch or so of play between the rollers and guides will not trouble a holder the least in its working or stability. If it be esteemed necessary to readily get at the rollers, they may be arranged round the top of the tank, free of the water altogether, as has already been shown.

So far as I can see, the sole legitimate doubt is that so fairly put forward by Mr. Cripps at the Southern Association meeting—viz., the resisting power of the holder to the distorting tendency of the transverse strains induced by wind pressure. On this head I hope shortly to be able to report the results of certain experiments actually made with the model, and also some others which will, I think, throw some light on the subject.

I am further hopeful it will not be very long before all concerned may be able to see a working holder on a practical scale, when the question will once for all be set at rest.

Manchester, Nov. 23, 1888.

W. GADD.

[The question of the accuracy of our comments upon the positions respectively occupied by Mr. Gadd's and Mr. Livesey's suggestions for guiding gasholders, must be decided by individual judgment. We can, however, and do distinctly repudiate the imputation in the second paragraph of the above letter, that in these comments we employed "the art of judicious tautology," with or without intent, to "create an unfavourable prejudice." We remain most deplorably ignorant of the existence of any "art of judicious tautology;" while pleading guilty to occasional indulgence in repetition of particular words, when the object is to emphasize a line of argument or to make an explanation specially clear. Mr. Gadd objects to our distinguishing his suggestion as a system of "long spirals;" yet he is fain to admit that Mr. Livesey's proposal is for "very short spiral or inclined guides"—much shorter, in fact, than he had ever attempted to make his own inclined tank guides. Where, then, is the error in our description of the difference between the two suggestions? We cannot profess to enlighten Mr. Gadd as to the degree of difference between two inventions, aiming at the same object, that may be legally held sufficient to constitute their independence. All that we can say is that we have tried to describe, for the benefit of our readers, what we have understood to be the obvious difference in the examples under notice; and if we have unwittingly done so in terms that displease Mr. Gadd, we are sorry for it, while still failing to see the heinousness of our language.—Ed. J.G.L.]

WATER BY MEASURE.

SIR,—“Positive” says that I have “not yet added anything to the discussion,” and he invites me to describe the meter on which my “conclusions,” as he correctly infers, “appear entirely to hinge.” The reasonableness of my position in basing my views on the merits of the meter is shown by “Positive” himself; for he says that his experience of low-pressure meters, is that they “are not so accurate as the present positive meters,” whilst all he can say of the latter is that he finds them “sufficiently accurate for all practical purposes.”

Previous to the enactment of the Act for regulating measures used in sales of gas, it was frequently said that gas-meters were “sufficiently accurate for all practical purposes;” but the Legislature brushed aside this vague expression, and prescribed the amount of error that would in future be allowed. This was declared to be 5 per cent.—2 per cent. in favour of the seller, and 3 per cent. in favour of the buyer; and we know that this has proved sufficient.

Now, if such a rule were applied to the water-meters “Positive” refers to, would they, one and all, or any of them, comply with it? If they would not, I, for one, would not consider them “sufficiently accurate for all practical purposes.” But, as has been rightly inferred, I have in view a meter which does comply with these conditions, and that too, under all possible variations as to quantity, between the full supply and the smallest drop. I shall therefore avail myself of your kind permission to send a description of this meter for an early number of the JOURNAL; and I am glad to learn from “Positive” that this will be “exceedingly interesting to all concerned.”

“Positive” says, “It is quite evident that ‘True Measure’ has not had experience, or he would not advocate meters at the end of a service;” and he adds that “gas men would not do that.” Now, is it not “Positive” whose “experience” is deficient? For do not “gas men,” in the majority of instances, do the very thing “Positive” says they “would not”? Is the gas-meter not, usually, placed at the end of the service? And has not the consumer full control of the pipes and fittings beyond it?

I may safely dismiss the suggestion of “Positive” that, with a meter on the end of the service—i.e., at the ball-valve of the cistern—pipes would be led from the service (behind the meter), and water would, through these, be stolen. There is no more reason to apprehend this in the case of water-meters than in the case of gas-meters; and whenever such a thing occurs in connection with the latter, gas companies know how to deal with it, and water companies would be no less equal to the occasion.

Nov. 23, 1888.

TRUE MEASURE.

A NEW WATER SCHEME FOR BARROW.—The General Purposes Committee of the Barrow Town Council have decided to promote in the next session of Parliament a Bill to empower the Corporation to take water from the River Duddon, and to construct weirs, settling ponds, conduits, &c. It is estimated that this work will cost £50,000. The reason the Corporation are promoting this Bill is because the Barrow Steel Company are requiring a further supply of water, which they are unable at present to obtain from the town's water supply; and, consequently, they propose to bring their own supply from the Duddon, unless the Corporation will agree to certain terms which at present are refused. Consequently, two separate schemes are being promoted for one object; but it is likely that a compromise will be effected, and that the supply will be provided by the Corporation.

Legal Intelligence.

HALIFAX BOROUGH COURT.—TUESDAY, NOV. 20.

(Before Mr. B. W. JACKSON and Mr. E. M. WAVELL.)

PROSECUTION OF THE LATE GAS-WORKS MANAGER.

This morning, Mr. William Carr, late Engineer and Manager of the Corporation gas undertaking was brought before the Court, having been arrested on a warrant issued at the instance of the municipal authorities. The warrant specified that “the said William Carr, then being Manager of the gas-works of a body corporate—to wit, the Halifax Corporation—unlawfully did, with intent to defraud, mutilate a certain book belonging to the said body corporate.”

The TOWN CLERK (Mr. Keighley Walton) appeared for the prosecution; Mr. WALTER STOREY defended.

The TOWN CLERK stated that the proceedings were taken under sec. 63 of the Act 24 and 25 Vict. cap. 96. He was not prepared to go into the case that morning, as Mr. Carr had only just been arrested; but he might state shortly that he would be charged with tearing out of a book belonging to the Corporation 79 pages. The pages contained very valuable information; and the absence of this information would prevent the Corporation from getting to the bottom of the “gas scandal.” He applied for a remand till the following Friday, and if necessary would call the Borough Accountant, Mr. Nichol.

Mr. STOREY (interrupting) said he did not object to the application at all. Mr. Carr, who had been in the South of England for a time, returned the previous Friday. He was in the town on Friday night, and had been about ever since. All sorts of rumours had been afloat—rumours that Mr. Carr was about to go to India, and other statements equally devoid of foundation. Mr. Carr was prepared to meet any charges preferred against him in the fullest manner at the proper time. He asked the Magistrates to fix bail; for there were many gentlemen in the town who had still confidence in Mr. Carr, and were ready to come forward as sureties.

Mr. WAVELL observed that the remand was only until Friday.

Mr. STOREY urged that the affair of the missing leaves was made public two months ago. Therefore, if Mr. Carr had wished to go away, he could have done so.

The TOWN CLERK said it was quite true that they knew about the missing leaves two months ago; but they did not until quite recently see the importance of the information which the leaves contained. Something had recently occurred of a very serious nature indeed, which rendered it most important that they should have these papers. They were more wishful to have the missing papers than that Mr. Carr should be punished.

Mr. WAVELL said the Bench as yet knew very little of the matter; but from what had been made public in the papers, the question as a whole was a very grave one indeed.

Mr. STOREY protested that statements in the newspapers ought not to influence the Bench.

The TOWN CLERK said he had no objection to bail.

The CHAIRMAN (Mr. Jackson) said that Mr. Wavell's remarks appeared to have been misunderstood by Mr. Storey.

After a short consultation, the Bench fixed bail—the accused in £500, and two sureties of £250 each.

FRIDAY, NOV. 23.

(Before Mr. E. M. WAVELL, Chairman, and Messrs. ARNOLD, WHITELEY, and HIGHLEY.)

MR. CARR COMMITTED FOR TRIAL.

Examination into the matter mentioned above was continued this morning.

Mr. BANKS, instructed by the Town Clerk (Mr. Keighley Walton), represented the Corporation; and Mr. McKEAND, instructed by Mr. Storey, appeared in defence.

Mr. BANKS, in opening the case, said he would state the facts very shortly. Mr. Carr was for some time Gas Manager to the Halifax Corporation; and on Sept. 28 last he was in possession of a copying-book which belonged to the Corporation. Some 79 pages of this book had been used for the purpose of copying gas tests; and on Sept. 28, the prisoner ordered a man named Milner—a clerk under him—to cut out the whole of these gas tests from the book. The following day, Carr left his situation. He (Mr. Banks) submitted that on these facts he should be entitled to ask their Worships to commit Mr. Carr on one or other of the two charges—or both—which he would quote. Under Vict. 24 and 25, cap. 96, sec. 83, he would submit that Mr. Carr did, being a public officer of a body corporate, mutilate a book belonging to that body corporate, with intent to defraud, although, of course, the question of intent to defraud was clearly a matter for a jury. The other section which he submitted would meet his case was the 67th section of the same statute, which set forth that any servant stealing a document should be guilty of a felony. As to the question of value, it was perfectly clear that the sheets had been taken; and if they were of no value, why should they have been torn out of the book? It was clear that they would have been of some value to the Corporation if they had been left there; and it was equally clear that they were of some value to the prisoner, who had taken them away. He would call the Borough Accountant to prove the ownership of the book; and then the clerk whom the prisoner instructed to remove the sheets.

Mr. James Nichol, Borough Accountant, said that he had held his present position for nearly thirteen years, and knew Mr. Carr as the late Gas Engineer and Manager to the Halifax Corporation. The foolscap copying-book produced was used at the gas-office, and was the property of the Halifax Corporation. The book was purchased in February, 1876, and had been in use since that time. He identified the letters produced, one from the Town Clerk asking for certain tests, and the other a reply from the prisoner informing the Town Clerk that he had not got the tests spoken of—that they had been submitted to the Committee, and he had not seen them since.

Cross-examined: The copying-book had been in Mr. Carr's possession from the time it was bought. He did not know that the book contained private analyses of coal made by Mr. Carr. There were 79 pages missing. He knew that Mr. Carr was allowed to make private analyses of coal submitted to him, unconnected with the Corporation altogether; and these private analyses would not have anything to do with the Corporation funds or with Corporation affairs.

Mr. J. Milner, Chief Clerk in the Corporation Gas Offices, deposed to having torn a number of leaves out of the copying-book, at Mr. Carr's request, on Sept. 28.

Mr. BANKS: What did Mr. Carr say to you?

Witness: He told me to take the coal tests out of the book.

Can you tell us how many pages you took out?—I cannot say. I was asked the question before; and I thought about 20 or 30, but could not tell.

Why did you select those sheets?—Because Mr. Carr told me.

Were those all the coal tests you could find?—Yes.

By the MAGISTRATES' CLERK: I gave the pages to Mr. Carr. As far as I can say, the book was intact before I commenced to take out the leaves.

Examination resumed, witness said that all the sheets he took out of the book were coal tests; and they were in his (witness's) own handwriting.

Mr. BANKS, at this point, said he would like to make one matter a little more clear. In a letter of the 28th of September last, Mr. Carr, in answer to a letter from the Town Clerk, asking him to forward the coal tests referred to in the report of June 1, said that he had not got them. On the following day the sheets were gone from the copying-book.

Cross-examined: Witness said he knew that Mr. Carr made private analyses; but he did not know that he did so with the consent of the Corporation. He found out after Mr. Carr had gone away that Mr. Berry, Alderman Midgley, and Alderman Riley were cognizant of his having made private tests. The surplus coal that was left after a private analysis had been made went to the Corporation.

Mr. M'KEAND: The pages which you tore out of the book related entirely, did they not, to private analyses?

Witness: I do not know, Sir.

What did he tell you to tear out of the book?—He told me to tear out the coal tests.

And you know that the coal tests you tore out were all private ones?—No, I do not.

There is one of the leaves (produced). As far as you know, it refers to a private analysis?—Yes, Sir.

Has it anything to do with Corporation business or funds?—The Corporation have never had any dealings with the person mentioned.

I will not put the whole of the sheets in; but only a few for the purposes of this cross-examination. That sheet marked "G" is also a private one?—Yes; this appears to be a private test.

Is the sheet marked "H" a private test?—Yes.

You used to copy these things?—Yes, Sir.

Did you ever yourself make a mess in copying these things, and have to tear a leaf out?—Yes, Sir.

Can you tell us, roughly speaking, how often you suppose that will have happened during the last twelve years?—I cannot say.

It might have happened eight or nine times?—It might; it is impossible to tell exactly.

You remember the tests referred to in the letter which has been mentioned?—Yes.

Had the tests referred to in the letter anything to do with the tests I produce to-day?—No.

Mr. M'KEAND (addressing the Bench) called attention to this last admission, and asked that it should be inserted in the depositions. Otherwise it would appear, from the letters, that the prisoner had told a deliberate falsehood.

The MAGISTRATES' CLERK said the Court was dealing with the question of mutilation. It would be for a jury to say whether there had been any fraudulent intent.

The CHAIRMAN said he took it that the duty of the Bench was to decide on the question of mutilation; and, if there were reasonable evidence, to then send the case on to another tribunal for further consideration.

Mr. BANKS: The witness was told to take out the coal tests, and he took out all the coal tests he could find.

The CHAIRMAN: He speaks to 20 or 30 sheets; while you refer to 79.

Mr. BANKS: That is his recollection of what he took out. I submit there is a strong presumption, which it is for the defendant to rebut, and which he must rebut before a jury. He is asked for the coal tests; and the very next day he tells this witness to take every coal test out of the book. Here is the book; and every coal test is gone. That is mutilation; and there is really no other inference to be drawn but fraudulent intent.

The CHAIRMAN: Do you propose to give any evidence as to the importance of these leaves?

Mr. BANKS said it would be some time before the trial came on, should the Bench choose to commit; and the interval would be spent by those who instructed him in strengthening the case in every way they could.

Mr. M'KEAND: You ought to do it to-day.

Mr. BANKS: Not necessarily. You shall have notice of all evidence in the usual way.

The CHAIRMAN asked the extent of the transactions which the missing sheets covered.

Mr. BANKS: Our discoveries are only very recent; but I believe the amounts are very large.

The CHAIRMAN suggested that it would have been the fairest course towards the defendant to have put in any general evidence which was in possession of the prosecution.

Mr. BANKS said the defendant should have notice of it as soon as possible.

Mr. M'KEAND: That is cruel.

Mr. BANKS submitted that the prosecution had made out a case of mutilation, and also of larceny.

Mr. M'KEAND said he believed that the rules observed at that Court would not allow him to go into the facts; but he would like to address a few observations to the Bench on points of law. He submitted that there was no case to go to a jury. His first argument might perhaps sound ridiculous at the outset; but he did not mean it to be so. He contended that there was no evidence of the existence of the Corporation of Halifax; and it was necessary, for the purpose of a criminal trial, that there should be a certificate of incorporation put in by a proper person to show that in fact the Corporation did exist. He had successfully upheld that objection over and over again; and he trusted that he should succeed once more. Apart from that, he had to urge that, unless they had some evidence to show that there was intent to defraud, there was no evidence to go to a jury. The inference drawn by the prosecution was that because the defendant had mutilated a book, therefore he had mutilated it with intent to defraud. But his friend was not in a position to call any witnesses to connect the transactions of the Corporation with the leaves which had been torn out; and this being so, there was absolutely no evidence of any intent to defraud. Mr. Carr was willing, and, indeed, he desired, to court the fullest investigation, because they had no fear of the issue, whether disposed of there or at the Assizes. He would be set right in the eyes of the public of Halifax, he was perfectly confident; but, under the circumstances, it was a cruel thing that a gentleman in his position should be kept waiting for his trial on such a serious charge. He (Mr. M'Keand) would wait the decision of the Bench with confidence, only observing that he could and would produce every one of the sheets about which complaint was made.

Mr. BANKS: That will be a question for the jury.

The Magistrates then retired for a few minutes; and on returning into Court,

The CHAIRMAN said they had decided to send the case for trial.

On being asked if he had anything to say, Mr. Carr intimated that he would reserve his defence.

Mr. M'KEAND: I suppose the Bench will allow Mr. Carr out on the same bail as before?

The CHAIRMAN: I should be glad if Mr. Banks could give me any idea, from general figures, of the amount of the transactions which these 79 sheets cover.

Mr. BANKS: It is almost impossible to say.

The CHAIRMAN: Is it tens of thousands?

Mr. BANKS: It may be; but that we cannot say. The amount must be very large.

The CHAIRMAN: The question of bail is always regulated by the circumstances of the case. In this case, as it is not opposed, the Bench will accept bail—Mr. Carr himself in £2000, and two sureties of £1000 each.

Mr. Carr was then formally committed to take his trial at the next Leeds Assizes.

At the close of the remaining business before the Bench,

Mr. STOREY said there were two or three gentlemen who would be willing to act as sureties for Mr. Carr, but only one was in Court. One was in Leeds, and another was in bed with rheumatism, but he was willing to attend as soon as possible. He (Mr. Storey) suggested that Mr. Carr should remain where he was until his sureties were able to attend. The latter would be men who would satisfy the Town Clerk and the Chief Constable.

The CHAIRMAN asked if it was not usual in such cases for the other side to concur in the bail offered.

Mr. STOREY said that was so; and he submitted that, the Chief Constable and the Town Clerk being satisfied, the rule was to allow the accused his liberty. To be sure, the Bench could make any rule they pleased.

The CHAIRMAN asked if it was not necessary that this should be done before a Justice.

Mr. STOREY said undoubtedly it was necessary; but any Justice would do.

The CHAIRMAN: You will, of course, take one who is not a member of the Town Council?

Mr. STOREY: Oh yes.

The CHIEF CONSTABLE said he thought it might be arranged during the afternoon or evening.

Among the witnesses said to have been subpoenaed by Mr. Carr, were Alderman Riley, Alderman Midgley, Mr. William Berry (three ex-Chairmen of the Gas Committee), and the Town Clerk; but as the defence was not entered upon they were not called. It is understood the three ex-Chairmen would have been called to show that it was customary for Gas Managers to be allowed to make private tests of coal.

Later in the afternoon, Mr. W. Longbottom and Mr. W. Swale offered themselves as sureties for Mr. Carr, and were accepted.

WESTMINSTER COUNTY COURT.—THURSDAY, NOV. 15.

(Before Mr. FRANCIS BAXLEY, Judge.)

THE GASLIGHT AND COKE COMPANY v. NORTHFIELD.

In this case, the point in dispute was as to whether or not it is necessary for a consumer to give notice in writing to the Company supplying him of his intention to discontinue the use of gas. The amount claimed by the Company was £1; being the value of gas consumed on the premises in question from April to August of this year.

Defendant stated that he left the premises referred to in 1880, and he informed the Company's collector of the fact. Since then the place had been let to two different tenants, whose names had been put up over the shop. He had been a customer of the Company for 40 years; and he believed he was doing what was right when he told the collector that he was leaving the place.

On behalf of the plaintiffs, it was pointed out that, under the Act of Parliament, it was necessary that notice to discontinue the supply of gas should be given to the Company in writing; and this was stated on the card which was left with each consumer.

His Honour, after referring to the Act, said that the defendant must pay the amount claimed—a written notice ought to have been given to the Company.

THE GASLIGHT AND COKE COMPANY v. HUSSEY.—A DEPOSIT QUESTION.

This was an action to recover £7 13s. 6d. from the defendant, who carries on business in Mare Street, Hackney, for gas consumed between Nov. 11, 1887, and June 19, 1888. The Company allowed £3 off this amount—being the sum paid by defendant as a deposit. The claim was admitted; but the defendant made a counter-claim for damage caused through the Company cutting off the supply without proper reason.

Mr. W. Barker stated that he made the contract on behalf of the Company to supply gas to the defendant's shop. He took £3 as deposit. The contract stated that the £3 would be deducted from "a" winter's quarter. A day or two before the contract was signed, he wrote a letter to the defendant, in which he said the deposit would "be returned on the winter's quarter." The word "the" was put in instead of "a" by mistake.

Defendant said that he forwarded to the Company the amount for the gas consumed, less the £3 paid as deposit; and it was returned. He sent it again; and it was returned. Soon after this the Company cut off the supply; and it caused him great inconvenience. He would not have signed the contract, unless the deposit was credited to him on the first quarter, as that was the winter quarter.

His Honour said it was clear that Barker had made a mistake in his letter, by writing the word "the" for "a;" and there must be a verdict for the plaintiffs on the claim and counter-claim.

FRIDAY, NOV. 16.

THE GASLIGHT AND COKE COMPANY v. LEACH.

In this case the amount sued for was £8; being for gas supplied to Messrs. Leach and Co., Wine Merchants, of Charterhouse Street.

On behalf of the Company, it was stated that the contract to supply the above-named firm with gas was entered into in 1878; and they held them liable for the gas consumed.

For the defence, it was alleged that in the year 1879 Mr. Leach left the firm, and gave notice to this effect to the Company; and the account now sued for was for gas consumed after his interest in the firm had ceased. When he left Charterhouse Street, he took offices in Fenchurch Street, and the Company supplied him with gas there; nothing being said as to the account at Charterhouse Street. He had never attempted to evade payment, because he did not consider he was liable; in fact, he knew nothing as to the amount of gas used after he left.

His Honour said he was not satisfied with the evidence; and he would therefore adjourn the case for the production of books and documents.

NEW RESERVOIR FOR THE HOBART WATER-WORKS (N.Z.).—The formal opening of the storage reservoir of the Hobart Corporation Water-Works, New Zealand, was celebrated a short time since. The reservoir, which was full to overflowing, contained 47 million gallons of water, which will be only drawn upon when the ordinary supply from Mount Wellington runs short. The cost of the work was £40,000.

Miscellaneous News.

SALFORD CORPORATION GAS SUPPLY.

THE HUNTER CASE.—THE GAS COMMITTEE AND THE PRESS.—MR. ELLIS LEVER'S CHARGES AGAINST THE DEPARTMENT.

At the Adjourned Quarterly Meeting of the Salford Town Council last Wednesday—the Mayor (Mr. Alderman A. L. Dickens) presiding—the above-named matters were under consideration.

Mr. LORD, Chairman of the Gas Committee, moved—"That, as recommended by the General Purposes Committee, a previous resolution appointing eight members of the Council to form a Consultative Committee in relation to the matters pending in connection with the Hunter case be rescinded, and that the Mayor and four members of the Council form the Committee."

Alderman HALL seconded the motion.

Mr. RYCKOFF proposed an amendment to the effect that the Committee consist of six members of the Council and the Mayor *ex officio*. He remarked that the Committee being a General Committee, it could not legally be composed in the manner suggested. Each district of the Council, he maintained, ought to have an equal representation on such a Committee. His object in moving the amendment was that Mr. Hewitt and himself might be placed on the Committee. When the Investigation Committee was being dissolved, he desired to be placed on the Consultative Committee; and the Investigation Committee in the first instance nominated Mr. Hewitt and himself as members of the Committee. But—under the influence of the late Town Clerk, he believed—Mr. Hewitt, himself, and Mr. Mandley were excluded from the Committee. However, he did not complain of the past. As the questions which would come before the Committee involved legal points, he thought Mr. Hewitt and himself, being members of the legal profession, ought to be on the Committee, so that they might give as much assistance as they could to the Committee and to the Town Clerk. In the past the Consultative Committee had been oblivious to what was going on; and were only called together when it suited the late Town Clerk. He wished to have a Consultative Committee which would endeavour to understand the position of matters, and do its work promptly, and with decision.

The Mayor assured the Council that it was desirable that things should be done quietly, and that the Committee should be as small as possible. Information had been conveyed to him since the last Consultative Committee meeting, which showed him very clearly that the result of the appointment of a large Committee would simply be to undo the work that was being done. The important information which would by-and-by be placed before the Council would show that the Committee had done its work.

Mr. DAVIS seconded the amendment.

After a short discussion, the vote was taken, when 26 were in favour of the amendment and 21 against. The amendment was then put as a substantive resolution, and adopted.

The Council then appointed the Committee "in relation to the matters pending in the civil action against Samuel Hunter;" and they were authorized "to take such legal or other proceedings as they may think fit in all matters that may arise in such action or actions, reporting from time to time their proceedings to this Council." The Committee consists of Alderman Husband, Mr. Phillips, Alderman McKerrow, Mr. Hewitt, Alderman Walmsley, and Mr. Ryckoff.

In reply to a question, it was stated that the Committee would have power to start an action against a coal contractor.

Mr. RUSSELL next moved—"That inasmuch as it is desirable that the ratepayers should know more about the Council proceedings, the General Gas Committee be and is hereby instructed to admit to their General Committee meetings the responsible representatives of the local and district press, on the understanding that it be in the power of a majority of the members then present to declare any matter before them to be private, and to consider the same during or without the presence of the reporters as they may see fit." He considered the time had arrived when something ought to be done in the direction he had indicated. Past affairs connected with the gas-works had occupied a good deal of attention lately; and he thought that it was desirable they should attend still more closely to present affairs. He believed the ratepayers wished for, and were entitled to more information than they had at present with regard to the work of the Gas Department. With more publicity, the members of the Committee would receive greater credit for, and more support in their work than they did just now. Rightly or wrongly, Salford was under a cloud, and the Gas Department in particular; and he believed publicity would do much to clear away this cloud. With regard to recent proceedings connected with coal contracts, with the question of stokers' wages, and other matters, publicity would have saved a good deal of misapprehension.

Mr. RUDMAN seconded the motion.

Alderman BROWN observed that, while Mr. Russell had put the matter in a fair and reasonable way, in his opinion, a wiser plan than that proposed would be for each Committee to take its own special circumstances into consideration, and decide for or against reporters being present. He moved, as an amendment, that the matter be referred to the Gas Committee for consideration.

Alderman MCKERROW, in seconding the amendment, said they had had experience of the presence of reporters at meetings of the other Committees of the Corporation. He did not say that any serious mischief had arisen from it; but he certainly felt that any advantage there had been connected with the opening of the Committees had been counterbalanced by the inconvenience which had been occasioned. He thought that of all the Committees of the Corporation, the one that was most likely to have delicate matters to negotiate—such matters, for instance, as the coal contracts and the selling of the bye-products—was the Gas Committee; and this being so, he thought Mr. Brown's proposal was a reasonable one. As a matter of policy, he thought it was inexpedient to admit reporters.

Mr. ROGER supported the amendment, and expressed a hope that the Gas Committee would decide to adopt the proposal in the resolution.

Mr. LORD said he was not unwilling that the question should come before the Gas Committee; but personally he agreed with Alderman McKerrow that as a matter of expediency, and in the interests of the ratepayers, it was better their proceedings should not be reported.

The amendment was adopted.

Mr. PHILLIPS subsequently said he desired to know whether any further communication had taken place with Mr. Ellis Lever with the view of obtaining from him the information which, in his letter to the local papers, he offered to communicate to a Committee. On Oct. 31, the Council adopted a resolution he proposed, accepting Mr. Lever's offer; but Mr. Lever had refused to go on because of certain statements with which the resolution was weighted—because of the Mayor's declaration that he would take care to be present, and that there would be shorthand notes taken of all that took place. He thought it was most desirable to

get to the bottom of the statements which had been made by Mr. Lever; and this being so, he wished to know whether the Mayor and the Council would not accept Mr. Lever's terms pure and simple, and allow him to make his communication to the three gentlemen who might be appointed.

The Mayor said he would be prepared to agree with Mr. Lever to the extent of dispensing with the shorthand writer; but if Mr. Lever met the Committee in the Town Hall, he would insist upon his right as Mayor to be present.

Alderman WALMSLEY hoped the Mayor would be present at any meeting of the Committee appointed.

The Mayor observed that if the persons chosen met outside the Town Hall, the matter would be different; but if they met there, he must be present.

It was then resolved, on the motion of Mr. RUDMAN, seconded by Mr. ROBINSON, to accept Mr. Lever's terms unconditionally.

THE BLYTH GAS COMPANY AND THE COWPEN LOCAL BOARD.

THE PUBLIC LIGHTING QUESTION.

In the JOURNAL for the 6th inst. (page 815), we briefly noticed an extraordinary meeting of the Blyth Gas Company, which had been convened for the purpose of considering the dispute that has arisen between the Directors and the Cowpen Local Board. A resolution was then passed, to the effect that an offer should be made to the Board to elect three of their number to meet an equal number appointed by the shareholders of the Company to discuss the matters at issue between the two bodies. At the succeeding meeting of the Local Board, the Clerk read two letters from the Gas Company, in which it was stated that they had appointed Messrs. Lynn, Walker, and Keenlyside as a deputation to meet a Committee of the Board. He also announced that these three gentlemen were in attendance. It was agreed to at once hear the statement of the deputation. On entering, Mr. Lynn (speaking on behalf of himself and his two colleagues) briefly referred to the proceedings at the meeting of the Company at which they were appointed to discuss the matters in dispute with a Committee of the Board; but to save time the deputation had decided to wait upon the Board that day. He had to ask them to re-open the negotiations which had been so abruptly closed; and he was sure that if they were inclined—and he did not anticipate any difficulty—they could bring the matter to a satisfactory termination. The unfortunate dispute, he believed, first arose with regard to the purchase of the lamps; and he found in the report of the Board's meeting that there was an offer made by the Board's Committee of 30s. per lamp all round. This offer the Company then refused. To show, however, that they were now prepared to waive everything they possibly could, and to avoid any question of arbitration, they would sell them at the Board's own price. He thought that this was as far as they could go in the first instance. In the discussion which ensued, the Chairman (Mr. W. Robinson) said that the whole of the ratepayers were against buying the lamps; and he thought the only thing which would meet the case would be a reduction in the price of gas, and a cheap rate for the public lighting during the remainder of the season. To this Mr. Lynn replied that the Company had very carefully considered the lighting of the district for the remainder of the season; and they had arrived at a lump sum, which was the lowest they could possibly do it for. At the meeting of the shareholders, he understood that there was no dispute as to the price of the gas; but he would take it upon himself, on behalf of the shareholders, to say that they would supply the Board with gas at 15 per cent. below the ordinary price. Certain members of the Board said that they should object to this arrangement, unless some concession was also made to the consumers. After further discussion, Mr. Lynn expressed the willingness of the Company to light the district for the remainder of the lighting season—from Nov. 22 to May 15 next—for £258 net; but he was not prepared to say that the Company would afterwards continue on these terms. The Chairman promised that the suggestions of the deputation should be considered; and the members then withdrew. A representative of Messrs. Jeunings and Co., electricians, of London, then had an interview with the Board. He said they were prepared to light the town for £600 a year; he gave it as his opinion that 18 electric lamps would suffice. The shortest period for which his Company would tender was seven years.

An Adjourned Meeting of the Local Board was held on the 13th inst.—the CHAIRMAN (Mr. W. Robinson) presiding—to consider the matters referred to above. A communication was read from the deputation of the Gas Company, offering to light the district from Nov. 22 to May 15 next for the sum of £258.

Mr. HEDLEY thought the time was come when they should adopt some mode of lighting the district. They had been in darkness too long; and he believed it was owing to the high price the Gas Company had been charging for their gas. The fact was apparent that other lights could be had more cheaply. He thought there would be improvements in electric lighting; and it would be wise for the Board only to have it for a short time, so that they might probably get better terms with the electric light company which they had been in treaty with for some time. He considered, if the electric light was adopted, it would be to the benefit of the community, and might tend to increase the consumption of gas for other purposes than those which it had been hitherto used for. He moved that the Board adopt the electric light for lighting the district.

Mr. TODD said if Mr. Hedley would move that they should accept the tender of the electric lighting company, he would second it.

Mr. HEDLEY consented to do this.

Mr. TODD seconded the motion. The residents in the district, he said, had been very patient; and he thought that that night the Board should come to some definite conclusion. He believed electricity would be the cheapest illuminant in the long run. This might be questioned; but he pointed to the £390 which gas would cost without the plant, and they would require 50 other lamps if they took Cowpen Colliery into the lighting area. Altogether it would cost about £550. He supported the idea of electricity, on the ground that it was the unanimous wish of the ratepayers that they should have the electric light, and crush the monopoly with which they had been for so many years contending.

Mr. JOBLING desired to point out what he conceived to be the greatest drawback to the adoption of electricity, and that was the seven years' agreement. By it they shut themselves out of all improvement, which they should be careful to watch. If they could by any means reduce the period to a shorter one—say, three years—it would be better for them.

Mr. NIXON suggested that they should try and get better terms for the electric light.

Mr. LEE said he went down one of the back streets during the exhibition of the electric light; and he certainly was not satisfied. He thought the back streets were the most important parts of the town. He also took exception to the seven years' contract, as it was a long time to be tied down. He should like to ascertain whether they could not have the district lighted with oil-lamps.

Mr. HINDMARCH considered that a four years' contract would be more reasonable.

On the motion being put to the vote, it was negatived by 5 votes to 3. Mr. NIXON then moved that a Committee be appointed to confer with the electric light company, to see whether a shorter term than seven years could not be arranged for a contract.

The words, "and with the gas and oil companies" having been inserted, the motion was carried.

It was decided that the Clerk should acknowledge the receipt of the letter from the deputation of the Gas Company, and inform them that it was not satisfactory, and that they could not entertain it.

At a Special Meeting of the Local Board, held last Wednesday—the CHAIRMAN (Mr. W. Robinson) presiding—the public lighting question was again under consideration.

The CHAIRMAN reported that the Committee appointed at the last meeting of the Board had fully considered the subject of public lighting, and had come to the conclusion to recommend the Board to make an offer to Messrs. Nicholson and Jennings. They were to be asked to supply electricity at the rate of £550 per lighting season for 18 arc lamps of 2000-candle power, for a period of five years, subject to conditions and arrangements to be mutually agreed upon; the work to be satisfactorily completed within a period of two months from the date of signing the contract.

Mr. BRYSON inquired whether any counter-proposals had been received from the Gas Company.

The CLERK said they had not. He had had a letter from Mr. Lynn, acknowledging the receipt of the communication which he (the Clerk) was instructed to send him, and expressing regret that the Board could not see their way clear to accept the offer made by the deputation on behalf of the Gas Company, so that the town might be lighted pending negotiations.

Mr. LEE said he thought it was a pity the Gas Company could not see their way to offer terms for three years which might have met with the Board's acceptance.

Mr. TODD moved that the recommendation of the Committee be adopted. Mr. HEDLEY seconded the motion.

Mr. WHITEMAN proposed that the words, "Further, that all arrangements and sanctions necessary from the Board of Trade be obtained by contractors," be added to the recommendation of the Committee.

This proposal having been agreed to, the Committee's recommendation was unanimously adopted.

One of the local papers reports that the Gas Company are removing their lamps and placing them in store; and this action, it says, puts "an element of uncertainty out of the way, it reissues the Company in a position of dignity and self-respect, and is a virtual intimation to the Board that it is at liberty to proceed with its alternative method of lighting."

MOSSLEY CORPORATION GAS SUPPLY.

AUDITOR'S REPORT.—THE LEAKAGE.

At the Meeting of the Mossley Town Council on Thursday, the 15th inst., the Mayor (Mr. Alderman R. S. Buckley) presiding, the Auditors presented a report on the gas accounts for the half year ending Sept. 29 last, in the course of which they stated as follows:—

The total make of gas during the half year, according to the Manager's report, has been 19,704,900 cubic feet. The sales have been as under:—

	Mossley. Cubic Feet.	Saddleworth. Cubic Feet.	Total. Cubic Feet.
Private consumers	7,721,300	5,587,800	13,309,100
Public lamps	705,100	59,200	764,300
Used on works	258,200	—	258,200
Total	8,684,600	5,647,000	14,331,600

leaving a balance unaccounted for of 5,373,300 cubic feet, or 27·27 per cent. on the total make. For the corresponding half year in 1887, the loss or balance unaccounted for was 26·86 per cent. We have before remarked that this loss is exceptionally heavy; and we still think that it requires very careful attention. The following is a comparison of the amounts charged for gas (inclusive of lamps and works) for the corresponding periods of 1886, 1887, and 1888:—

	Half Year ending Sept. 3.		
	1888.	1887.	1886.
Mossley	£1221 4 7	£1193 15 4	£1308 4 10
Saddleworth.	848 9 8	893 9 4	881 5 4
	£2069 14 3	£2077 4 8	£2189 10 2

Although the amount for September, 1888, is slightly less in comparison with September, 1887, there is an actual increase in the consumption of gas—the relative quantities, in cubic feet, being 14,331,600 and 12,926,600; the difference in value arising from the reduction of 4d. per 1000 cubic feet from March 25 last. The arrears of gas-rentals at Sept. 29 amount to £96 16s. 10d., of which £11 8s. 4d. has since been written off as irrecoverable. This compares very favourably with the state of the arrears in September, 1887, when the amount was £227 2s. 11d. New mains have been charged during the half year with £136 3s., being the proportion of the Staveley Coal and Iron Company's invoices of £301 10s., and representing the difference in the cost of the 10-inch, as compared with the 6-inch mains for which they have been substituted in the Saddleworth district.

The Mayor, referring to the increase in the leakage, said it was not more than they expected, because there naturally was a considerable amount of gas lost during the laying of mains. The result of the experiment of putting down larger pipes in Saddleworth had yet to be proved; but it was expected that its effect would be to much reduce the leakage. They were already supplying gas to Saddleworth at lower pressure than at the same time last year, and they were hoping that the leakage would be proportionately reduced. If this did not result, they would have to adopt other and more decided means to reduce it. Of course, it was only during the summer months that it was so heavy. It was not probably half the amount during the winter. Still, unless the leakage was reduced, the anticipations of the Chairman of the Gas Committee this year would not be realized. With respect to the income from the supply of gas, there was one pleasing feature. In 1887 the total receipts from March 25 to Sept. 30 were £2077; and this year they were £2069—a difference of only £8, though during the interval the price had been reduced 4d. per 1000 cubic feet. He thought this a matter for congratulation.

Mr. MARLAND asked if the consumption at the works was registered. They put it down at £48; and he wished to know the basis on which this was calculated.

Mr. J. MAYALL thought the Gas Manager should be instructed to check the consumption in different parts of the district, both Mossley and Saddleworth. It was impossible for 26 per cent. of gas to escape; and it seemed to him it was being consumed without being paid for.

The Mayor said, with regard to the registration of the gas at the works, that Mr. Marland was a member of the Gas Committee, and if the meter was there he should see it. Mr. Mayall was also on the Committee. The point he had mentioned was one that had occupied his (the Mayor's)

attention very seriously. Eighteen months ago he would have called in an expert to ask his opinion as to the loss of gas. It had been in the hands of the Committee, and they decided to put down new and larger mains, and see whether or not they could reduce the waste. They must try this now; but he would have resorted to stronger measures.

THE LONDON COAL DUES.

THE DIVISION OF THIS YEAR'S SURPLUS.

In the course of a long letter, a correspondent of *The Times* last week discussed the subject of the distribution of the present year's surplus of the London Coal Dues. He commenced by pointing out that the Metropolitan Board of Works are not entitled to receive the duties collected in respect of coal brought into London since July 5 last, although the duties remain to be payable till the corresponding date next year. The continuing Act of 1868 specifies that, in the event of there being a surplus, the same is to be applied "as Parliament may hereafter direct." Speculation is already rife as to how Parliament will "direct," and already, as will be seen later on, suggestions have been made as to suitable objects on which to bestow the remaining funds. The duties produce annually about £450,000; and according to a statement prepared and issued last year by the Metropolitan Board of Works, the cost of freeing the bridges—the main purpose of the dues—amounted to £353,618. Consequently, there will be about £100,000 to dispose of, which amount will probably be available somewhere about September next. Any disposition concerning it must, therefore, be made next session. In view of this state of things, two notices have already appeared in which claims are put forward to some portion of the dues. Under one of them it is proposed to apply for an Act to appoint trustees to take charge of the surplus of the London coal and wine dues, and to apply the same, "together with any other moneys that may come to their hands by gift or otherwise," as follows:—"In the purchase of lands, rights, and easements, and for providing the expenses of erecting a monumental chapel or other buildings, in proximity of, or contiguous to Westminster Abbey; the preservation of open spaces within or near to the Metropolis; and generally to apply such surplus, or portion thereof and other moneys in or towards one-half the expenses of such monumental chapel, and other works, public buildings, and improvements within the Metropolis, as defined by the Metropolis Management Act, 1855, or within the area of the Metropolitan Police district, or such objects as will be named in the Bill, or as Parliament shall direct; the other one-half part of the expenses to be incurred in or about such works, public buildings, and improvements being provided from other sources." A second and independent notice contemplates an Act to authorize certain lands and houses at Westminster being purchased, by compulsion if necessary. It is proposed to remove the houses situated in Old Palace-Yard "for the purpose of opening out a view of Westminster Abbey, the Chapter House, and other buildings, and to appropriate a portion of the site so cleared for the erection of a monumental chapel in connection with Westminster Abbey, and in the improvement of the approaches to the Abbey." To aid in effecting these objects it appears to be intended to ask the sanction of Parliament to apply the whole or some part of the surplus coal duties for the present year. These notices, it was remarked, "foreshadow a regular scramble."

Proceeding to explain how the dues are raised, the writer observed that, as is well known, the whole of the Metropolitan Police District contributes to them. This district extends far beyond the Metropolis, and comprises Cheshunt on one side of London and Epsom on the other. "It is not likely," he said, "that the Local Authorities of the extra-Metropolitan district will very quietly stand by and see the surplus duties of the present year appropriated to improvements in Westminster. It is true that the toll bridges which are freed by the present year's duties are not bridges which afford much convenience to the City or to the Westminster ratepayers; but on the other hand, the coal consumers in the extra-Metropolitan districts have for many years contributed to the duties which have been exclusively laid out within the Metropolis. It may, at any rate, be fairly argued that, as the Legislature only gave the Metropolitan Board of Works the coal duties up to the 5th of July, 1888, and then partially appropriated the duties for the following year, it was considered that the Metropolis had received all the benefit it was entitled to from the coal duties levied for a great number of years over a large outside area. Another question may arise in connection with this surplus. The Act of 1868 is not very clearly drawn; and it will be open to the Corporation of the City to urge that the surplus wholly belongs to them. Their right to this depends upon the construction of the Act of 1868 and preceding enactments. Although, however, the question of interpretation may be discussed, there can be little doubt that Parliament will consider that it is able to exercise the power, which in 1868 it reserved to itself, of dealing with the surplus as it should 'hereafter direct.' When, in the early part of the present year, the Metropolitan Board and City Corporation offered the Local Authorities of the outside area a tempting bait if only they would help them in getting the coal duties re-imposed, a statement was published by the Corporation of the City indicating what, in the judgment of the Corporation, was a fair proportion of the duties to be repaid to the Local Authorities in the non-represented area."

The net amount produced by the coal duties being £450,000, as collected for a year from a district having a net rateable value of £38,000,000, it was estimated that the amount collected in the area outside the Metropolis was, in proportion to rateable value, equal to about £85,000. Dividing the assumed surplus of £100,000 on a similar basis, the Metropolis would be entitled to about £78,000 and the outside districts to about £22,000. Worked out on the same principle, the writer considered that the following counties would be entitled to the amounts named:—Middlesex, £9410; Surrey, £5720; Essex, £4410; Kent, £1810; Herts, £650. He thought, however, that the districts comprised in these counties had a claim to a much larger sum (£100,000 was named), divided in similar proportions to the £22,000 mentioned above.

ROSARIO WATER COMPANY, LIMITED.—The ordinary general meeting of this Company was held on Monday last week, at Winchester House, Old Broad Street—Mr. J. Morris in the chair. The report stated that the gross revenue from the opening of the works on Aug. 1, 1887, to June 30 last had been £7776, and the expenses £4858; leaving a balance of £2918, which had been carried to the credit of net revenue account. After charging that account with the debenture interest and interest on loans for the year ended June 30 last, there remained a balance at the debit of the account of £5195. Last December a concession was granted by the Municipality for the drainage of the city, one of the terms of which was that the taking of the Company's water was obligatory on all the houses connected with the drainage system. An English Company had been formed for carrying out this concession; and the works, which were being proceeded with, were expected to be completed within two years. The Chairman, in moving the adoption of the report, referred with satisfaction to the progress of the undertaking, which he believed had a bright future before it. The motion was adopted.

BAHIA GAS COMPANY, LIMITED.

The Half-Yearly General Meeting of this Company was held last Thursday, at the London Offices, No. 7 and 8, Idol Lane, E.C.—Mr. E. HORNER in the chair.

The SECRETARY (Mr. A. J. Head) read the notice convening the meeting; and it was agreed to take as read the Directors' report and the statement of accounts for the half year ending June 30 last, which were summarized in the JOURNAL for Nov. 13 (p. 851).

The CHAIRMAN said that the first resolution he had to put before the shareholders was—"That the report and statement of accounts now presented be and is hereby adopted." In proposing this, he did not think there was a great deal for him to say. He had carefully gone through the figures in the accounts; and he made out that there were certain items in them on the expenditure side which had, taking them together, risen to £618 more than in the previous half year. On the other hand, there were decreases which amounted in all to £1090; leaving a considerable balance in favour of the Company. One of the principal causes of this result was the rate of exchange, which, fortunately for the Company, had gone up very much. They were £687 better off in this respect in the present half year than before. On the other side of the account, there were items that showed a decrease together of £189; while the other items exhibited an increase of £588. This result was very satisfactory. There was no doubt about the fact that exchange had gone up at last; and he hoped, looking at the low rate of interest which now prevailed in the country in which they carried on their operations, that it would not be so bad again as it had been. The gas made during the half year had been scarcely so much per ton of coal carbonized as previously. This was due to the fact that they had been using up the stock which had been on the works a long time. Of course, in a hot climate, the coal, if kept in stock a certain time, would not yield so large a quantity of gas as when fresh. They were now using a new lot of coal, and they were producing quite as much gas per ton as formerly. In conclusion, he remarked that the Board hoped to be able to meet the shareholders on future occasions in just as happy a position as on the present.

Mr. HORATIO BROTHERS seconded the motion.

Mr. MACHELL asked the amount of the unaccounted-for gas, as he did not see it mentioned in the report. At the last meeting, this matter was referred to; and it was stated that the leakage was largely caused by the traffic and the opening up of the ground in Bahia, which greatly injured the pipes.

The CHAIRMAN said that the leakage in the previous accounts was 9·6 per cent.; and on the present occasion it was 10·1 per cent.

Sir H. E. CARTWRIGHT inquired whether the Directors had been able to sell any of the Bahia provincial bonds since last year. A certain number appeared in the accounts; and he was aware that there was at present an impression that bonds of this sort were not so saleable as they were some time ago. There was some expressed fear as to the uncertainty in Brazilian politics just now. For his own part, however, he believed the bonds were good.

The CHAIRMAN said they had sold £3800 of the provincial bonds during the half year. They could have disposed of more; but they did not care to do so.

Mr. J. W. MASON said that at one of the previous meetings a question was asked as to the large amount of preliminary expenses which was standing in the balance-sheet of £10,000. The reason given, he recollected, as to why this particular item was kept in the accounts was that it might influence the position when the Company was taken over, or the concession that would be moved for by-and-by. In the present accounts he noticed that £8000 of this amount had gone somewhere since the last meeting; and he should like a little information respecting this point.

The CHAIRMAN observed that this matter referred to a time prior to his connection with the Company; and he would ask Mr. King to explain the matter.

Mr. A. J. KING said it was true that the item alluded to stood in the previous accounts at £10,000. The original estimate of preliminary expenses was £16,914; and this had been partly written off by successive sums of £1000 from revenue account since 1880 till now. The reason of the £8000 disappearing now was this: It seemed a very extraordinary thing that, after 28 years' existence of the Company, it should have any preliminary expenses at all; and the Board asked the Accountant to prepare an analysis of the balance still remaining of those expenses, and say whether it was all properly chargeable as such. He reported that no less than £8000 should be charged as investment; and the Board had carried this sum to investment—leaving only the balance of £2000, which would disappear in due course by successive half-yearly amounts. He thought they were perfectly justified in dealing with the £8000 in this manner.

Mr. MASON said that, to his mind, it had taken a long time to come to the conclusion that this sum should have been charged to another account. If care had been taken in working out the accounts originally, this amount would not have appeared so long in the balance-sheet.

Mr. KING remarked that the present Board inherited the accounts from their predecessors.

The motion was then agreed to.

The CHAIRMAN moved the declaration of a dividend for the half year ending June 30 last at the rate of 10 per cent. per annum, less income-tax, on the 10 per cent. preference capital, of 7½ per cent., less income-tax, on the 7½ per cent. capital, and of 10 per cent., free of income-tax, on the ordinary capital of the Company.

Mr. MACHELL seconded the motion, which was carried unanimously.

On the motion of Mr. BROTHERS, seconded by Mr. A. M. CLARKE, Mr. Horner was re-elected to his seat at the Board; as was also Mr. A. J. KING, on the motion of Mr. H. FINLAY, seconded by Mr. CLARKE.

The CHAIRMAN and Mr. KING having acknowledged their re-election,

Mr. T. GUYATT proposed, and Mr. ESCOTT seconded, the re-election of the Auditor retiring by rotation (Mr. Magnus Ohren, Assoc. M. Inst. C.E.). The proposition having been agreed to,

The CHAIRMAN moved a vote of thanks to the Superintendent (Mr. F. Hooper), the Secretary, and the other officers of the Company.

Mr. BROTHERS seconded the resolution, which was heartily approved of. Sir H. E. CARTWRIGHT said that the shareholders were indebted to the Directors for the successful working of the past half year. It had been a fairly difficult position; and he hoped that the Board would work on with the same success in the future. He suggested that the Directors should use proper influence in the necessary quarters, and forestall any arrangement that might be made as to the continuation of the concession. This was a serious matter that the Board had in hand; and they would have to exert every possible influence they had in all quarters, so as to ensure the future success of the Company. He concluded by proposing a vote of thanks to the Chairman and Directors.

Mr. MACHELL seconded the motion, which was agreed to *nem. con.*

The CHAIRMAN thanked the shareholders for their recognition of the Directors' services. Referring to the question of the concession, he said that there was a large gas company working in Europe whose concession lately expired; and they had done what he should like to see carried out—that is, have an interminable concession. They would be able to put such

a case before the Government or the Corporation of the town as would give them an immediate profit, so that they would never terminate with the Company at all. Even if the shareholders took a little less dividend and succeeded in this way, it would be of permanent interest to the Company.

The proceedings then terminated.

THE AFFAIRS OF THE QUEENSTOWN GAS COMPANY.

The Auditor appointed by the Queenstown Commissioners (Mr. M. P. Buckley) to investigate the accounts of the Queenstown Gas Company has presented his report, dealing with the accounts for the year ending June 30 last. He says the quantity of coal carbonized in this period was 1530 tons 18 cwt., which cost £1038; or an average of 13s. 6½d. per ton. The total make of gas was 14,394,000 cubic feet; being equal to a production of 9400 cubic feet per ton of coal; and the loss by leakage was 1,914,400 cubic feet, or 13·35 per cent. The working expenses for the year were £2429 4s.; and the total receipts amounted to £3939 3s. 10d. The outlay on the Company's permanent investment, which now stands at £19,794 4s., was £11 12s.; while the paid-up share capital and debentures is only £19,672 16s. 11d.—thus showing an outlay of £125 8s. 1d. on capital out of revenue. The result of the year's working shows a profit balance of £1509 19s. 10d., which is allocated as follows:—Debenture interest, £209 13s. 3d.; dividend at the rate of 6½ per cent. on "A" shares; 3½ per cent. on "B" shares; 4½ per cent. on "C" shares—in all £815 8s.—and depreciation £80; leaving a surplus of £404 5s. 4d. Mr. Buckley says that if the shareholders had received their usual full statutory dividend of £1247, instead of £815 18s., and the Directors and Auditors their usual fees of £115, the year's working would show a deficit of £142 6s. 8d. The surplus assets of the Company now stand at £248 12s. 8d., as compared with £2916 1s. 3d. for the corresponding period of 1887. In other words, the surplus assets of the Company are now less by £3071 13s. 11d. Since the last audit, certain defalcations, amounting to £991 13s. 11d., occurred in the office, owing to a system of fraud carried out by the former Secretary through the medium of the rental journal. Mr. Buckley shows how this was effected. Supposing a consumer owed £7 10s., and paid his bill in due course, the Secretary (who was also Cashier and Collector) appropriated the amount and allowed the sum named to stand in the books as against the consumer. He explains that all the books were certified as correct before he commenced his annual audit; and he therefore concluded that the balance brought down at the foot of each consumer's account was strictly accurate. He also mentions, in justification of the Company's Auditors, that the skilful manner in which the frauds were effected almost prevented detection. He confesses that he attributes this loss to the false economy practised by the Directors in entrusting the duties of Secretary, Collector, and Cashier to one individual, and not having ample security with a person occupying a position of such responsibility. Mr. Buckley takes exception to the allocation of £2150 among the shareholders of the old Company, with the sanction of the Master of the Rolls. This sum is composed of two items; £1593 18s. 11d., being surplus assets as shown by the balance sheet of 1879; and £556 1s. 1d., interest allowed thereon from this period up to June 29, 1888. As regards the item of interest, he finds that the sum of £1593 18s. 11d. realized to the Company during the nine years only £419 1s. 4d., yet £556 1s. 1d. has been paid to the shareholders of the old Company—showing a loss of £136 19s. 9d. On this subject Mr. Buckley remarks: "I am of opinion that the Directors of the new Company should have calculated on the actual amount of assets realized, and they certainly ought to have been satisfied with the amount of interest accrued thereon, as it was they who invested the money, and consequently they ought, to say the least of it, to be content with the result of their own investment. Now, what is the fact? £153 15s. 7d. of the amount put down as surplus assets was never realized; and not only did they receive this amount, to which they had no claim, but they were actually paid 4 per cent. per annum interest on it for nine years. I may mention that the 1000 shares of the old Company in 1879 were held by 35 shareholders, 23 of whom have retained 822 of them and since considerably added to this number; so that in point of proprietary, the old and new Company are, with few exceptions, virtually one. As your Auditor, I have done all I could to prevent what I considered misappropriation of the Company's assets, as I respectfully submit the Legislature never contemplated such allocation of them when granting the Queenstown Gas Act of 1879; and I am still of opinion that my contention is based upon equity and common sense." Accompanying Mr. Buckley's report is a copy of the "opinion" of Mr. J. Atkinson, of Dublin, to the effect that the profits of the old Company do not properly form part of the reserve fund, but under the 7th section of the Queenstown Gas and Light Act, 1879, are assets to be applied to the purposes of the Company.

THE PUBLIC LIGHTING OF BUTTERSHAW.—At the meeting of the Buttershaw Local Board last Thursday, it was reported, on behalf of the Gas Committee, that trial had been given to several types of oil-lamps for street lighting purposes, but none had proved satisfactory. In the point of cost, too, they found there would be no economy in working expenses as compared with gas, and there would have to be a large outlay in the purchase of the new oil-lamps. In this condition of affairs, the members were of opinion that oil lighting could not be entertained at all; neither could the Board, in face of the expressed opinion of the ratepayers, take steps to light the existing gas-lamps. It was therefore decided to take no further action in the matter of the public lighting of the place.

THE LIVERPOOL CORPORATION AND THEIR "WATER FAMINE" RATES.—Last Wednesday, at the County Magistrates Court, the Liverpool Corporation sued a Solicitor (Mr. W. Cowl) for a sum of £1 for "garden water" supplied during the past summer. It seems that early in the present year the Corporation, owing to the short supply of water available, determined to raise their scale of charges for the supply of water through garden hose. Mr. Cowl was formerly charged 10s. 6d. a year; but the charge was increased to £1, and the demand note for this sum was served in June. No objection was raised until November, when Mr. Cowl pointed out that he had a special contract as to the price at which the Corporation were bound to supply him with any water that he might require for the purposes of his garden. As a matter of fact, however, for three months out of the four, when it was ordinarily necessary to use the hose, the supply was curtailed; the water being turned off for the greater part of the day. He had no notice of the increased charge until June, when the year was half through; and he contended that the Corporation had they no power to make the increase, and that, under the circumstances, it was unreasonable to demand payment of the full amount. But he offered to compromise the matter on an equitable basis. Mr. Barber, on behalf of the Corporation, produced the contract, and said in pursuance of the terms therein mentioned, they had the power to vary the charge. Had Mr. Cowl communicated his objection soon after he received the demand note, as others did, the charge would in all probability have been reduced; but nothing was heard from him until the present month. After an ineffectual attempt to compromise the matter, the Bench made an order for the payment of 10s. 6d.—thus supporting the defendant's contention.

GAS SUPPLY IN SOUTH AFRICA.

COMMENCEMENT OF GAS-WORKS AT WOODSTOCK.

On Saturday, Oct. 20, the foundation-stone of the works which the South African Gas Company are erecting at Woodstock, for the supply of that town and the neighbouring villages on the road from Cape Town to Wynberg, was laid by the Mayor of Woodstock (Mr. W. Searle). The formation of the Company, with a capital of £100,000, was noticed in the JOURNAL about a year ago; and a joint concession from the Municipality of Woodstock and the Cape Town Divisional Council having been obtained, a site was secured at the former place as the centre of operations. The works have been designed by Mr. E. Herbert Stevenson, of Westminster; and, of course, will be furnished with the latest appliances for the economical manufacture of gas. They will cover an area of about two acres, and be capable of producing 100,000 cubic feet of gas per day. The retort-house will contain three settings of six retorts on the regenerative system; though two will be sufficient to meet the first requirements. All the necessary auxiliary apparatus will be provided, as well as offices and buildings for the accommodation of the Manager and his staff. The gasholder will be a two-lift one, contained in a wrought-iron tank. It will be 60 feet in diameter, and have a capacity of 88,000 cubic feet. Already 4000 out of the 5000 yards of mains (ranging from 12 down to 4 inches in diameter), which it is intended to lay, have been put down; so that as soon as the manufacturing plant is in order a supply of gas will be at the command of the inhabitants. The Municipality of Woodstock have arranged to light the streets. The works are in proximity to a railway line, with which they will eventually be connected by a siding; thereby facilitating the delivery of coal direct into the works from the docks. It is expected that everything will be ready for lighting Woodstock in about three months from the present time; and on their completion, arrangements will be made for giving a supply of gas to the villages of Rondebosch and Claremont. Mr. J. Maxwell is the contractor for the works; the Resident Engineer being Mr. Arnott. After the ceremony of laying the stone had been performed, the Mayor gave a brief address, in the course of which he remarked that the introduction of gas into the streets of Woodstock meant far more than the mere substitution of one mode of lighting for another. It was, to himself, conclusive evidence that the inhabitants were determined to take advantage of all the comforts of modern civilization, and thus render the suburbs of Cape Town more attractive, and, furthermore, to enhance the value of property. Not only would the interior of houses in the Municipality be rendered more comfortable by a superior method of illumination, but the streets would be lighted, and those crimes for which the hours of darkness were peculiarly suitable and generally chosen would naturally decrease. The ceremony of that afternoon, therefore, marked an important period in the history of Woodstock; and they might well pride themselves upon being the first of the suburban municipalities to take steps for the supply of gas and water. He need scarcely assure the Company that, as soon as they were in the position to supply gas, they would find the inhabitants ready and wishful to do their part in making the venture remunerative. The charge for gas would be 8s. per 1000 cubic feet, or somewhat less (by 2s. 6d.) than the rate charged in Cape Town. He was only giving expression to the sentiments of the public when he said that he wished the South African Gas Company every success in their enterprise. Subsequently the toast of "Success to the South African Gas Company" was proposed by Mr. Atmore, and responded to by Mr. W. E. Moore (one of the local Directors) as representing the Board.

THE HOUSE-TO-HOUSE ELECTRIC LIGHT SUPPLY COMPANY, LIMITED.

In view of the fact that this Company is the first to propose giving a supply of electricity to private houses of any size on terms at all analogous to those under which gas is furnished, it may be interesting to reproduce in our columns some extracts from a circular now being sent out to residents in Brompton, Earl's Court, South Kensington, and the immediate neighbourhood. It is intimated that, consequent on the approaching completion (on the 15th prox.) of their West Brompton Central Electric Lighting Station—adjoining the West Brompton Station of the Metropolitan District Railway—the Company are prepared to contract with residents in the neighbourhood for a supply of electricity to their houses on the following terms:—

Supply of the Light.—The householder can have any number of lamps installed on his premises; but in pursuance of the regulations of the Board of Trade, he is obliged, in demanding the light, to state the maximum supply he requires—i.e., he must declare the greatest number of lamps he may want to use at any one time. The householder need only avail himself of the maximum supply (which he can compel the Company to have always available for his use) to such extent as he requires. In the event of the householder wishing temporarily to increase the number of lamps available for use beyond that stipulated for in his maximum supply, he can do so by arrangement on giving 48 hours' previous notice in writing to the Company. The maximum supply demanded by the householder will be conveyed to his premises from the central station either by means of underground or overhead mains as the local authority may determine. After passing the main switch in the house, a simple but *absolutely reliable* meter will register the quantity of electricity actually consumed in the lamps. When any lamps are turned on or off, a greater or lesser amount of electricity is being consumed, and a greater or lesser amount is consequently passing through the meter; so that the quantity registered is exactly in proportion to the number of lamps in use from time to time.

Cost of the Light.—The quantity of electricity actually consumed on the premises will be ascertained quarterly, and the following charge made on the basis of a sliding scale, varying with the maximum supply demanded by the householder, as follows:—

1. At the rate of 1s. per Board of Trade unit* for the first 100 hours' consumption of the maximum supply demanded.
 2. At the rate of 8d. per Board of Trade unit for the second 100 hours' consumption of the maximum supply demanded.
 3. At the rate of 4d. per Board of Trade unit for any further quantity consumed.
- Rent of meter, instruments, &c., 5s. per Board of Trade unit of maximum supply demanded per quarter.

For example, suppose that 40 lamps are installed on premises in respect of which a maximum supply of one Board of Trade unit (which will permit of about 20 incandescent lamps of 16-candle power, or their equivalent, being alight at any one time) has been demanded, and that during the heavy winter quarter 20 lamps have been in use on an average for five hours each evening, the total consumption of electricity registered by the meter would be: 20 lamps × 5 hours × 92 days × 50 watts per hour = 460,000 watt-hours, or 460 Board of Trade units (50 watts per hour being the quantity consumed by a 16-candle power incandescent lamp of the best

* A Board of Trade unit (1000 watt-hours) may be estimated to supply about 20 incandescent lamps of 16-candle power (or an equivalent number of lamps of smaller candle power) for one hour.

efficiency). Then, the maximum supply having been fixed at one Board of Trade unit of 1000 watt-hours—i.e., the electricity required for 20 16-candle power lamps for one hour—and the actual consumption having been 460 Board of Trade units, the amount payable would be as follows:—

First 100 units at 1s.	£5 0 0
Second 100 units at 8d.	3 6 8
Balance of 260 units at 4d.	4 6 8
Lamp renewals, say 9 at 4s.	1 16 0
Rent of meter, instruments, &c.	0 5 0
	£14 14 4

Equal to an average charge of 6½d. per Board of Trade unit of electricity or less than 4s. per 1000 cubic feet of gas. In making comparison with gas, however, it must be remembered that greater economy can be exercised in the consumption of electricity by the facility with which the light can be turned on and off, and the consequent avoidance of the necessity of keeping the lamps alight when not required. In the event of such an extension of the Company's business as would permit of a reduction of charge, all consumers, whether new or old, will enjoy the benefit of the reduced tariff; and it should be also noted that every improvement in the efficiency of incandescent lamps by reducing the quantity of electricity consumed will further diminish the cost of the light to the householder.

Lamps.—The cost of the renewal of lamps is to be borne by the householder, who may use those of any maker he may prefer. The Company will be prepared to supply lamps of the highest efficiency at the price of about 4s. each. The best lamps are extremely durable, and ordinarily last for 1000 hours; so that in the case of an installation of 40 lights, in which each light is, on an average, in use for 250 hours during the year, there will be an average renewal of about 10 lamps per annum.

Installing.—The cost of installing the electric light on the premises is to be borne by the householder, estimates for which the Company will be prepared to furnish free of charge. In the event of the premises being wired by others, the work is to be done to the approval, and subject to the test, of the Company's Engineer. As a set-off against this outlay, it must be remembered that a large expense, which would be otherwise incurred for painting, decorating, &c., will be avoided.

Fittings.—In cases where the householder may prefer not to do away with his gas-fittings, he can have the electric lamps attached to them. The beauty of the electric light, however, is greatly increased by the use of special electroliers and fittings, which appliances, by the best makers, can be supplied by the Company in great variety and on the most advantageous terms.

Summary of Cost of the Light for Various Sized Installations.

(Based upon the probable consumption for the heavy winter quarter.)

Twenty 16-candle power incandescent lamps, or the equivalent thereof, in a house where the maximum number required to be used at any one time is 10 lamps of 16-candle power, or the equivalent thereof = a maximum supply demand of 0·50 of a Board of Trade unit. 10 lamps × 92 days × 5 hours × 50 watts = 230,000 watts, or 230 units.

First 100 hours of maximum supply demand of 0·50 of 1 unit = 50 units at 1s.	£2 10 0
Second 100 hours of maximum supply demand of 0·50 of 1 unit = 50 units at 8d.	1 13 4
Balance of 130 units at 4d.	2 3 4
Renewal of lamps, 5 at 4s.	1 0 0
Rent of meter, instruments, &c.	0 5 0
	£7 11 8

Gas at 2s. 9d. per 1000 cubic feet £5 6 3

Forty 16-candle power incandescent lamps, or the equivalent thereof, in a house where the maximum number required to be used at any one time is 20 lamps of 16-candle power, or the equivalent thereof = a maximum supply demand of 1 Board of Trade unit. 20 lamps × 92 days × 5 hours × 50 watts = 460,000 watts, or 460 units.

First 100 hours of maximum supply demand of 1 unit = 100 units at 1s.	£5 0 0
Second 100 hours of maximum supply demand of 1 unit = 100 units at 8d.	3 6 8
Balance of 260 units at 4d.	4 6 8
Renewal of lamps, 9 at 4s.	1 16 0
Rent of meter, instruments, &c.	0 5 0
	£14 14 4

Gas at 2s. 9d. per 1000 cubic feet £10 7 5

Fifty 16-candle power incandescent lamps, or the equivalent thereof, in a house where the maximum number required to be used at any one time is 25 lamps of 16-candle power, or the equivalent thereof = a maximum supply demand of 1·25 of a Board of Trade unit. 25 lamps × 92 days × 5 hours × 50 watts = 575,000 watts, or 575 units.

First 100 hours of maximum supply demand of 1·25 of 1 unit = 125 units at 1s.	£6 5 0
Second 100 hours of maximum supply demand of 1·25 of 1 unit = 125 units at 8d.	4 3 4
Balance of 325 units at 4d.	5 8 4
Renewal of lamps, 12 at 4s.	2 8 0
Rent of meter, instruments, &c.	0 10 0
	£18 14 8

Gas at 2s. 9d. per 1000 cubic feet £13 3 0

One hundred 16-candle power incandescent lamps, or the equivalent thereof, in a house where the maximum number required to be used at any one time is 50 lamps of 16-candle power, or the equivalent thereof = a maximum supply demand of 2·50 of a Board of Trade unit. 50 lamps × 92 days × 5 hours × 50 watts = 1,150,000 watts, or 1150 units.

First 100 hours of maximum supply demand of 2·50 of 1 unit = 250 units at 1s.	£12 10 0
Second 100 hours of maximum supply demand of 2·50 of 1 unit = 250 units at 8d.	8 6 8
Balance of 650 units at 4d.	10 16 8
Renewal of lamps, 24 at 4s.	4 16 0
Rent of meter, instruments, &c.	0 15 0
	£37 4 4

Gas at 2s. 9d. per 1000 cubic feet £26 1 0

THE PRICE OF GAS AT ROCHDALE.—The newly-appointed Gas Committee of the Rochdale Corporation held its first meeting last Wednesday. Alderman Petrie was re-elected Chairman. The principal topic discussed was the suggested reduction in the price of gas. It was at first proposed that the reduction should be 2d. per 1000 feet; but ultimately it was unanimously decided to recommend the Council to reduce the price of gas supplied to consumers within the borough by 3d. per 1000 feet. If this recommendation is approved by the Council the prices will be, for prompt payment—Under 10,000 cubic feet, 2s. 9d. per 1000 feet net; 10,000 feet and under 50,000, 2s. 8d.; 50,000 feet and under 100,000 2s. 7d.; and above 100,000 feet, 2s. 6d.

THE PROPOSED TRANSFER OF THE PARTICK GAS-WORKS TO THE GLASGOW CORPORATION.

OBJECTIONS TO THE SCHEME.

When referring, in the last number of the JOURNAL (p. 901), to the position of the proprietors of the above-named Company in view of the proposed acquisition of the undertaking by the Glasgow Corporation, it was stated that at the meeting held on the 8th inst. no intimation was given by the preference shareholders of any intention on their part to oppose the propositions of the Directors. We find, however, that these gentlemen are still dissatisfied with the agreement entered into by the Directors for the sale of the works; and they have addressed to their fellow-shareholders a circular setting forth their views on the subject. They consider, in the first place, that the price offered for the undertaking is, considering its prospects, ridiculously small; and they charge the Directors with having surrendered to the Corporation without discretion. They review the position of the Company, as shown by the last balance-sheet. According to the revenue account, there was a gross profit of £13,245. After providing for interest on debentures, interest on the reserve fund, general interest, and the dividend on the preference shares for one year, there was left a balance of £9047. A portion of this was employed in meeting several extraordinary items, amounting together to £5242. Out of the balance (£3805), the Directors wrote off certain amounts for depreciation, and for interest on the depreciation fund. This the preference shareholders regard as an injudicious act, in view of the possible annexation, inasmuch as the writing off of these sums had the effect of lowering the net profits, and consequently the selling price of the concern; and, moreover, they question the necessity for taking this course, seeing that the works have been kept in efficient repair, year by year, out of revenue. It is contended that, after reducing the price of gas to meet the reduction made by the Corporation, the profits of the Company in ordinary years are sufficient to pay a 6 or 7 per cent. dividend; and they say that no body of business men would come to an agreement by which a concern capable of paying 7 per cent. is bound down to pay only 4 per cent., and the shareholders' capital locked up for two years with this inadequate rate of interest. The lump sum of £122,370 proposed to be paid for the works, they maintain is not based upon any fair valuation of the property as a going concern capable of earning good dividends. The figure should, they think, be nearer £200,000 than £120,000. The circular concludes as follows:—"If we assume that the profits admit of a dividend of 7 per cent. being paid—and that is well within the mark—then 25 years' purchase of it (£7000) and the preference dividend (£1650) = £8650 amounts to £216,250. The price agreed on is not even based upon the low rate of interest accepted by the Directors pending the handing over of the concern to the Corporation; for if we add the preference interest or dividends, £1650, to the ordinary dividends at 4 per cent., £4000, and multiply the total, £5650, at 25 years' purchase, we get £141,250 as the value of the property, or over £18,000 more than the price agreed upon. The want of firmness in standing out for an equitable price, has greatly prejudiced the value of the property." These being the views of the representatives of the preference shareholders, it is probable that the proceedings at the adjourned meeting will be anything but tranquil. The opinion of the objectors to the scheme is that better terms may be secured by the Company defending their interests in Parliament when the Corporation apply for power to extend their boundaries.

IMPROVED GAS LIGHTING IN NEWINGTON PARISH.—At the last meeting of the Newington Vestry, the Works and Sanitary Committee recommended that new lanterns with single 10 feet burners should be fixed to the 148 columns in the eight main roads of the parish, at a first outlay of £173 18s. and afterwards at an annual charge of £303 4s. 4d. The recommendation of the Committee was adopted.

THE NEW WATER SUPPLY FOR WAKEFIELD.—A sample of the water now being supplied to Wakefield, and which is obtained from the Rishworth Moors, on the Peuline Range or backbone of England, was recently forwarded to Dr. C. Meymott Tidy, for examination; and he has just made a report to the Corporation as to the result of his analysis. He states that it is "most excellent water for a town's supply."

THE ALDERSHOT LOCAL BOARD AND THE GAS AND WATER COMPANY.—About the middle of last month, the Aldershot Gas and Water Company intimated to the Local Board their intention to apply to the Board of Trade for power to increase their capital by £20,000, to purchase 20 acres of land, and to supply gas and water beyond the district of the Local Board. The matter was referred to a Committee, who obtained a legal opinion from Messrs. Wilkins, Blyth, and Dutton, who pointed out that as the money proposed to be raised was for gas capital, the water and gas capital of the Company should be separated. There was a proposal to adopt the sliding scale for gas, which they advised the Board to oppose unless the Company would fix an initial price of 3s. per 1000 cubic feet. The clause in the proposed Order exempting the Company from penalties was also objectionable, as it practically prevented penalties being enforced by suggesting a regulation answer. A special meeting of the Board has been held since the receipt of the letter to consider the matter; and a communication was then read stating that the Company had decided to withdraw their application, on the ground that there was no time for further discussion before the advertisements should be issued to the papers. After an animated discussion, it was decided—notwithstanding the decision of the Directors—to meet them, if possible, on an early date to see what arrangement could be come to.

THE GAS QUESTION IN HAWES.—The township of Hawes-in-Bedale is, says the *Yorkshire Post*, at present the centre of a lively discussion on the respective merits of coal gas v. water gas for illuminating purposes. The leading men of the district have been agitating the community to bestir itself to introduce an illuminant to supersede the old-fashioned and dangerous paraffin lamps; and, after some correspondence on the matter, it was determined to invite representatives of the coal-gas interest and the British Water Gas Syndicate to meet the inhabitants and discuss the different methods. The coal gas representatives did not "turn up." But Messrs. Wildy and Brewer, from the British Water Syndicate, did; and a goodly number of representative Hawes men listened with deep attention to a most interesting and instructive lecture on water gas by Mr. Wildy, who illustrated the method of manufacture of gas from water by diagrams on a blackboard. Mr. Wildy, in suitable language (avoiding as much as possible all technical terms), made himself thoroughly understood to his audience. The pertinent questions put to the lecturer by some of those present showed that the subject was one which had already been carefully considered; whilst the suggestion of a well-known gentleman in the room, to raise a subscription there and then to send delegates to Leeds to see the water-gas plant at the Leeds Forge, showed the practical Yorkshire mind. The result of the suggestion was that a sum of money was raised, and three gentlemen were selected to represent the meeting, and visit Leeds to view the water gas making, and witness experiments as to its illuminating and heating properties.

STOCKTON AND MIDDLESBROUGH WATER BOARD.

THE WORKING DURING THE PAST HALF YEAR.

The accounts of the Stockton and Middlesbrough Water Board for the half year ending Aug. 13 last have just been issued. They show that there has been a capital expenditure in the half year of £17,994; bringing the total cost of the undertaking up to £1,238,738. Of the capital expenditure, the principal items are as follows:—On account of the Hury reservoir, £10,288; reservoir at Sadberge, £2437; conduit No. 5 (Sadberge to Stockton), £125; pumping plant at Broken Scar, £1368; reservoir at Fighting Cocks, £683. The sums received on capital account during the half year amounted to £30,000; bringing the total amount up to £1,243,094—being £4355 in excess of the amount expended. The revenue account shows the income to have been £28,347; being an increase of £837, as compared with the preceding half year, and of £1054 13s. as compared with the half year ending Aug. 13, 1887. There was an expenditure on revenue account during the half year of £6703 12s; being an increase of £24, compared with the previous half year, and of £277 16s. as compared with the half year ending Aug. 13, 1887—this increase being more than accounted for under the head of rates and taxes. The balance carried to the net revenue account is £21,643, as compared with £20,829 19s. in the former half year, and £20,836 in the six months ending Aug. 13, 1887. The net revenue account is debited with £290, in respect of sundry charges for interest, and is credited with the rents of land in Baldersdale, and interest received from the bank. After being so dealt with, there remains a balance of £21,431, of which £18,000 has been paid to the Corporations and the Local Board; and there remains a balance of £3431, which it is proposed to carry forward, as it is understood that the effect of clause 12 of the Act of 1885 is to relieve the funds of the constituent authorities of any charge on revenue account for the past year. During the summer the works in connection with the Hury and Sadberge reservoirs have made excellent progress; the latter may be expected to be ready for use in the early part of next year, and the former probably in the early part of 1890. The Sadberge reservoir mains are in such an advanced state that they will be ready for use simultaneously on completion of the reservoir, when it is confidently expected that the numerous complaints of want of pressure in the mains will be remedied. The growing demand for water for manufacturing purposes, to which attention was called in the last two reports, it is stated has continued without interruption during the past half year. The prospect of a still greater demand in the immediate future, and the best means to meet it, have engaged the serious consideration of the Board; and, after much deliberation, it has been decided that it is not safe any longer to defer the commencement of the construction of the Blackton reservoir. The Engineer has therefore been instructed to prepare the plans and specifications requisite to enable the Board to enter into contracts for the works; the land upon which the reservoir is to be constructed having been acquired by the Board some years ago.

BRADFORD CORPORATION WATER SUPPLY.

THE PREVENTION OF WASTE.

The Engineer of the Bradford Corporation Water-Works (Mr. A. R. Binnie, M. Inst. C.E.) has just presented to the Water Committee a report on the working of the Deacon waste-water meter system, which has now been in use in the borough for about three years.

In commencing the report, Mr. Binnie states that the whole borough has been divided into 38 districts, governed by 29 6-inch and 9 4-inch meters. In beginning work in any district, a complete register is made of all the circumstances of each particular supply included in it. As soon as this information is obtained, outside stop-taps and Deacon's detection meters are fixed, and the district under observation is ready for inspection. In working it is assumed that, between the hours of twelve midnight and five a.m., all ordinary use of water is at a standstill, and that which is found passing through the pipes is running uselessly to waste. Of course, as is pointed out, this is not exactly the case in any town, and is far from being so in a large centre of manufacture like Bradford. As soon as the meters are set to work, several trials are made of the flow through them into the district between the hours of midnight and five a.m. The lowest flow per hour is noted on the diagram; and the result, multiplied by 24, is, for the purpose of the work, assumed to be waste—the object being, by the detection and repair of leaks, to reduce this night, or rather early morning flow to the smallest possible amount.

The modes in which, in the first instance, leakages are detected are two. First, as to the distribution-pipes in the street. The meter having been set to work between midnight and five a.m., each of the branch-pipes is in succession shut off. It is clear that if no water is passing through them, this will have no effect on the meter reading; but, should leakage be going on, the cessation of its flow is at once recorded on the meter diagram, which records the exact time of such cessation, and, as a record is also made by the inspector of the time when each street was shut off, a comparison of his note-book with the meter diagrams at once detects in which particular street the leakage was situated. The first preliminary trial, the report says, generally detects large flows from defects in the iron pipes, which between 1886 and 1888 have been as follows:—From pipes of 1½ inch diameter, the number of leaks has been 1; from 2-inch pipes, 4; from 2½-inch, 1; from 3-inch, 146; from 4-inch, 41; from 5-inch, 5; from 6-inch, 20; from 9-inch, 2; from 12-inch, 4; from 18-inch, 5; from 30-inch, 1. The total number of leaks was 230, exclusive of 35 similar cases detected by the same means previous to 1886. The second mode of detecting leakage refers to such as occurs in private houses. When it is believed that all the iron supply-pipes in the district are in good order, but that leakage is still detected going on in the district, that street in which it is suspected is shut off and isolated from the others. The meter diagram then records the flow in that particular street only. The inspector afterwards visits each outside stop-tap which governs the private supplies, listens with his stethoscope, and if he hears water running, closes it. As he always notes the time at which he does so, a comparison of his book with the meter diagram at once indicates in what particular house supply the leakage is situated. By this means many hidden and underground leaks are detected, which by mere visual inspection could never be discovered; and householders are saved the annoyance of useless visits from inspectors, as they are enabled to go at once to the exact house where the leak exists instead of visiting all the houses in a street to find perhaps one or two faulty taps, cisterns, or broken pipes. Between 1886 and 1888 the following causes of leakages were detected:—water-closets, 145 taps, 1498; lead water-pipes, 851; urinals, 15; fire-plugs, 91; valves, 30; ferrules, 43; water-taps left open, 80; and miscellaneous leakages, 220—making a total of 2973 leakages.

Speaking of the outcome of the work in the whole of the 38 districts combined, Mr. Binnie says that, when they introduced the system the assumed night leakage was at the rate of 4,080,600 gallons per 24 hours, which, after inspection and repair, has been reduced to 1,041,600 gallons per 24 hours; showing that a leakage of 3,039,000 gallons has apparently been prevented since commencing the work in 1885. As latterly the staff work with greater accuracy due to increased experience, and many

of the meter's diagrams are often taken on Saturday and Sunday nights so as to avoid trade meter supplies interfering with the result, and which was not done in all instances at the commencement of working, Mr. Binnie is inclined to think that the actual daily saving is less than the above figures really show, and which he estimates at about 2,000,000 gallons a day actually saved. But, he continues, even the whole of this saving of 2,000,000 gallons a day cannot any longer be reckoned on as available for use, as between 1885 and 1887 the trade supply by meter has increased nearly 500,000 gallons a day, and the supplies to property within the borough have increased in the four years 1885 to 1888 by 2809.

As to the expense incurred in the whole of the work since 1885, the following is a brief summary of the charges up to date:—Capital for meters and stop-taps, £5152; salaries and working expenses, £2631—or a total of £7783. At first sight it would appear, continues the report, that there have been saved about 2,000,000 gallons a day, or 2,190,000,000 gallons in three years. As the gross expenditure has been £7783, this would be at the rate of 0·85d. per 1000 gallons. But although such a rough mode of viewing the question is satisfactory in showing the generally economical nature of the work, yet the correct method is to take the capital and working expenses in proper proportions for one year only. The capital charges are supposed to be paid off in twelve years; therefore one-twelfth of £5152 equals an annual charge of £429 6s. 8d. Salaries, &c., for the past year amounted to £1102 8s. 4d. These two amounts added together make £1531 15s. (estimated in 1885 to cost £1540) as the total annual expenditure in saving 2,000,000 gallons a day, or 730,000,000 gallons per annum. This is at the rate of 0·503d. (say ½d.) per 1000 gallons; the value of the water saved, at the rate of 6d. per 1000 gallons, being, of course, £18,200.

PROPOSED PURCHASE OF THE TONBRIDGE WATER-WORKS BY THE LOCAL BOARD.

A Meeting of ratepayers was held at Tonbridge last Wednesday to consider the question of the Local Board acquiring on behalf of the town the property of the Water Company. Mr. W. Hodgeskin, who presided, in opening the proceedings, remarked that he was in the awkward position of being a shareholder and Director of the Company; but whatever the ratepayers decided upon, he would concur in. Mr. Rice addressed the meeting at length. He considered the report of the Local Board was in favour of the purchase of the works; and he was afraid that if they did not acquire them now, they would lose this valuable property. Two or three years ago he addressed a letter to the ratepayers on the question, when he submitted that the purchase of the works would be a distinct advantage to the town. The greater part of the loans would be paid off in 30 years; the works would be the property of the town; and the revenue would, to the extent of £1200, go to reduce the general district rate. He went on to refer to a circular which had been distributed by the opponents of the project, in which, among other things, it was stated that the Local Board would not pledge itself to borrowing the money for the purchase at 3½ per cent. for 30 years; but a private gentleman had given him (Mr. Rice) permission to say that he would find the money at that rate of interest. Then, it was asserted that the Company's profits were less than £1000 per annum; but, by their own showing this was incorrect. With regard to the statement that the mains had been in use 30 years, and in a few years would have to be renewed at a cost of £1000 per mile, if this were true, it was strange that the Company should want to retain their undertaking. He thought the town would make a mistake if they did not purchase the undertaking. A number of questions were then put by various ratepayers; and subsequently Mr. Rice moved a resolution urging the Local Board "without delay to carry out the terms of the Provisional Order, by the immediate purchase of the water-works undertaking." Mr. Millidge seconded the motion; and after some further discussion, it was carried with but two dissentients. It was then decided to forward the resolution to the Local Board, a Committee of which body have already reported in favour of the purchase.

LEAD POISONING AT PUDSEY.—At the meeting of the Pudsey Local Board last Wednesday week, the minutes of the Sanitary and Hospital Committee contained a report made by Messrs. Reynolds and Branson, of Leeds, of an analysis of the water supplied by the Calverley Water Company to the Pudsey district. The Chairman said they were told that not fewer than from 40 to 60 cases of lead poisoning had occurred in the town; and it was highly desirable that the ratepayers should be placed in possession of the facts which had led to the water supplied to the district being sent for analysis, as he was of opinion that the remedy was largely in the hands of the ratepayers themselves. The Clerk then read the report, which showed that the samples of water submitted contained as much as 13·20ths of a grain of lead per gallon, which the analysts regarded as a distinctly injurious quantity. The Chairman said it appeared that the cases of lead poisoning had occurred in families residing in houses a long distance from the mains, and that the poisoning had resulted from drinking water which had been all night in the lead pipes conveying the water from the mains to the houses in question. He was of opinion that the people themselves could obviate a great deal of the mischief if they allowed the water to run to waste every morning for some time, so as to empty the pipes before drawing water for domestic use. After some conversation, it was decided that a copy of the analysts' report should be sent to the Calverley Water Company, and that, after their answer had been received, further action could be taken in the matter.

THE WATER QUESTION AT BRIGHOUSE.—A Brighouse correspondent writes, under date of Nov. 16, that "the Directors of the Rastrick Water-Works Company, Limited, have given notice of their intention to apply to Parliament during the ensuing session for an Act incorporating their Company, and conferring upon them the customary statutory rights and privileges, and restrictions usually vested in and imposed upon undertakings of a like nature. The Company," it is remarked, "was established shortly after the very serious drought and scarcity of water that prevailed in the year 1868; and for the space of 20 years it has solely supplied the district with water. The present action of the Company in seeking incorporation and more extensive capital powers is the outcome of the growing requirements of the district, which causes a corresponding increase in the consumption of water, to cope with which the Company are intending to make considerable extensions in their works. At present they supply the bulk of the water in Rastrick for domestic and other purposes; the Local Board having no interest whatever in the water supply. Some half-dozen years ago a vigorous agitation sprung up in the district in favour of the Local Board purchasing the Water Company's plant; but the proposal was contested, and was ultimately allowed to lapse. The proposed action of the Directors came as a surprise yesterday to the bulk of the water consumers and ratepayers in the district; and opinions were freely expressed that the Bill should be opposed by the Local Board; and that the opportunity should also be taken to 'buy out' the Company before any further capital is sunk in the undertaking. The capital of the Company is £6000, in 2000 shares of £3 each, all of which are fully paid up. Last year the Company paid a dividend of 8 per cent."

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday.*

The Dundee Gas Commission met for the first time after the election on Tuesday. Almost the only business transacted was the appointment of officers. Mr. Nicoll, Treasurer of the town, was re-elected Convener of the Finance Committee; and Mr. Lindsay, Convener of the Works Committee. In acknowledging his re-election, Mr. Nicoll said he hoped the finances of the Commission would prove as satisfactory this year as last; and he added that, so far as the year had gone, there was every reason to expect that the accounts would turn out favourably.

The storm which I mentioned last week, as having damaged several gas and water works, was the occasion of a peculiar effect at Portobello. The large gasholder got twisted by the gale; and while it was being adjusted, unpurified gas was allowed to enter the mains by the bye-pass valve. This is the explanation given by the Gas Company. What the inhabitants of the town felt was a sense of oppression, and a difficulty of breathing, in apartments where gas was burned. On Saturday night shopkeepers were obliged to keep the doors of their premises open; and on Sunday the odour in the churches was of so sulphurous a nature, that the congregations could scarcely remain in the buildings. It was reported locally that the occurrence was owing to the mistake of a workman, committed while the Manager was giving his attention to the gasholder.

Mr. Adam Pratt, whom I have before referred to as the head and front of the agitation in Aberdeen upon the alleged overcharges for gas, having been returned to the Town Council, this body have done the wisest thing possible in unanimously appointing him to the Gas Committee. Now that Mr. Pratt is on the Gas Committee, he may get his eyes opened to the extent of being obliged to look at things in a different light than when he was an agitator. Can this be the explanation of his attitude at a meeting of the Gas Committee on Thursday? At that meeting, Mr. Clark drew attention to the long delay in receiving the report as to the gas consumers' grievances, and asked when it was going to be finally brought forward. Mr. Cook made a remark that he thought Mr. Pratt would have pushed this matter; but Mr. Pratt, in reply, said there was time enough when the report was before them. The Convener said the report would be before them very soon; and it was stated that the Sub-Committee appointed to furnish a statement would meet in a day or so.

After a good deal of difficult negotiation, the burgh of Linlithgow seems to be in a fair way to obtaining an additional water supply. The Local Authority are being pushed on to take this step, as well as to improve the sanitary condition of the town, by the Board of Supervision. A complaint by the Board against the Local Authority has been for several months before the First Division of the Court of Session; and procedure in it has been more than once delayed at the request of the burgh, to allow the negotiations for means to remove the evils complained of to be made. A report—the sixth on the subject—was made by the Local Authority to the Court on Thursday. In it they stated that they had resolved to impound the water on the estates of Hiltly and Preston; but that they had been threatened with legal proceedings by paper makers who use the water collected on the Preston estate; and that in view of this opposition, as well as the opposition of a minority of themselves who favoured a proposal to take the water from the Piccarton Burn, they had resolved to apply to Parliament for a Provisional Order authorizing them to have the Hiltly-Preston works executed. In addition, they are endeavouring to acquire, by agreement, the water rights of the two estates. The Court were asked to allow further delay; and this was readily granted. Mr. J. A. Warren, C.E., of Glasgow, has reported, with reference to the Hiltly-Preston water, that "it is free from sewage, and is an upland water of great purity, well suited for drinking purposes." The total addition to the water supply would be 27,967 gallons per day, or seven gallons per head per day. He proposes to construct a reservoir to contain 12 million gallons, and estimates the cost of the scheme at £3960.

The Edinburgh and District Water Trustees have issued notices that they propose to apply to Parliament for a Bill to increase their borrowing powers, to enable them to take steps to reduce excessive use of water, to terminate existing agreements for the supply of water to other Water Trustees in the district, and to enter into new agreements with these Trustees. It is proposed to increase the borrowing powers, which are nearly exhausted, by £50,000.

The water supply of Aberdeen does not appear to have benefited to anything like the extent expected by the opening of the two new reservoirs. The Water Committee on Thursday had before them complaints by residents in the higher parts of the city, that there was not sufficient pressure; and it was stated that the new reservoir at Mansfield had not given any increased pressure to parts of the town whence the complaints emanated. The Committee ordered reports to be prepared on the subject of the pressure in all the districts from which there were complaints, in order that they may be able to equalize it.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday.*

There seems to be every probability that the next move of any importance in connection with gas affairs in the neighbouring town of Paisley will be the abolition of the meter-rent. This matter came prominently forward in the late municipal elections. An opinion was expressed at a meeting [of the First Ward electors that, as they had now such cheap gas in the town, the Gas Trust should turn their attention to a reduction of the charges for meter-hire; and Mr. Smith, a member of the Council, in replying, stated that he had canvassed the members of the Town Council with considerable success to have the meter-hire abolished. He promised that if he was sent back to the Council, he would press the matter to an open division. At the same meeting an elector, after assuming that the meter-hire would be abolished, asked what consideration the members of the Gas Trust would give to those consumers who had purchased their own meters. Ex-Bailie Macfarlane remarked that the subject broached by the elector would doubtless receive attention; and those persons who had purchased their meters would likely be recompensed. On this point, the Chairman of the meeting suggested that a portion of the annual gas surplus might be used in the event of the meter-hire being abolished to recompense those who had purchased meters; and Ex-Bailie Macfarlane stated that he was quite willing that this should be done.

Complaints are being made in various towns as to the inadequacy of the street lighting. At the meeting just referred to, one of the speakers stated that there was an insufficiency of lamps in certain streets in the burgh; and that, in fact, the streets throughout the whole of the West-end were not half lighted. Then, as regards the street lighting in Greenock, a correspondent in one of the local newspapers calls attention to the condition of several parts of the town; one portion named, he says, being at nights and in the early morning in a state of utter darkness. Referring to the complaint made by the correspondent, the Editor of the paper says that there is a great amount of truth in the accusation, and

asserts that at the present time, even when all the shops are lighted up, the main thoroughfare of the town has a very gloomy appearance.

The subject of insufficient street lighting was also before the Town Council of Stirling, at the monthly meeting last Monday. A long minute in reference to the public lamps was submitted by the Lighting Committee, in the course of which it was stated that the Convener had asked the Gas Manager (Mr. P. Watson) to take out of the lamps all the No. 4 burners except four. The Committee had compared the light given by such a burner in one lamp with that afforded by a No. 3; and they were of opinion that the difference of the light was not worth the additional cost of 10s. per lamp. They recommended that only No. 3 burners should be used in the lamps. In the course of the discussion, several complaints of insufficient lighting were made by members of the Council; and a motion was subsequently made by Mr. McQueen, and agreed to, to the effect that the Lighting Committee should be empowered to improve the lighting in certain districts.

On Thursday of this week business was done on the Glasgow Stock Exchange in the shares of the Partick, Hillhead, and Maryhill Gas Company, when 81s. per share was paid, which showed no change. Sellers were wanting 82s. Yesterday business was again done at that price.

Sulphate of ammonia is steadily advancing in value; the spot price this week having reached £12 15s. per ton, and close on £13 per ton has been named as the forward price.

A very material advance has been obtained by the Johnstone Gas Commissioners in this year's contract price for the residual products—£220, as against £149 last year. Some years ago more than £500 was obtained at Johnstone for the residuals.

After a little irregularity in the early part of the week, the Glasgow pig iron warrant market has for the last day or two presented more firmness; the week closing with a very hopeful tone. Over the week Scotch warrant iron has fallen in price about 3d. per ton; Cleveland, 6d.; and hematite iron, 2d.

The local coal trade continues to be exceedingly active in almost every department, with firm prices. All fears of a strike among the miners have disappeared, as the advance of wages conceded by the coalmasters has generally been accepted.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Nov. 24.

Sulphate of Ammonia.—There has been some further improvement in sulphate; but unfortunately the nitrate market exhibits symptoms which do not augur well for the immediate future. The gravamen of the moderating attitude of nitrate values is evidently found in the figures cabled in reference to the November shipments. These are apparently thought heavy (105,000 tons), especially as the loadings for December are stated to be close upon this figure (102,000 tons). Adding thereto the probability of large shipments by steamers, the doubts as regards any deficiency during the early spring months seem to have been palpably removed. As it may be interesting to compare the shipments and loadings of previous years, they are given below. After saying this much about nitrate, which has been made responsible for the recent advance in sulphate, it remains but to be remarked that, whatever decline may take place in nitrate rates, it does not necessarily follow that sulphate will adopt the course of nitrate in this direction. It has been stated before that sulphate did not advance quite as much as nitrate; and it cannot be gainsaid that the position of the former is exceptionally strong—admitted, though it be, that very large quantities are held in second hands for speculative account. It must be assumed that the demand is far from satisfied; but the upward tendency will receive a check because the impetuous operations of consumers, excited by the nitrate movement, will now cease, and they may hold off until the time of actual requirements. The production (now getting very heavy) does not so far clog the market, which closes very steady at £12 12s. 6d. to £12 15s., at the various ports. Nitrate on spot is quoted at 11s. 3d. per cwt., and is somewhat dull.

Nitrate Shipments to Europe during November 1884-1888.

1888.	1887.	1886.	1885.	1884.
Tons 105,000	102,000	69,000	46,000	52,000

Loading on the 1st of December.

Tons 102,000	88,000	28,000	34,000	27,000

Liverpool "Spot" Prices.

Nitrate per cwt.	11s. 4½d.	8s. 9d.	8s. 10½d.	10s. 6d.	9s. 3d.
Sulphate per ton.	£12 15s.	£11 12s. 6d.	£10 15s.	£10 10s.	£13 10s.

LONDON, Nov. 24.

Tar Products.—There is a little better demand for creosote for burning purposes; and both crude and crystal carbolic acid are more inquired after. Benzoles are undoubtedly weaker; whilst pitch is nominally quoted higher, though buyers will not pay the prices now named. Prices may be taken as follows:—Tar, according to position, 17s. 6d. to 22s. 6d. per ton. Benzol, 90 per cent., 8s. 1d. per gallon; 50 per cent., 2s. 5d. Toluol, 1s. 7d. per gallon. Solvent naphtha, 1s. 3d. per gallon. Crude naphtha, 30 per cent., 1s. 1d. per gallon. Light oil, 8d. per gallon. Creosote, 2d. per gallon. Pitch, 17s. to 20s. per ton. Carbolic acid (crude), 3s. 9d. per gallon. Cresylic acid, 10½d. per gallon. Tar salts, 15s. per ton. Anthracene, 30 per cent., "A" quality, 1s. 5d. per unit; "B," 1s. 3d.

Ammonia Products.—Sulphate is in excellent demand; and the price continues to advance. Sales have been reported as high as £12 17s. 6d.; but the average price of the week will not exceed £12 10s. to £12 12s. 6d. per ton. Prices of other products are: Gas liquor (5° Twaddle), 8s. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 2d. per lb. Carbonate of ammonia, 3½d. per lb. Muriate of ammonia, brown, £18 per ton; white, £25. Sal-ammoniac, £30 per ton.

[From the Chemical Trade Journal, Nov. 24.]

Tar Products.—The rise in value of tar products has not been without effect upon the price of tar. The last price we have heard of as being realized for tar of good quality is 29s. per ton at the gas-works, upon which there was a carriage of 1s. 10d. Benzoles continue firm; and last week's prices may be said to be ruling to-day. The demand for creosote and solvent naphtha is very good; and the effect of the Wells' light upon this market has made itself felt in the Manchester district. Crude carbolic acid is reported firmer; and at the same time crystals have a higher tendency, though some attribute this only to speculative agencies. Anthracene is very firm; and the report that a split had occurred in the foreign alizarine market is making producers here hold all the more firmly. To one maker, 1s. 6d. has been offered for "A" quality, and has been refused, as both he and others expect finally to get much more. Pitch has been rising lately; and we hear Beckton is asking 20s. per ton. To our own knowledge, business has been done in Yorkshire at 17s. 6d., and in other districts at 18s. f.o.b. As a specimen of inland business, the requirements

of the Manchester Corporation for the next twelve months have just been secured at 10s. per ton.

Sulphate of Ammonia.—The market in ammonia salts has been very firm indeed during the past week; and both sulphate and muriate have risen in price. Hull sulphate stands to-day at £12 16s. 3d. f.o.b.; the price at Leith being £12 15s. London outside makes are fetching £12 12s. 6d.; and though Beckton price is nominally £12 10s., they are not sellers for the moment.

A LAMPLIGHTERS' BENEFIT SOCIETY.—The lamplighters employed by the Manchester Corporation have formed a sick and superannuation society; and at its first annual meeting last Saturday week, it was reported that there are 101 members, with funds amounting to £378 8s. A burial fund has been added to the sick or superannuation branches. The subscription per member is only 6d. weekly, and an additional amount is received from fines.

SALE OF SHARES.—On Wednesday last, 100 new "B" shares in the *Horsham Gas Company*, of the nominal value of £10 per share, the maximum dividend on which is 7 per cent., were sold by auction at Horsham, in lots of from one to five. The following are the prices realized: Three shares sold at £14 2s. 6d. each; twelve, at £14 5s.; fifty, at £14 7s. 6d.; fifteen, at £14 10s.; fifteen, at £14 12s. 6d.; and five, at £14 15s.—the total amount produced being £1442 15s., or an average of £14 8s. 6d. per share.

THE NORTHERN COAL TRADE.—In the Northern coal trade, there is a good demand for steam coal; but it is less than it was, as is usual at this period of the year, and a further contraction of the demand must be looked for now the winter will close the ports. The current price for best steam qualities must be put at about 8s. 6d. It is believed that the wages agitation will be settled by the miners accepting the advance offered. In the gas-coal trade, there is difficulty in meeting contracts, owing to the miners restricting the output. One of the chief Tyneside gas-coal collieries used to obtain 2200 tons of coal daily; but it now rarely exceeds 1900 tons, and it is evident that the margin, after meeting contracts, must be a limited one. For that small margin, from 7s. 6d. to 8s. 6d. per ton is asked and obtained. There is, however, a probability that next month the miners will work better, as they usually do before the holidays. Household and manufacturing coals retain their old features; but coke sells more freely, and gas coke would realize 8s. 6d. to 9s. per ton for shipment, were it readily obtainable. The coal trade promises better even for next year—increasing cost of timber and increasing wages tending to make prices higher.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 930.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.					£ s. d.
GAS COMPANIES.								
590,000	10	12 Oct.	10½	Alliance & Dublin 10 p. c.	10	181-19	½	5 10 6
100,000	10		7½	Do. 7 p. c.	10	123-133		5 11 1
800,000	100	2 July	5	Anstralian (Sydney) 5½% Deb.	100	110-112		4 9 3
100,000	20	30 May	10	Bahia, Limited	20	243-253		7 16 10
200,000	5	14 Nov.	7½	Bombay, Limited	5	7-7½		5 0 0
40,000	5		7½	Do. New	4	5-5½		5 9 1
350,000	Stek.	29 Aug.	11½	Brentford Consolidated	100	223-233		5 3 1
125,000			8½	Do. New	100	164-168		5 4 2
230,000	20	13 Sept.	10½	Brighton & Hove, Original	20	43-45		4 13 4
320,000	20	28 Sept.	11½	British	20	43-45		5 0 0
50,000	10	13 Sept.	11	Bromley, Ordinary 10 p. c.	10	13-14		5 4 9
39,000	10		8	Do. 7 p. c.	10	13-14		5 14 3
\$28,750	10	14 Nov.	8	Buenos Ayres (New) Limited	10	134-143	½	5 10 4
200,000	100	2 July	6	Do. 6 p. c. Deb.	100	110-112		5 7 1
150,000	20	10 Aug.	7	Cagliari, Limited	20	25-27		5 3 9
550,000	Stek.	12 Oct.	13½	Commercial, Old Stock	100	255-260		5 5 9
130,000			10½	Do. New do.	100	209-214		5 0 5
121,234		28 June	4½	Do. 4½ p. c. Deb. do.	100	309-214		3 10 3
557,320	20	14 June	13½	Continental Union, Limited	20	44-46		5 13 0
243,680	20		13½	Do. New 6½ & 72	14	294-304		5 19 4
200,000	20		10½	Do. 7 p. c. Pref.	20	36-38		5 3 3
75,000	Stek.	38 Sept.	10	Crystal Palace District	100	205-215		4 13 0
234,060	10	27 July	13	European, Limited	10	254-263		4 18 1
120,630	10		13	Do.	7½	18-19		5 2 7
354,060	10		13	Do. New	5	12-13		5 0 0
5,468,600	Stek.	29 Aug.	13	Gaslight & Coke, A, Ordinary	100	250-254	½	5 2 4
100,000			4	Do. B, 4 p. c. max.	100	100-105		3 16 3
665,000			10	Do. C, D, & E, 10 p. c. Pf.	100	257-263	-2	3 16 4
30,000			5	Do. F, 5 p. c. Pf.	100	125-130		3 16 11
60,000			7½	Do. G, 7½ p. c. do.	100	182-187		4 0 2
1,900,000			10	Do. H, 7½ p. c. do.	100	167-172		4 1 4
168,000			10	Do. J, 10 p. c. Pf.	100	255-260	-3	3 16 11
1,061,150		14 June	4	Do. 4 p. c. Deb. Stk.	100	118-121	-1	3 6 1
294,850			4½	Do. 4½ p. c. do.	100	123-127	-1	3 10 10
650,000			6	Do. 6 p. c. do.	100	172-177	-2	3 7 10
3,000,000	Stek.	14 Nov.	10	Imperial Continental	100	205-208	+1	4 16 1
75,000	5	14 June	6	Malta & Mediterranean, Ltd	5	5-5½		5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	113-115		4 6 11
541,920	20	14 June	6	Monte Video, Limited	20	20-21		5 14 3
150,000	5	30 May	-0	Oriental, Limited	5	9-9½		5 5 3
60,000	5	28 Sept.	7	Ottoman, Limited	5	6-7		5 0 0
166,870	10	27 July	4	Pará, Limited	10	54-63		6 3 1
People's Gas of Chicago—								
420,000	100	2 Nov.	6	1st Mtg. Bds.	100	104-107		5 13 1
500,000	100	1 June	6	2nd Do.	100	95-100		6 0 0
100,000	10	12 Oct.	10	San Paulo, Limited	10	154-164		6 1 2
500,000	Stek.	29 Aug.	15½	South Metropolitan, A Stock	100	297-303		5 2 7
1,350,000			12	Do. B do.	100	233-237	+3½	5 1 3
141,500			13	Do. C do.	100	117-120		3 6 8
500,000	100	27 July	12½	New River, New Shares	100	345-353	+3	3 6 0
1,000,000			4	Do. 4 p. c. Deb. Stk.	100	123-127		3 8 8
902,300	Stek.	14 June	6	S'whk & V'xhall, 10 p. c. max.	100	173-177	½	3 7 10
126,500	100		6	Do. 7½ p. c. do.	100	139-140	-8	3 11 5
1,155,066	Stek.	14 June	10	Tottenham & Edm'ton, Orig.	5	11-13		4 4 0
* Ex div								
WATER COMPANIES.								
717,467	Stek.	28 June	9	Chelsea, Ordinary	100	260-265		3 7 11
1,730,580	Stek.	12 Oct.	7	East London, Ordinary	100	197-202		3 9 9
700,000	50	14 June	9	Grand Junction	50	123-127		3 13 2
708,000	Stek.	10 Aug.	10½	Kent	100	270-275		3 16 4
1,043,800	100	28 June	9	Lambeth, 10 p. c. max.	100	255-260		3 9 3
406,200	100		7½	Do. 7½ p. c. max.	100	200-205		3 13 2
500,000	Stek.	28 Sept.	4	Do. 4 p. c. Deb. Stk.	100	117-120		3 6 8
1,000,000	100	27 July	12½	New River, New Shares	100	345-353	+3	3 6 0
902,300	Stek.	14 June	6	Do. 4 p. c. Deb. Stk.	100	123-127		3 8 8
126,500	100		6	S'whk & V'xhall, 10 p. c. max.	100	173-177	½	3 7 10
1,155,066	Stek.	14 June	10	West Middlesex	100	267-272		3 13 6

† Next dividend will be at this rate.

PORTSMOUTH WATER COMPANY.—At the half-yearly meeting of this Company on Thursday last, the Directors reported that the expenditure on capital account during the six months ending Sept. 30 was £10,286. Part of this outlay was on account of the new pumping station at Bedhampton Springs, with which good progress has been made. During the half year 3306 yards of additional street mains of various sizes were laid; and 663 yards of new mains in place of old. There were 694 additional house services laid on, including 25 meter supplies. The total number of premises now supplied by the Company is 31,759. The average daily supply of water for all purposes in the half year was 5,457,000 gallons; being a decrease of 31,000 gallons per day, as compared with the same period of last year. The revenue from all sources amounted in the six months to £23,313; and the expenditure, to £7817—giving a balance of £15,496. The sum available for dividend was £16,651 7s. 2d., subject to the usual deductions. The report was adopted; and dividends at the rate of 10 per cent. and 7 per cent. on the different classes of shares were declared. It was also agreed to carry £500 to the renewals account; leaving a balance of £2387 to be carried forward.

THE LONDON COAL DUES.—In the House of Commons last Thursday, Sir J. Pease asked the Attorney-General whether, on the expiration of the London Coal Dues in July, 1889, it would be within the power of the Corporation or other City authority to exercise an alleged obsolete right of measuring or weighing all coals coming within the Port of London under certain charters of James I. and James II., or other alleged title, and to levy therefor a due of 8d. or some other sum per ton; and, if so, whether Her Majesty's Government proposed to take steps to repeal such power. The Attorney-General, in reply, said he could not express an opinion upon an abstract and very difficult question of law, and one which depended upon the exact nature of any claim which might be made by the Corporation. With regard to the latter part of the question, he said he was authorized to state that in the event of any such claim being made, the Government would carefully consider the whole subject. Mr. Brunner pointed out that the matter was of great importance; and he asked whether the Attorney-General would undertake to inquire into the subject, and advise the Government to bring in a Bill before the claim was made. Sir R. Webster replied that it was impossible to give any such undertaking.

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Exhausters of nearly all sizes in Stock.

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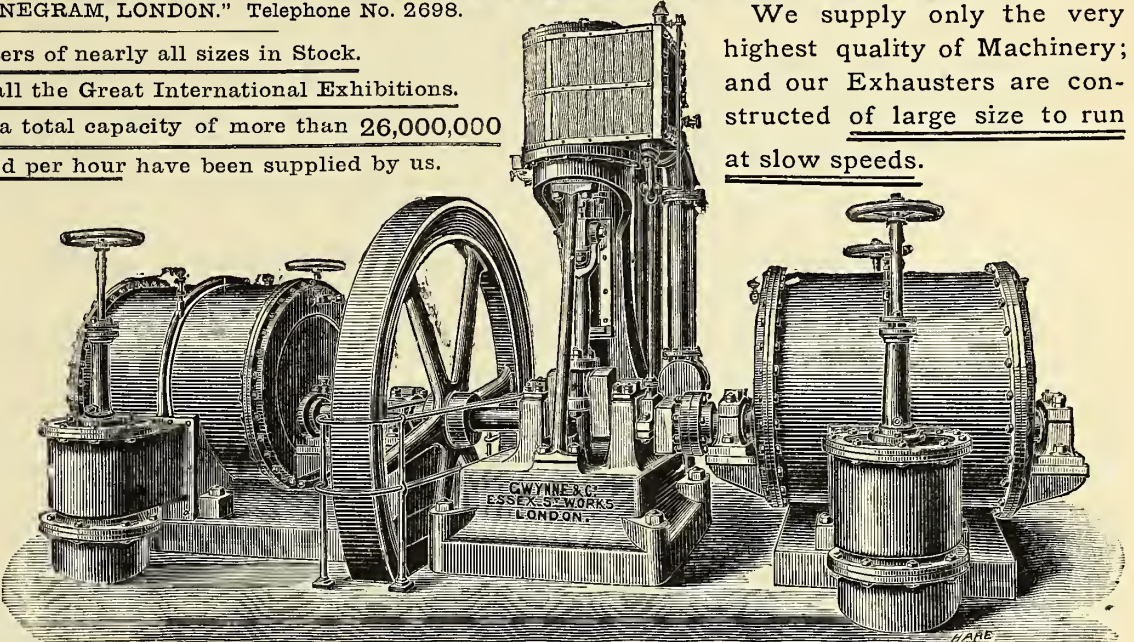
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OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN Wm. O'NEILL, Managing Director.

ANDREW STEPHENSON, Agent for the GAS PURIFICATION AND CHEMICAL COMPANY, Limited, Palmerston Buildings, Old Broad Street, London, E.C.

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JOHN ROMANS & SON, EDINBURGH. Gas Engineers, supply all the most approved SCOTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.

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ADVERTISER seeks Engagement with a Gas Company. Considerable experience in all kinds of Stoves, Meters, and general Fittings, Accounts, Shorthand, and knowledge of Gas Testing. Age 28. First-class references. Address No. 1661, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS Manager wants a Situation. Has been Six years in present appointment, and holds excellent testimonials. Thoroughly experienced, and not afraid of work. Age 33 years, and married. Apply by letter to No. 1660, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Man accustomed to the Gas-Stove trade. Must be able to Fit and Sell. Address "GAS," care of Advertising Offices, 103, QUEEN VICTORIA STREET, E.C.

WANTED, a Second-hand Livesey WASHER, sufficiently large for 45,000 cubic feet per hour. Must be in good order. Price and full particulars to W. L., 55, Pyenest Street, Sbelton, STOKE-ON-TRENT.

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For Prices apply to JAMES LAWRIE AND CO., 63, Old Broad Street, E.C., Sole Agents for London and District. Telegraphic Address: "EIRWAL, LONDON."

ALEX. WRIGHT & Co., 55, 55a, and 56,

MILLBANK STREET, LONDON, S.W.
[Telegraphic Address: "PRECISION LONDON."] Makers of Wet and Dry Gas-Meters, Station Meters and Governors, Photometers, and Gas-Testing Apparatus, Test Gas-holders and Meters, Registering and other Gauges, &c., &c.
** See Advertisement on Page III. of the Wrapper of last week's issue.

W. C. HOLMES & Co., Huddersfield,

AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gas-holders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
** See Advertisement p. 958 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

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TEST Papers and Solutions for Gas- Works prepared by R. D. Gibbs, Summerfield Crescent, Birmingham.
Analysis of Coal, Oxide, and all Gas Materials.

WANTED, a Gas-Fitter, also a Main and SERVICE LAYER.
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LIQUOR 7° to 9° Twaddel. Must be removed in consignments of about 900 gallons every three to four weeks.

Reply to F. G. DEXTER, Manager, Gas-Works, WANTAGE.

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All in first-class order; erected 1880.

Further particulars and order to view to be obtained from the undersigned, to whom tenders are to be addressed on or before Dec. 8.

T. H. MARTIN, Assoc. M. Inst. C.E.
Gas-Works, New Barnet, Nov. 16, 1881.

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BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased. 120 and 121, NEWGATE STREET, LONDON, E.C.

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FOR Gas, Steam, and Water; Galvanized, White Enamelled, and Hydraulic Tubes and Coils JOHN SPENCER, Glohe Tube Works, WEDNESBURY and 14, Great St. Thomas Apostle, LONDON.

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Gas Engineers and Contractors, Makers of Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Tools, and Sundries.

** See large Advertisement in last week's issue, page 911.

FOR SALE—A Station Meter in Round

Case, to pass 12,000 cubic feet per hour, with Clock Tell-tale, Water-Level Indicator, &c. The Meter is being removed to make room for a larger one. Inspection invited.

For particulars, apply to Mr. JOSEPH HEYDON, Gas-Works, MANSFIELD.

FOR SALE—A valuable French and

GERMAN PATENT for Gas Apparatus. Is Selling rapidly in England. Good testimonials.

For particulars, apply to No. 1658, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

(By Order of the ROYAL COLLEGE OF SURGEONS.)

CRYSTAL PALACE DISTRICT.

SALE OF GAS SHARES.

THURGOOD and MARTIN have received

instructions to Sell by Auction, at the Auction Mart, Tokenhouse Yard, E.C., on Thursday, the 6th of December, 1888, at Two o'clock precisely, in 219 lots cum dividend, £24,780 in the STOCK OF THE CRYSTAL PALACE DISTRICT GAS COMPANY, producing Dividends at the rate of 10 per cent., 7 per cent., and 6 per cent. respectively; also 375 £6 FULLY PAID 7 PER CENT. SHARES in the Capital of the same Company, which is a specially safe and easy investment for large or small sums, the dividends being secured against fluctuation by ample Reserve and Insurance Funds, and the increasingly profitable district of the Company.

Particulars and Conditions of Sale may be had of Messrs. WILDE, BERGER, and MOORE, 21, COLLEGE HILL, E.C., Solicitors; at the PLACE of SALE; and of the AUCTIONEERS, 27, CHANCERY LANE, W.C.

Shares may be paid up in full, and 5 per cent. Interest will be allowed upon Calls paid in advance.

THE SOUTH AFRICAN LIGHTING ASSOCIATION LIMITED.

Incorporated under the Companies' Acts, 1862 to 1886.

CAPITAL - - - - - £50,000,
IN 5000 SHARES OF £10 EACH.

PRESENT ISSUE, 5000 Shares of £10 each.—Payments, £1 on Application; £2 on Allotment; £2 a fortnight later; and the remainder in Calls of not more than £2, at intervals of not less than three months.

The intention being to call up the whole amount within 18 months.

Directors.

D. FORD GODDARD, Esq., Assoc. M. Inst. C.E., Ipswich (Director of the Ipswich Gas Company).
JAMES MANSENGH, Esq., M. Inst. C.E., 3, Westminster Chambers, Victoria Street, S.W.
WILLIAM WOODALL, Esq., M.P., Queen Anne's Mansions, S.W.
(With power to add to their number.)

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Messrs. WILKINS, BLYTH, & DUTTON, 112, Gresham House, Old Broad Street, E.C.

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Engineer.

CORBET WOODALL, Esq., M. Inst. C.E., Palace Chambers, Westminster, S.W.

Agents in South Africa.

Messrs. MACKIE, DUNN, & CO., Port Elizabeth.

Secretary.

WILLIAM CASH, Esq., 90, Cannon Street, London, E.C.

ABRIDGED PROSPECTUS.

The objects of this Association are the providing of artificial light to towns in South Africa, the acquisition of existing and the erection of new works, and the supply of apparatus for lighting by Gas, Electricity, or Oil.

Acting on the advice of Mr. Corbet Woodall, M. Inst. C.E., who, in the autumn of last year, visited South Africa on behalf of the promoters of the Association, provisional contracts have been entered into for the purchase of the undertaking of the Port Elizabeth Gas Company, and for lighting King William's Town, both in Cape Colony.

At present Cape Town and Port Elizabeth are the only towns in South Africa which have a gas supply.

Negotiations have been opened by Mr. Corbet Woodall with other towns; and there is reason to believe that further contracts of a favourable nature will be concluded, in which event the Association will have the benefit of those contracts.

PORT ELIZABETH.—This is a considerable town of 13,000 inhabitants, and a port second only in importance to that of Cape Town. The Gas-Works have been established for over 20 years; and the Company has been earning large profits. A new Manager of much experience was sent from England at Christmas last, and has already brought about marked improvements in the working.

The Works are in excellent condition, and are equal to the

production, storage, and distribution of more than twice the present maximum requirements.

The Company has acquired the Works for £36,000 (which includes the provisional agreement for the King William's Town concession and the preliminary expenses), in addition to the value of the coal in stock.

KING WILLIAM'S TOWN.—This is a thriving town, about 40 miles from the coast, having a population of about 6000, and the centre of a large up-country trade. It contains good public buildings, churches, stores, &c. The Municipal Council have provisionally agreed to grant the exclusive right to open the streets for the purpose of laying gas-mains for a period of 25 years, and to take gas for lighting the public roads at a remunerative price.

The cost of erecting works and laying mains in this town, as estimated by Mr. Corbet Woodall, will not exceed £18,000; and it is confidently anticipated that the revenue derived therefrom will be sufficient to enable a dividend of 10 per cent. to be divided upon this capital.

The only contract which has been entered into is as follows, viz.:—A contract dated the 24th of October, 1888, between Mr. Corbet Woodall, of the one part, and William Cash, as a trustee for the Company, of the other part.

It is the intention of the Directors to apply for a Stock Exchange quotation at the proper time.

Prospectuses may be had of the Bankers, or of the Brokers, or at the Offices of the Company.
The Memorandum and Articles of Association can be inspected at the Offices of the Solicitors.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, DECEMBER 4, 1888.

ORNAMENT IN ENGINEERING WORK.

SOME short time since the American engineering press contained an account, in the usual "spread-eagle" style, of a wonderful piece of work that had been done in a locomotive engine-shop at Altoona, consisting in the erection of a locomotive and finishing it ready for steam in 16 hours and 50 minutes. This loudly-blazoned triumph of American mechanical engineering was criticized in *Engineering* as being somewhat too theatrical to really merit admiration. It was pointed out in the English print that a little previous arrangement will enable very ordinary people to perform very sensational feats in the way of despatching work; and the writer might have quoted the instance which so greatly interested our grandfathers, of a coat being made complete from the fleece on the sheep's back in a single day. The key to apparent miracles of this kind, which are at bottom mere conjuring tricks, is the preparation; and in engineering work

the meaning of the word completion as applied to a particular job is open to various interpretations. The Americans who put their engine together in less than 17 hours, of course started with a good deal of the heaviest work already done. The boiler was fixed on the frame, and the cylinders were in place. All the hoisting and lining-out had been finished, in short; and what was left was the assembling of the small pieces which had been already made to gauge. Thus in the same way the period required for "completing" any work will depend greatly upon the point of starting. In the example of the Forth Railway Viaduct, which has been in progress for years, and will yet take a long time to complete, the time will come when, by the placing of a last beam, and the closing of the last rivet, the great undertaking will be finished. By making a special effort, a great deal of this final work could be done in a very short time; but it would be an abuse of language to claim any special credit for thus expediting the "completion" of the work. So argued the writer in *Engineering*, and wound up his critical remarks by stating that, after all the heavy and particular work is done, it does not require much time to turn out a locomotive "resplendent with brass and paint." This last phrase has called forth a rather smart rejoinder from an American correspondent, who points out that the day is long past when locomotives in that country were usually smartened up in the fashion alluded to. They are all thoroughly, but soberly painted; and there is no brass. The writer goes on to say: "We are here becoming very sensible in matters of machine design; and I think that we can teach you in England a good lesson in the plainness and smoothness of machinery. Why," he asks, "do Doric and Corinthian architectures still flourish among the designers of your town water-works pumping-engines?" and so on to the same effect. We are reminded in reading this bit of satire, of the ridicule which we have on former occasions poured on the Siena marbled station-meters, and the ornate temples for enshrining these "things of beauty," with which well-meaning but inartistic gas managers attempt to relieve what they feel to be the dinginess and ugliness of their manufacturing stations.

The reappearance of this reproach in connection with machine design in general reminds one how deeply seated is the love of ornament in the human breast. The lowest savage may perforce dispense with clothing and ignore the advantages of cleanliness; but he must have his bead necklace and his tattooed skin decoration. And so it is up to the modern engineer, who in designing a beam engine makes his central pillar into the similitude of a fluted Doric column, and in erecting a gasholder disguises his cantilevers under architectural adornments borrowed from Corinthian temples. Drive the manifestation of this tendency under the surface in one place, and it breaks out again at another. If we forbid the gas engineer to make his gasholder look what Joe Gargery calls "much too architectooralooral," he will smarten up his station-meter; and if we deprive him of this solace, he will do something to the ridge and ventilators of his retort-house. Somewhere and somehow he will pay this homage to the tastes of his ancestors, unless all remnants of the transmitted propensity are purged out of him by severe discipline in the cold verities of Art. Most of us have need to watch over ourselves in matters of design, to see that we offend not in respect of unnecessary, ill-placed, or incongruous adornments. We can all smile at the florid decorativeness of the Renaissance, when natural philosophy was being painfully equipped with the apparatus which has done so much to unlock the secrets of the universe. If we look into any account of the origin and development of a particular philosophical instrument or pursuit, such as the telescope or ballooning, we cannot fail to be struck with the elaborate ornamentation, as contrasted with the intrinsic crudity of design of the early forms of these appliances. An old microscope was engraved, and fluted, and embossed with Medusa heads and festoons of fruit and flowers, which made it an extremely costly toy; while the vagueness of its defining power prevented it from being much more than an ornament. Half the cost of Montgolfier's balloon must have gone in the decoration of it by paint and gilding. This exuberance of ornamentation was toned down by degrees, although it yielded ground very stubbornly, and clung tenaciously to every part which seemed to harbour it. Thus, as the microscope was improved, ornament was banished from the tube to the stem and pillar—foliations and arabesques giving place to rings and lines, until at last all attempt to trick out the instrument was abandoned, and the makers grew content to take their

chance of the beauty that comes of fitness and good material well put together. The great solace is that this reward is nearer than seekers after ornament can realize. The truer a thing is to type, the more obviously designed with intelligent regard to its nature and office, the better it is finished—so much nearer is it to beauty. It requires high training or keen natural sense of beauty, or both, to appreciate this truth in its fulness, so as to rely upon it in deed as well as in thought. Unfortunately, we English as a people are anything but artistic, and Americans are no better. Some Continental and Oriental peoples have a true feeling for Art; but it is, naturally, confined to objects that have afforded opportunities for the growth of this feeling through past generations. Thus the Tyrolese will build a wooden cottage that it is a pleasure to look upon, just as naturally as he takes to playing the zither. The Briton of a similar class would never think of attempting to do either one thing or the other. The uninstructed Russian peasant makes and paints pretty as well as useful wooden articles which an artist delights to place upon his mantelpiece where he can have them before his eyes; while the English cottager buys of a hawker the most hideous earthenware dogs and horses, for chimney “ornaments.” It would be useless to ask the Tyrolese or the Russian to design a gas-bracket; for such an object would come from without the world of his sympathies and experiences. It is we inartistic British people who have originated steam-engines, gasholders, iron viaducts, and the host of other ngly modernities that harmonize so badly with pretty old-fashioned things; and when in our ignorance we try to break the shock of the contrast by “ornamenting” our harsh utilitarian creations with features borrowed from the older life, which was before these came, the result is an abominable monstrosity. If we let our work-a-day constructions alone, they are not always so utterly bad. We have, as a people, a sense of the proportion of the members of machines which is not to be seen in much of the best foreign work; and we make the best and neatest finish permitted by our materials, and required for the purposes intended to be served. No mechanic can compare British and (say) French workmanship in machinery, without noticing the difference in the styles in which such work is turned out of hand. When we build a gasholder, every plate is flattened, and every rivet regularly placed, although few people may see the work after it is done. In such towns as Berlin and Vienna, on the other hand, the windows of shops occupying the ground floor of magnificent blocks of buildings in the principal thoroughfares may be observed closed with miserably-made iron shutters, constructed of sheet iron buckled in all directions, so that work which we should be ashamed to put in a corner of an obscure gas factory our neighbours tolerate upon their house fronts. Let us then be content with that which we can do, and resign all attempts after what is beyond our reach. If the gasholder framing is taut and well proportioned, let us not sigh after ornate finials on columns or rosettes at the intersections of girders. If the station meter is well built and safely housed, it will not be improved by disguising it as a sarcophagus. Unnecessary ornament, when confined, as it must be, to particular spots, only makes the rest look nglier and more forlorn, like a diamond ring upon a dirty hand or a gold chain festooned across a shabby waistcoat. It may be hoped and believed that a sense of this truth is surely, if slowly, making its way among British engineers.

THE PARLIAMENTARY NOTICES FOR NEXT SESSION.

In another column will be found the list of notices given for the Private Bills relating to the supply of gas, water, and electricity which are to be submitted to Parliament next year. The measures relating to gas make a very poor show indeed. Only seven Bills in all mention gas supply; and there is not one of even second-rate importance, to say nothing about a higher class. The most interesting notice is that of the West Ham Gas Company; and the interest of this lies chiefly in the fact that the Company are asking for an extension of the amalgamation provisions of the City of London Gas Act, 1868, so that they may be enabled to unite, under the terms of the Act, with any neighbouring Company. It may be judged from this statement how meagre the crop of new Acts is likely to be, when this little scheme of a London Suburban Company has to be cited as the most striking notice of the whole list. Nor does inspection of the notices for Provisional Orders reveal any prospective activity of the Board of Trade by way of compensation for the poverty of Bills. Seven Orders are to be applied for, all by small Companies; and a

body of Improvement Commissioners intend to move the Local Government Board for powers to purchase gas-works at present in private ownership. On the whole the parliamentary outlook is dull in the extreme. Electricians are moving a little, as we notice in another column; the relaxation of the transfer clauses of the Electric Lighting Act having inspired speculators with the desire to make fresh attempts upon the investing public. If the legal aspect has improved in their eyes since this time last year, however, other circumstances are not more favourable. It may be mentioned that the Metropolitan Board of Works have given notice of their Bill for regulating the position of gas-mains in thoroughfares (as to which the views of the London Gas Companies are not quite in accord), in order that the County Council may be in a position to proceed with the measure if they think fit.

THE LAWRENCE GAS COMPANY AGAIN.

THE Lawrence Automatic Gas Company gave what is called a “private view” of their system of lighting to the usual knot of newspaper reporters on Wednesday last. Particular care was taken that no representative of the JOURNAL should be present, for reasons which we perfectly understand and fully appreciate. We had a look at the first display of this precious “invention” when it was shown in Fenchurch Avenue at the end of March last, and told our readers plainly what we thought about it. Since then we have had occasion to mention the subject again, *à propos* of the “puff” of the system which the Company have extracted from that celebrated expert, Dr. John Hopkinson, F.R.S., whose competency in such matters is attested by his confession that he had never previously heard of any arrangement for carburetting gas by volatile hydrocarbons vapourized without external heat! The Company have attempted to spawn some concessionary concerns, after the approved example of “Grandfather Brush;” but with what success we know not. Wednesday’s show, and the little lunch to follow, must have been intended to signalize the removal of the Company into Lombard Street. They will go a little farther yet, before they have done; for we do not entertain the slightest illusion respecting the fate of the Company. It will be kept afloat until some of those who are interested in it can “unload,” as the picturesque phraseology of the financial papers has it; and then it will sink like a stone. It is amusing to see how newspapers like *The Times*, which are popularly supposed to be well posted in regard to all matters of current interest, have reported Wednesday’s doings as though some of them had not published similar intelligence respecting the identical speculation months ago. As to *The Times*, one grows tired of pointing out how egregiously the Editor is misled by the people or person to whom he entrusts the preparation of paragraphs upon scientific matters; and nobody who ever saw the class of representatives that are sent by the conductors of London daily and weekly newspapers to demonstrations of this kind, could wonder at the rubbish they write respecting such subjects. These men might do very well at a fire, or the scene of a murder; but it is cruelly to expect them to write intelligibly—after a city luncheon, too!—about gas making. Yet these are the witnesses the Directors of the Lawrence Gas Company seek, instead of welcoming the criticism that comes from knowledge. Though we did not receive their invitation for Wednesday last, however, we willingly bestow this notice upon them. They may desire to exclude the unwelcome voice of warning; but it will not be silenced for all that, seeing that while the Lawrence Directors have their own object to gain by this practice of getting hold of ignorant press-men, we have also an end to serve, which is to prevent readers of the JOURNAL from falling into trouble. Meanwhile we notice that the great flourish made by the promoters of the Lawrence gas scheme has attracted another projector, in the person of a Mr. F. J. Lothammer, who also managed to get his wonderful invention described in *The Times*. This is, of course, a gasoline carburetter device, like the other, only the air is delivered under pressure, which is one more disadvantage. There will be plenty more of such schemes if the British public show the slightest tendency to “bite.”

A NEW SERIES OF PLATES ILLUSTRATING GASHOLDER DESIGN.

WITH this issue of the JOURNAL, we commence the publication of a set of drawings illustrating the large gasholder recently supplied for the Sydney Gas-Works by Messrs. C. and W. Walker, who are responsible for both the design and construction. It is a very creditable piece of work; and we publish it, with the description, in order to place it upon

record as one of the finest examples of modern gasholder construction. It is also a substantial proof of the material progress of the Australian colonies that they should now require such large provision for gas lighting in localities that but two, or at most three generations ago were wildernesses only lighted on dark nights by the bushmen's fires. And it does not appear as though any other means of artificial lighting that might be supposed to be able to supplant gas at the Antipodes has yet achieved sufficient success to alarm the Directors of the Australian Gaslight Company; seeing the splendid provision they are making for the future wants of the community which provides them with consumers of gas. At the present time, when the design of gasholders is very much before the attention of gas engineers, it is desirable that the actualities of construction should not be overlooked in the discussion of future possibilities. We cannot say positively what the gasholder of the future may be like; but we confidently recommend the subject of this notice as a first-rate example of the gasholders of the present. There is nothing strikingly novel about the design, which was indeed to be deprecated under the conditions; the holder being made in England and erected by the Gas Company's own workmen. It is all plain, straightforward design, realized in sound materials and good workmanship, such as any gas manager might be satisfied with. We understand that the holder is giving, in daily working; every proof of the excellence of its planning and execution.

Water and Sanitary Affairs.

ALTHOUGH not without importance, no very striking features offer themselves for comment in respect to the schemes coming before Parliament in the session of 1889, in connection with the water supply of the kingdom, and of which we give a complete list in our present week's issue. The Barrow Hæmatite Company, Limited, seek power to construct water-supply works, with power to transfer the same to the Corporation of Barrow-in-Furness. The Corporation, it will be seen, are going to introduce a Bill empowering them to construct new water-works, taking their supply from the River Duddon and elsewhere. The Hæmatite Company propose drawing from the Duddon and the waters of Crosby Gill. Bills are to be introduced for forming new Companies in some localities—including a district in East Kent, comprising Sandwich and other places, the works to be constructed at East Langdon; also for the supply of Bettws-y-Coed, Cwmdu, Llangeinor, and contiguous parts in Glamorganshire; the parishes and townships of Long Eaton, Sandiacre, and Stapleford, in Derbyshire and Nottinghamshire; and several small places in South Kent. Powers for the construction of additional works are sought by the Barrow Corporation, as already mentioned, as also by the Bristol Water Company, the Belfast Water Commissioners, the Corporations of Bury, Coventry, and Hythe, the Commissioners of the Deanhead Reservoir, the Eastbourne Water Company, the Kettering Water Company, Limited (who likewise propose a change in their legal status), the Newcastle and Gateshead Water Company, the Padiham and Hapton Local Board, the Plymouth Dock Water-Works Company, the Rastrick Water Company, Limited (to be transformed into a new Company), and the Yeaton Water-Works Company. An extension of time for works already authorized is sought by the Barrow Corporation in respect to works authorized in 1875; and by the Belfast Water Commissioners concerning works specified in their Act of 1884. The Wakefield Corporation seek similar relief for works authorized in 1880, including four reservoirs. The Swansea Corporation desire an extension of the time fixed by their Act of 1884 for the completion of the Upper Lliw reservoir and other works. An extension of time is sought by the Heywood Corporation in regard to a reservoir on Ashworth Moor. An enlargement of the statutory limits is proposed in several cases. Some of the Bills propose to regulate the employment of plumbers; Liverpool affording one instance. The misuse and fouling of water are the occasion of some preventive measures. The Corporation of Manchester seek for authority to alter certain lines and levels connected with their aqueduct from Lake Thirlmere to Prestwich. In London we meet with the Bill of the Metropolitan Board for regulating the laying of mains and pipes, and limiting the liabilities of Vestries and District Boards in the event of damage. The London Hydraulic Power Company seek to alter

some provisions of the Acts relating to their undertaking. The Rickmansworth and Uxbridge Valley Water Company propose to extend their limits so as to include Harmondsworth, Sunbury, Shepperton, and Littleton. New works are to be constructed by this Company, who also seek power to supply water in bulk to Water Companies and other bodies. The Corporation of Wigan have a somewhat ambitious scheme for extending the borough boundaries and absorbing the water undertakings of adjacent Local Boards. At Bury, Cleveland, and elsewhere, it is proposed that the charges for water shall be revised. The Huddersfield Corporation seek powers for the transfer to them of the property held by the Commissioners of the Wissenden reservoir. The Woodhall Spa Company desire to obtain the water-works situated in Lindley. There is thus a considerable amount of change contemplated, even though the individual projects are generally on a moderate scale. Among the more important schemes to which we have thus referred, attention might be called to the projects at Bristol and Newcastle. Further particulars concerning them are given in our "Parliamentary Intelligence." In each case a reservoir is to be formed by means of an embankment across a valley traversed by a river. It will be noticed that the Grand Junction Company are not proposing to re-introduce their Bill for drawing a supply of water from a source $3\frac{1}{2}$ miles above Windsor Bridge. The scheme has been highly commended by General Scott, the Metropolitan Water Examiner; but the ill-judged opposition offered this year in Parliament has frustrated the enterprise, despite its extreme importance to the Metropolis. So far, we have referred to the Bills which are to be brought into Parliament. In addition, there are a few applications to be made to the Board of Trade, which do not call for special remark at present.

THE NEW GAS MANAGER AT BATLEY.—The vacancy in the management of the Batley Gas-Works, caused by the removal of Mr. T. Holgate to Halifax, has been filled by the appointment of Mr. John F. Bromley, of Bolton.

THE SALFORD TOWN COUNCIL AND MR. ELLIS LEVER.—A meeting of the Salford Town Council will be held on Wednesday next, to consider, among other things, a communication sent to the Mayor from the Solicitor of Mr. Ellis Lever with reference to the resolution passed at the last meeting of the Council agreeing to the proposal of Mr. Lever as to the appointment of three members of the Council to whom he would disclose certain alleged frauds in connection with the Gas Department, which he now declines.

SACCHARINE.—Dr. Fahlberg, "the discoverer of saccharine," writes from Salbke, Westerhusen, to one of the Manchester papers, denying the truth of the allegation that coal tar saccharine is injurious to the human system. The origin of the statement, he says, is doubtless traceable to the report issued by the Commission appointed by the Conseil d'Hygiène et de Salubrité de la France, to inquire into the properties of saccharine, and also to the remarks made by Dr. Worms at a meeting of the Académie de Médecin in Paris, on April 10 last. The report, he avers, is objected to by all prominent men of science outside France, who have been consulted in the matter; that the words of Dr. Worms had become magnified and distorted by the French press, until they no longer represent what he did say; and that this distortion is malicious and is dictated by the fears of the French sugar industry lest sugar should be displaced. Dr. Fahlberg has delayed replying to the charges which have been made against saccharine pending the completion of experiments, impartially conducted, with a view to testing their veracity. Had they been confirmed he declares he should have discontinued the production or sale of saccharine.

THE LATE MR. JOHN COLLINS, OF BOLTON.—We have just learned some particulars as to the late Mr. John Collins, F.C.S., &c., of Bolton, whose death was briefly announced in our columns at the time of its occurrence. Mr. Collins, who was one of the most prominent Chemists and Gas Analysts in Lancashire, was born at Darton in 1832, and was educated at Chester College and South Kensington. He was identified with the gas industry all his life; and carried on an extensive practice, in association with his son, Mr. Walter H. Collins, Ph.D., F.C.S., &c., as an Analytical Chemist and Consulting Chemical Engineer, at Bolton. He was Chemist to the Ashton Gas Company, Gas Examiner under the Sale of Gas Acts for several Local Board districts in the neighbourhood of Bolton, Wigan, Liverpool, &c.; and he was at one time Chemist to the Bolton Gas-Works Committee and also Borough Analyst. He devoted a good deal of attention to water supply and pollution; and his experience of over thirty years in "scientific litigation" was very extensive. He was a familiar figure, as an expert witness, at Westminster and the new Law Courts. His health began to fail about three years ago, since which time most of his work has devolved upon Mr. Walter Collins. Mr. Collins was the originator of a most successful process for treating town's sewage, called the "M & C Process," in use at Bolton and elsewhere. His loss is felt by many gas engineers as a personal one. Those who were intimate with him find it difficult to name a man more equally or usefully accomplished. He had read deeply; and was a keen observer of men and manners in many countries.

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(FOR STOCK AND SHARE LIST, see p. 997.)

DURING the past week there has scarcely been any recovery effected in the Stock Exchange markets from the depression which characterized them the week before. From time to time there was a promise of some degree of rallying—according as more favourable views of the monetary position were formed; but it died away, leaving only fluctuation as the result. Still, on the whole, the week has closed rather better than it opened. Business in the Gas department may be written as decidedly quieter, especially in the Metropolitan Companies. Transactions in these have been marked at steady prices throughout the week, with very slight range of figures. Gaslight "A" has only varied from 251½ to 253. South Metropolitans have been quiet; and transactions have been mostly in the "A"—prices ranging from 300 to 301. For the "B," 235 has been the only price recorded; and the single transaction effected in "C" was at 246. In Commercial, the old stock has changed hands a few times at rather better than average figures; but it has not yet evinced that tendency to rise which we are inclined to believe is in store for it. All the Companies are, we believe, doing excellent business, not only in their residuals (the markets for which have greatly improved), but also in an increased sale of gas, which is the healthiest possible sign. Unless any abnormal circumstances and conditions of weather should occur to make this, the last month of the year, less prosperous than the rest, we shall expect that the accounts for 1888, when disclosed, will occasion a feeling of regret to those who have lately been parting with their stock. Among the Suburban Companies, Brentford has been done at rather easier prices; but the quotation is not affected. In the Foreign category, Continental Union, partly paid and preference, have advanced in view of the approaching improved dividend; and some Companies are quoted *ex div.*, at about equivalent figures. The Water Companies offer nothing particular to remark, except general firmness. Business in them has been very quiet; but some have made further advances in quotation. The only exception is Southwark and Vauxhall, the 7½ per cent. shares of which have lost the 2 that they gained the week before.

The daily operations were: Moderate business on Monday in Gas, mostly in the Metropolitan issues, without change of quotation. Water was very quiet indeed; but New River rose 1½. On Tuesday, business in Gas was more restricted; and again without change. Water was extremely quiet; but Kent improved 2. Wednesday's Gas business was only a shade more active, if at all, at previous quotations. A few Water stocks changed hands at good prices—especially East London, which rose 2; but Southwark 7½ per cent. relapsed to a similar extent. There was rather more doing in the Gas department on Thursday; but prices were only moderate. Water was quite stagnant. Friday was a very inactive day for Gas; but the figures recorded showed a very fair degree of firmness. Water again presented nothing to notice. Saturday's business in Gas was quiet, even for a Saturday; but the few prices marked were satisfactory. Continental new rose ½; and preference, 1. A little was done in Water; but all quotations remained unchanged.

ELECTRIC LIGHTING MEMORANDA.

THE COST OF ELECTRIC LIGHTING IN LONDON—PARLIAMENTARY NOTICES OF ELECTRIC LIGHTING VENTURES—FAILURES OF ELECTRIC LIGHTING IN GLASGOW AND PARIS.

LAST week we published a statement emanating from the House-to-House Electric Light Supply Company respecting the business which they contemplate doing in view of the immediate completion of their West Brompton lighting station. This statement calls for some comment. It will be noticed that in the first place the undertakers lay special stress upon the necessity for their being informed as to the maximum supply required by their subscribers. The importance of this direction becomes apparent when studied in connection with the experience of the customers of the Grosvenor Gallery Company, whose style of lighting is criticized in another column by an eminent correspondent. It is complained of the Grosvenor Gallery Company that they have taken on more subscribers than they are able to properly supply at the hours of greatest demand; and they accordingly have been driven to keep some consumers short while attending to others. The Charing Cross Railway Station has notoriously been made a convenience of in this way. Here the gas is always on; and when the electric lamps grow too dim, they are dispensed with for a time. When the Bond Street and Regent Street shops close, then the railway station gets its full current. Of course, the Grosvenor Gallery Company are not working under the restrictions of a Provisional Order, or these vagaries would not be permitted. The West Brompton station is not legalized either; but steps may be taken with this object, and the Company are wise to make sure of what they may be asked to maintain in the way of maximum supply during the heaviest hours of business. The Company's statements relating to the price of their supplies are worth noticing. By artfully manipulating the figures of imaginary rental accounts, they make it appear that incandescent electric lamps are to cost their customers but little more than gas at London prices. It is shown that 20 such lamps may cost for a winter quarter (reckoning five hours of lighting per night), the modest rental of £14 14s. 4d. Now this is equivalent to 46,000

cubic feet of gas for the same quarter, which at the same total cost would come to about 6s. 6d. per 1000 cubic feet. It is, however, waste of time to examine all these estimates. The best rule is that which we have already given in a previous issue: The price of electricity per Board of Trade unit, multiplied by 13, gives the equivalent cost of 16-candle gas.

The Parliamentary Notices, which appear in another column, contain several references to electric lighting. The Metropolitan Electric Supply Company seek powers by Bill for producing and supplying electricity in the parishes of St. James, Westminster, and St. Martin's-in-the-Fields, also over Waterloo Bridge and the Victoria Embankment. Then the Chelsea Electricity Supply Company mean to apply for Orders to enable them to commence business in the parishes of St. George's, Hanover Square, and Kensington. The Electrical Power Storage Company contemplate installations for the supply of Paddington and St. Martin's-in-the-Fields, and the Strand district. The Kensington lighting is to be scrambled for by the House-to-House and Kensington and Knightsbridge Electric Supply Companies. The London Electric Supply Corporation have given notice of their desire to occupy an enormous district extending from Chelsea to Whitechapel, and from Hampstead to Greenwich—all London, in short. In this ambitious scheme, they are rivalled by the Metropolitan Electric Lighting Company; and there are two smaller ventures, taking their names from Notting Hill and Westminster respectively, which are designed to pick up the crumbs that the others may leave in these parts. So that it will be seen how well provided London is to be with electric lighting in the near future—if all these schemes get successfully under weigh. This is, of course, a very big "if;" and we are a long way yet from the Royal Assent to all these projects. They will keep the Vestries busy for a few months, and give the new County Council something to think of.

The claims of electricity to be regarded as the safest of all possible means of lighting will not be helped by what happened on Monday last week at the Glasgow Post Office. About eight o'clock in the evening—just at the busiest hour, of course—all the electric lights went out, leaving the rooms in darkness. Soon it was reported that the roof was on fire. The fire brigade on the premises ran out their hose, and got the fire under with the assistance of the town force. It was found to have been caused "by some defect in connection with the electric lighting apparatus." For the rest of the night the building was lighted by candles. So the much-abused lights of other days have to be called in too frequently to supplement the defects of the light of the future. The incident is a serious one, not to be undervalued by those who wish to understand the exact position of electric lighting in this country. Professors pretend to cudgel their brains for reasons why electric lighting is not more prosperous than it is, yet somehow they always happen to forget these little mishaps, one of which does more harm to the prospects of electric lighting than a volume of lectures can repair. This class of misadventure is not confined to British electricians, for we read in the *Revue Industrielle* that the Paris Municipal Council Chamber and also part of the Hôtel de Ville have been lighted by electricity; and at the first sitting after this improvement had been completed, there was a sudden extinction of all the lights. Darkness cut short the business of the evening; and, no preparation having been made for such an eventuality, the municipal councillors were fain to find their way to the doors as best they might, adjourning their usually lively debate to the third day after. The electrical plant is fixed in the cellars of the Hôtel; and, naturally, all the arrangements of the lighting service are the best that money can procure. The occurrence is remarkable in connection with the fact that the Municipal Council have decided to embark in the business of electric lighting in the market quarter of the capital. Warnings against their undertaking any such business have been vainly addressed to them; and now they have been so dramatically reminded of the risks and uncertainties of electric lighting, people are asking the question how the Municipality can expect to do a satisfactory business of the kind in a large out-of-door district, when they cannot depend upon having a proper light in their own house? These considerations are not, however, likely to trouble municipal authorities bent upon spending public money in furtherance of their own ideas.

THE Directors of the Anglo-Spanish Gas Company have appointed Señor Francisco Ivern y Roig to be General Manager of their Játiva and Denia stations.

THE Directors of the West Kent Gas Company have appointed Mr. Albert Box to the post of Manager of the Erith works of the Company, vacant by the recent death (already announced) of Mr. Daniel Vincent.

NEXT Thursday, at 5 o'clock, there will be a meeting at the Sanitary Institute, Margaret Street, Regent Street, W., to hear a lecture by Sir Douglas Galton, K.C.B., F.R.S., on "The Future of the Amalgamated Societies—the Parkes Museum and Sanitary Institute of Great Britain."

THE Buenos Ayres Co-operative Gas Company have accepted the tender of Messrs. Gibbons Bros., of Dudley, for the erection of retort-benches at the new gas-works now in course of construction. The system of firing is entirely regenerative—as designed by Mr. G. Ernest Stevenson, C.E., the Company's Engineer—and consists of 32 beds of 8 retorts each, in four benches. The Company hope to make gas by Jan. 1, 1890.

DESCRIPTION OF A THREE-LIFT GASHOLDER FOR SYDNEY.

DESIGNED AND CONSTRUCTED BY MESSRS. C. & W. WALKER, ENGINEERS, OF LONDON AND DONNINGTON.

By the courtesy of Messrs. C. & W. Walker, we are able to present to our readers a series of actual working drawings used in the manufacture, construction, and erection of one of the largest and handsomest gasholders in the world. This gasholder was specially designed by Messrs. Walker for the Australian Gaslight Company, to be erected at their works at Sydney; and everything has been so arranged as to give the least possible trouble in erection—the Company themselves undertaking this part of the work.

It is, of course, obvious that a firm of engineers like Messrs. C. & W. Walker, who are constantly making and erecting gasholders, not only from their own designs but from designs by all the most eminent gas engineers of the day, must be in an advantageous position for determining the most economical and effective design to fulfil given conditions. So many gasholders pass through their hands that they can tell at once the best form to adopt to attain the maximum of stability with the minimum of work for the given capacity.

The gasholder we have to describe is a three-lift holder, of the following dimensions:—

	Ft. In.
Inner lift.	199 0 diameter by 40 feet deep.
Middle lift	201 6 " " "
Outer lift	204 0 " " "
Tank	206 0 " " "

The total capacity is about 3,750,000 cubic feet.

The guide-framing consists of 22 lattice standards of T section, connected by three tiers of warren girders, and diagonal ties. The tops of the standards are braced together horizontally by wind ties; and the whole guide-framing forms a complete, rigid structure, entirely independent of the gasholder bell for its preservation of form, and therefore able to give it perfect support and guidance in the operation of rising and falling.

The cost delivered f.o.b. Liverpool was about £11,000, or less than £3 per 1000 cubic feet capacity—a remarkably low sum, when the substantial character of the work is considered; and especially when everything was done to lessen the cost of erection, freight, &c.

General Principles to be Observed in the Design.

- I.—Gasholder to be erected, thousand of miles away, by strange hands. Necessary, therefore, that the difficulty and labour of erection should be reduced to a minimum.
- II.—In order to reduce "freight," the weight of the holder must not be greater than necessary.
- III.—For the same reason, the shape and size of the pieces in which it is sent away must conform to the shipping requirements.

These three points had to be borne prominently in mind; but are influenced greatly by the following considerations, or axioms, which affect the designing of gasholders generally:—

(1.) Saving weight in a structure does not always mean saving cost, because, to get the same strength and durability, the work and labour expended upon the manufacture and erection of a light, flimsy holder of complex form, may more than wipe out all the estimated advantages due to reduction of weight.

(2.) In many ways the less pieces there are to handle and connect in a holder, the less will be the cost; and if this can be attained by a little extra weight, it is a good compromise.

(3.) It is far cheaper to do as much work as possible on a low level where everything can be got at for rivetting, &c., and where every appliance is handy for doing the work in the cheapest form, and then lift the holder up in the bulk so to speak, than to build it up in fragments, piece by piece, towards the sky. It is also easier to get at it for inspection, sounder work is secured, and it is much easier to get everything plumb and true. This applies more particularly to the guide-framing.

(4.) As far as possible, special sections of iron should be avoided—viz., unequal sided tees or angles, and of unusual thickness and widths, as they entail extra cost, and are difficult to get rolled in a hurry. Sometimes a job is kept waiting a long time because the makers of the iron will not put in the rolls for an awkward section, which an engineer insists on having. Of course, there are special cases where it is an advantage to use an irregular section, where the strength or convenience of construction demands it.

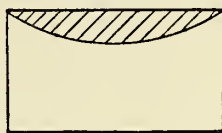
(5.) A number of different sections of iron (angle, tees, &c.) should be avoided. As far as can be arranged, the same section should be used throughout the work—e.g., how often do we find gasholders with top purlins of several different awkward sections, when one or two at the most of some regular size would do. This rule is particularly necessary to observe in the case of channel and rolled joist iron, as they invariably take longer to get than ordinary bar iron. Moreover, if only a small quantity of several sections are ordered, the makers will not put in the rolls for them until they get orders for the same section, from other sources to make it worth their while; whereas with the same total quantity of one or two sections, there would probably be little trouble in getting them in good time.

(6.) One part should be the duplicate of another, or in other words everything should repeat itself as much as possible; and everything should be arranged symmetrically. For instance, the gasholder should be constructed in bays, corresponding in number with the number of columns or standards. By this

we mean that the number of pieces into which each ring, whether top curb, bottom curb, or hydraulic cups should be divided must equal the number of columns; and they should all be of equal length. The number of vertical stays, guides, &c., should also be a multiple of the number of columns. By this means every bay with its system of curbs, cups, dips, vertical stays, guides, rollers, &c., is repeated throughout the holder.

(7.) Welded joints and turned or joggled corners of angle or tee iron should be avoided where a substantial joint can be made in other ways. This will be understood when we come to consider the framed standards hereafter described, which are singularly free from unnecessary bending and welding of the iron.

(8.) Plates cut out in hollow curves should be avoided, as the pieces have to be punched out, which occupies much time. Thus to cut out the shaded piece in "A" it has to be done inch by inch, and then trimmed on the raw edge. It is far better to leave it



A.



B.

straight on the edge; for the value of the piece of plate saved is nothing compared with the trouble of cutting it out. Of course, plates can be sheared with convex curved edges without any trouble. For instance, cutting away the shaded part in "B" only requires a few strokes of the shearing-machine.

(9.) A great and unnecessary variety in the sizes of rivets or bolts should be avoided, especially in the same member or bar—e.g., it is often advisable to put a larger rivet through a bar in a certain place than is theoretically required to meet the strain upon it, just to agree with other holes in the same bar which are required to be of that size. Otherwise the bar has to be lifted, and brought to the punching-machine two or three times, when once handling would do. The extra weight of the rivet is a mere trifle, compared with the saving in labour of handling. Besides, to have but little variety in rivetting, prevents mistakes being made. If it be said that the iron is weakened by putting through a larger hole than necessary, then use a heavier section to compensate for the weakening; it will be saved over and over again in the increased facility with which the work can be executed.

(10.) Many things might be mentioned respecting castings, especially relating to cast-iron columns; but as they do not enter into the construction of this holder, it will not be necessary to lay down minutely the rules for guidance in designing cast-iron work. We may, however, mention that: (1) The taper of a cast-iron column should always be $\frac{1}{8}$ -inch to a foot. (2) The lengths of each piece should not exceed 16 feet, except for special reasons. (3) All mouldings should be well bracketed inside. (4) The metal should be thickened up round holes for bolts, &c. (5) Never cast a guide-rail or other large projections on one side of a column. (6) The practical requirements of the foundry as regards moulding, &c., must be observed. (7) Square based, high pedestals, on which to stand the shaft above, are very bad; they crack in casting from contraction strains. (8) Cast-iron lattice-work must be avoided; it is very treacherous.

(11.) The depth of a gasholder should, if possible, never be less than one-fifth of the diameter. Messrs. C. & W. Walker have, we believe, made the shallowest gasholders in the world—viz., 165 feet diameter by 20 feet deep, each lift; the depth in this case being less than one-eighth of the diameter. From their experience, they assert that it would be absolute waste of material to make them any shallower; indeed, they should never have been this depth (as the expense was greatly increased thereby), if it had not been for very exceptional circumstances.

We will now give a description of each of the working drawings as they appear, calling attention to any details of special interest and give the reasons for the construction adopted.

DRAWING No. 1.

The Inlet and Outlet Pipes.—These are 3 feet diameter, and constructed of wrought-iron plates, made in handy lengths with angle-iron flanged joints, faced. The duck-foot bends and tees, however, are made of cast iron, as wrought-iron duck-foot bends and tees are very expensive to make. It is worth noting that the duck-foot is cast in separate pieces from the bend; the reason being that it avoids the cracking from contraction strains. In fitting together, there is the least possible work in chipping, as little snugs are cast on, which alone require trimming; the joints are also caulked up solid with borings to make a sound job.

Holding-down Bolts and Plates.—These are 2½ inches diameter, and about 16 feet long. There is no swelling up at the thread, because it is better to make the bolts larger in diameter (for their entire length) to allow for weakening due to screwing; and thus save the weld. The foundation plates are built solid in the brick-work; flat iron being used in preference to a large casting, as the latter destroys the continuity of the brickwork of the tank too much by cutting it away. For the same reason the foundation bolts are made with heads, instead of cotter ends, as cotters require large recesses to be left in the tank to get them in after the tank is built.

Tank-Guides.—The wrought-iron tank-guides are of channel iron

bedded flat against the tank wall all the way up, to avoid springing, and are attached by wings and Lewis bolts to the stones let in the tank walls. This is all clearly shown on the drawing.

Livesey Man-Lid.—Drawing No. 1 also gives a detail of the Livesey man-lid, which is coming very much into use, especially in large holders, as it admits of ready access to the inlet and outlet pipes inside the gasholder when the holder is at rest, without discharging all the gas contained in the crown of the holder. The construction shown is as effective and simple as it is possible to make it.

ELECTRIC LIGHTING STATIONS.

DURING the last few months a considerable amount of public interest has been aroused by reports of a prospective revival of enterprise in electric lighting from central stations. This was of course, the system upon which the pioneer electric lighting companies of ten years ago were supposed to work; and we all know how they fared. Then for some years past central lighting stations were only talked about between electricians as among the certainties of that future to which they have always looked with undimmed hope. But their only real business meanwhile was with special installations for lighting single buildings, or groups of buildings, and steamships. Yet through all this period of discouragement, the lamp has been kept burning in one or two places. There have still been a select few who would not give up the idea of distributing electricity for lighting like gas, and disdained to join in the scramble for isolated lighting installations in which others were fain to seek their livelihood. Now these persevering experimentalists seem to be forging their way to the front once more. The Electric Lighting Act has cleared the road for them, to a certain extent, and capital appears to be forthcoming to test the practical question whether the last ten years of probation have really weeded out weaknesses from the various surviving systems of electrical distribution. Mr. Killingworth Hedges has recognized the moment as an opportune one for the publication of a little work descriptive, from an ostensibly impartial standpoint, of these systems.* He confesses also to having another object—that of persuading British gas companies to “follow the example of the American companies, and take up the business of supplying electricity.” And as Mr. Hedges is a well-known writer on the subject of electric lighting, with some pretensions to be esteemed an authority upon electrical engineering, we are prepared to seriously examine his arguments.

In his preface, Mr. Hedges admits that the actual result of the application of scientific knowledge and large capital during the last ten years to the art of lighting by electricity, “appears to be discouraging.” He thinks, however, that “the era of central-station electric lighting, which has now commenced, ought to re-establish the position of electricity in financial circles, and afford a safe and profitable outlet for the surplus capital of the investor who buys gas and water shares to pay 4 per cent.” This passage is not so clear as could have been desired. It might be asked, for instance, in what sense the era of central-station lighting has “now” commenced? We have already shown that this was the purpose claimed by the companies which started, in the first years of the decade, with the expectation of driving gas lighting out of the kingdom. We are not aware that there exists any justification for the claim that there is at the present time anything more than a revival of interest in this subject, due in great measure to the amendment of the Electric Lighting Act. The demonstration of the scientific and commercial success of the idea which, with the ineradicable precipitancy of electricians, Mr. Hedges writes of as a fact, is something which remains to be proved. Mr. Hedges begins his book with a general explanation of what is meant by the term “Central-Station;” what such an establishment may be expected to do as a matter of work; and how it is likely to be supported. He then goes on to deal with the method of charging for electricity; and here he becomes misleading. In the first place, he does not explain the Board of Trade unit in a way that a non-technical consumer could understand; indeed, it is as much as we can do to follow him. He states that the Board of Trade unit is 1000 watts per hour, and that a 16-candle power Swan lamp is assumed to require 60 watts, which permits his readers to understand that 16 $\frac{2}{3}$ such lamps can be kept going (theoretically) with a consumption of one unit of current, which he says is supplied in England from 1s. to 7d. by different contractors. Now, 16 $\frac{2}{3}$ statutory gas-burners of 16-candle power will consume 5 cubic feet per burner per hour each, or altogether 83 cubic feet of gas per hour, which is consequently the equivalent of a Board of Trade unit of electricity. Therefore the ratio of the unit of electricity (which, as we see, equals in lighting effect 83 cubic feet of gas) to the usual unit of 1000 cubic feet by which gas is sold, must be as 83 : 1000, or a fraction ever one-twelfth. To find the equivalent price for gas, to give equal light, to electricity quoted at per Board of Trade unit, we must multiply the latter by twelve. Hence electricity at 1s. per unit is equivalent, light for light, to gas at 12s. per 1000 cubic feet. Mr. Hedges makes it 6s. 10d. Will he kindly explain how he gets at this figure? Even our calculation is scarcely fair to gas, for Mr. Hedges admits that Swan lamps require in practice about one-sixth more power than theory prescribes; and, further, that a 20-candle power lamp must be used to give the 16 candles actual illuminating power, so that his statement of equivalent values

is still more erroneous. Mr. Hedges would probably admit that the cause of electric lighting has suffered sufficiently in the past from exaggerated statements of its value as compared with gas; yet here, in the very opening of his new book, we detect him in an altogether misleading comparison, as flagrant in its way as the “French measurement” of illuminating power introduced and adhered to with such effrontery by the Brush Company. For the guidance of our readers, we have been in the habit of computing the Board of Trade unit of electricity as equal to 100 cubic feet of ordinary coal gas. Thanks to Mr. Hedges, we shall in future multiply the price of the unit by 13 to arrive at the true equivalent, unless he can correct us in this matter.

We cannot follow the author through all his descriptions of systems and plants, most of which are borrowed from published lectures and papers, and tell little or nothing that has not been already conveyed to our readers through our ordinary reports of such matters. For a subject that, according to the author's claim, is to be taken as the record of a scientific and commercial success, he has singularly few data to offer. All his statements of capital and working expenses are mere estimates, or apply to foreign or isolated examples, and not one of them can be cited as illustrating the financial circumstances of an English central electric lighting station. So far as we are informed, the Grosvenor Gallery people are the sole possessors of reliable information upon this head; and they are distinguished for keeping their knowledge to themselves. Mr. Hedges has a chapter, which he would probably regard as of peculiar interest for our readers, headed, “The Interests of Gas Companies as to Electric Lighting.” It begins with the statement that “the policy of gas companies with regard to electric light has, with few exceptions, been a state of indifference to the progress of things electric, with contempt for a rival whose opposition is not sufficiently powerful to be appreciated.” This, we venture to say, is altogether an error. Gas companies have looked upon “the progress of things electric” with much interest, since the memorable time when a Stock Exchange manœuvre sent their shares down to panic values. Mr. Hedges goes on to prophesy that the progress of incandescent lighting will infallibly displace gas lights; and he proceeds to argue that gas companies, being in a position which would enable them to acquire “almost as complete a monopoly of lighting by electricity as they have of gas,” should seize the opportunity. He employs the example of the Imperial Continental Gas Association in Vienna, and gas companies generally in the United States, to prove that electric lighting and gas can be satisfactorily supplied together. With much of his argument we agree. If it is possible to supply electric light well and cheaply, it can be done from gas-works, where fuel may be had at the minimum of cost, and the best experience in distribution is available. With Mr. Hedges's deduction, however, it is impossible to concur. Gas companies are undertakings for supplying gas, not electricity, with which they have no more warrant for concerning themselves than they have for selling petroleum. If electric lighting from central stations is ever made successful, it will not be by gas companies; and if money is lost in it, it will not be money subscribed on the faith of the gas business. Even if the idea recommended itself to gas shareholders (which it does not), local authorities would rightly object to such an expansion of the gas interest. Mr. Hedges knows little of the circumstances and motives of local authorities in the United Kingdom if he really believes that “a very little expenditure” would enable gas companies to enlarge their powers in the direction he contemplates. We do not presume to judge the conduct of American gas companies, whose circumstances differ radically from those of English gas undertakings. It would doubtless be very agreeable to electricians if gas companies everywhere would take electric lighting in hand, but it would be folly to encourage any delusions upon this point. Such a thing is not to be looked for in this country, where gas lighting is so settled by statute that the public are partners of the undertakers, which is not the case in any other part of the world.

On the whole, Mr. Hedges's book may be found a useful compendium of the information respecting its subject which may be regarded as generally available at the present time. The author has no original experiences to narrate, and has not discovered any useful secrets; but he is a very fair chronicler of other engineers' projects and reports.

At last night's meeting of the Society of Chemical Industry, Mr. A. H. Allen read a paper on “The Analytical Examination of Water for Technical Purposes.”

The County Justices of Suffolk have appointed Mr. G. Hodson, M. Inst. C.E., of Loughborough, to advise them upon the water supply of their asylum at Melton.

Last Friday week, Mr. Thomas Canning, Assoc. M. Inst. C.E., Engineer and Manager of the Newport (Mon.) Gas Company, was elected a member of the Town Council for the Central Ward of his borough.

TELEGRAPHIC information has been received that the formal contract for the acquisition of the Do Beer's Consolidated Mines Water Supply Act by the Kimberley Water-Works Company, Limited, has now been signed.

At the recent municipal elections, Alderman Samuel Haynes, Managing Director of the Lichfield Gas Company, was elected Mayor of the city, and his son (Mr. George Haynes) was elected High Sheriff of the City and County of Lichfield.

* “Central Station Electric Lighting, with Notes on the Methods used for the Distribution of Electricity.” By Killingworth Hedges, M. Inst. C.E., &c. London: E. & F. M. Spon, 1888.

Notes.

THE ADULTERATION OF COAL TAR NAPHTHA.

In a further note to the *Chemical News* (see *ante*, p. 934), Mr. Thomas T. P. Bruce Warren gives the following results of some ordinary commercial products, so as to show the value of the method he suggested:—

Designation of Liquid.	Iodine absorbed Per cent.	Remarks.
Benzol, 90 per cent. . . .	1.911	
Toluol, commercial . . .	4.046	Mean, 3.429 and 4.679 = 4.054.
Naphtha, solvent	3.808	Sp. gr. 875 at 15.5° C.
„ product, 142° C. . .	3.429	Sp. gr. 869 at 15.5° C.
„ „ 160° C. . . .	4.679	68 per cent. Sp. gr. 870 at 15.5° C.
„ „ residues	4.246	29 per cent. Sp. gr. 900 at 15.5° C.
„ with 10 % benzoline . .	5.742	3 per cent. Sp. gr. 750 at 15.5° C.
Benzoline	20.980	Sp. gr. 797.
Paraffin oil, white . . .	4.864	
Shale spirit	44.900	

The iodine absorption of the original naphtha was 3.808 per cent.; the absorption calculated on the products was 3.801 per cent. The addition of 10 per cent. of benzoline to the same naphtha should have given a calculated absorption of 5.525 per cent. The addition of petroleum products will, says Mr. Warren, evidently increase the iodine absorption. The specific gravity of the mixture with 10 per cent. of benzoline was 863 at 15.5° C.

THE DISTRIBUTION OF FRICTION IN STEAM-ENGINES.

Professor Thurston read a paper, at the last meeting of the American Society of Mechanical Engineers, upon the distribution of internal friction in steam-engines. In this he stated the results of a number of experiments conducted by himself and others under his direction. The idea of the experiments was to ascertain how the observed total friction was made up by the addition of the friction of the various sliding parts; and the method adopted for carrying out the investigation was by determining the total internal friction of the engines selected for testing, and then disconnecting the moving parts one after another, driving them separately from some other source of power. In this way it was ascertained that in a so-called "straight-line" engine, with a 6-inch cylinder and 12-inch stroke, working with a slide-valve, the internal friction amounted to 2.389-horse power, distributed as follows:—In the main journals, 35.4 per cent.; in the eccentric strap, 4 per cent.; in the crank-pin, 5.1 per cent.; in the crosshead, 4.1 per cent.; in the valve, 26.4 per cent.; in the piston and rod 25 per cent. In a new 12 inch by 18 inch "Automatic" engine, the main journals took 41.6 per cent.; the valve and valve gear, including eccentric, took 9.3 per cent.; and the piston, crosshead and crank took the remaining 49.1 per cent. It was found that the friction of all the engines tested was practically the same under all conditions of loading; even a compound engine exhibited substantially the same internal friction at all loads up to its full rated power, and also without any load at all. Several engines showed a different distribution of friction at different rates of speed; but the variation was in all cases slight. Consequently the writer concludes, as a general deduction, that in all ordinary forms of the steam-engine, and under all common conditions of working, the internal friction of the machine is practically invariable under variation of useful work, and is very nearly independent of piston speed.

THE MIXING OF CEMENT CONCRETE.

A recent number of the *Deutsche Bauzeitung* contains a contribution upon the subject of Portland cement concrete from a well-known German authority, Herr Dyckerhoff. The main purport of this communication is to emphasize the fact that careful mixing of the ingredients of concrete is tantamount to saving cement, seeing that a comparatively small proportion of cement thoroughly incorporated with the broken stone and sand is much more effective than a greatly increased quantity less perfectly mixed. For ordinary foundations, Herr Dyckerhoff recommends one part of cement to from six to eight parts of sand or gravel, or from eight to ten parts of broken stone. Where the substructure is likely to be subjected to heavy shearing stresses, these proportions should be slightly reduced—say, to one of cement to five or six of gravel. In cases of very important works, the writer recommends the carrying out of preliminary experiments to determine the best proportions of cement and sand, employing samples of the same sand that is intended to be used in the work, because sands differ very much in constitution, and often a dull and comparatively poor-looking sand will give much better results when tested in this way than sands of brighter and better appearance. This remark does not apply to the case of sands clearly containing clay. In the preparation of concrete the cement should not be measured but weighed. The sand and cement should be mixed dry in a wooden trough, and turned over three or four times with a spade, before any water is added, after which it is again to be thoroughly worked over until it forms a homogeneous and slightly damp mass. The broken stone, gravel, &c., which has been carefully washed and is still damp is then added; and the whole is thoroughly re-worked, so as to cover every fragment of stone with a coating of the cement, which is a point of the first importance. Care is taken to prevent the stone working to the top during the transit of the concrete from the mixing-table to the site where it is to be deposited, and

equal care is taken in depositing it in the trenches. For finishing off the surface of work, Herr Dyckerhoff uses a cement mortar composed of 1 part of cement to 2½ parts of sharp sand; to which, if the sand is very coarse, 0.1 part of fat lime is added, which makes the mortar spread more easily. Of course, old work is very carefully washed before the mortar is applied.

DIFFERENTIAL CHARGES FOR ELECTRO-MOTORS.

In a contribution to the New York Convention of the National Electric Light Association, Mr. H. C. Lufkin states that where motor energy is distributed by electrical currents, it is found more convenient to differentiate between the uses of power for various purposes, than to charge a uniform rate per horse-power delivered. Thus, for example, fans used in the ventilation of hotel dining-rooms and restaurants, being only required for a short time during the day and for a few months in the year, are charged at the highest rate for the horse-power required. The highest rate is also charged for working open tank elevator pumps for passenger use. An important source of business in connection with electric motor service is sewing-machines. In some cases the machines are driven from counter-shafting actuated by a comparatively large motor; and in others every machine has its independent motor of about ⅓-horse power—the latter being the more profitable system to the supplying company. It is stated that a company can make in the United States a better profit than out of lighting by lending out sewing-machine motors and supplying them with current at an average charge of \$1.25 per month. Picture-frame makers and moulding manufacturers are good customers to the electric power-supplying companies, and so are nickel and silver platers and polishers. Printers frequently take the electrical power for one or two job presses; and laundries are profitable. Coffee grinders, manufacturing jewellers, opticians, dentists, and church-organs are all in Mr. Lufkin's list, which illustrates the need experienced by modern town communities for small and convenient motors in substitution for manual labour.

The death is announced of Mr. Thos. Wheatley, Secretary of the Greenhithe and Northfleet Gas Company at the age of 40 years.

The Directors of the Abergele Gas and Water Company have appointed Mr. J. W. Wilson, of Crossgates, near Leeds, to be Manager of their works.

It has been decided to light the town of Puerto Real, near Cadiz, by gas; and the proprietor, Senor M. Diez y Carrera, has placed the order for the necessary plant, &c., with Messrs. Gibbons Bros., of Dudley, who expect to have all in readiness to light the town about the beginning of next March.

The greatest pressure recorded at the Forth Bridge during the gale on Friday, the 16th ult., was 27 lbs. per square foot on the large board of 300 square feet area, 41 lbs. on the small fixed, and 35 lbs. on the moveable boards. On the island of Inchgarvie are placed three wind-gauges or pressure-boards; the larger one, 300 square feet in area, is fixed square to the east and west winds, and of the two smaller ones of 1½ square feet area, one is fixed as above, and the other is free to swivel square to the wind in any direction. The wind, being south-west, did not strike the fixed board at right angles. At the other parts of the bridge, an average pressure of 32 lbs. per square foot was recorded. A pressure of 56 lbs. per square foot has been allowed for in the bridge calculation.

An interesting and most successful *conversazione* was given last Friday week by the Oxford Junior Scientific Society; the *élite* of Oxford society and learning being present in the Museum to listen to the lectures of Professor Milnes-Marshall, on "Animal Pedigrees," and Colonel Gourand, on Edison's new phonograph. Among the many interesting objects exhibited were a fine group of regenerative lamps of various kinds erected by the Oxford Gas Company. These included the "Wenham," the "Cromartie," and the "Schülke" lamps; the latter being shown in three sizes of 25, 15, and 4 feet per hour consumption. One of these was placed in a most trying position—opposite the entrance door, through which a furious gale was blowing; and those versed in such matters were struck by the remarkable steadiness of the flame under such difficult conditions. The whole display was a remarkable one, as showing the highest development which lighting by gas has reached at the present time.

A USEFUL recipe for a cement for stopping cracks in stone or brickwork is published in the *American Wood Worker*. The basis of the preparation is old paint scrapings from kegs, the skins formed in old paint pots, or any similar refuse which contains oil and zinc or other mineral. The mass is to be steeped in some cheap oil, and heated, if necessary, until soft enough to be capable of being stirred into a homogeneous paste, when it should be reduced by the addition of a little more oil, and then worked through a sieve, and ground in an ordinary paint-mill. A quantity of common whiting is next to be worked into the oil and paint, exactly as in the manufacture of putty; but the paste of whiting, oil, and paint should not be so tough as common putty. When the whiting has been thoroughly mixed in, and the mass well worked over, add a quantity of Portland cement, just sufficient to bring the paste to a consistency that permits ready handling. Cracks in brick and stone work puttied up with this mixture will be effectually stopped. The mixture sets, and hardens like iron, becoming impervious to moisture, and unaffected by any range of atmospheric temperature.

Technical Record.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

The Seventy-sixth Quarterly Meeting of this Institution was held last Saturday, at the Victoria Hotel, Manchester. The PRESIDENT (Mr. Thomas Duxbury, of Darwen) occupied the chair; and there was a fair attendance.

The HONORARY SECRETARY (Mr. Harrison Veevers, of Dukinfield) read the minutes of the last meeting, which was held at Doncaster, on Aug. 25 last, and they were unanimously confirmed.

NEW MEMBER.

Mr. J. C. Ingham, Manager of the Ramsbottom Gas-Works, was elected a member of the Association; on the motion of Mr. W. Woodward (Bury) seconded by Mr. J. DALGLIESH (Glossop).

ELECTION OF PRESIDENT.

The next business was to elect the President for the year 1889-90; the election, according to rule, preceding by three months the actual time of entering on the duties of the office.

The PRESIDENT remarked that the gentleman who was to succeed him in the chair was one who would fill it with credit to himself and honour to the Institution.

Mr. WOODWARD said he had a very pleasant duty to perform in proposing the election of Mr. T. Banbury Ball, of Rochdale, as President for the ensuing year. He did not know any member of the Institution who would fill the position with more credit to himself and to the Institution than Mr. Ball. His bearing and general manner towards the members of the Institution had been such as to make him many friends. His election would be a popular one; and he did not doubt that his occupation of the chair would give satisfaction to the members generally.

Mr. W. W. HUTCHINSON (Barnsley), in seconding the proposal, said that Mr. Ball's professional ability entitled him to the highest honour which the Institution could confer, while his integrity and gentlemanly bearing were qualities calculated to bring credit on the Institution.

The PRESIDENT observed that he wished to echo every word which the mover and seconder of the resolution had said in regard to Mr. Ball. That gentleman had had considerable experience in the management of Gas Institutions. He had been on the Council of The Gas Institute, and seen how things were there conducted; though, whether he had seen anything there to emulate might be a matter of opinion; still, he was a gentleman who would, as President, be calculated to enhance the interests of the Institution, if he retained his health. They were sorry that his health had not been all that they or he could have wished; but they were glad to have him amongst them, and they would do credit to themselves in electing him President of the Institution.

The resolution was carried by acclamation.

Mr. BALL remarked that no one was more fully aware than he himself of the few merits which he had to recommend him to their selection as President of the Institution. During the past year, occupying as he had the post of senior Vice-President, he was sorry to say that his attendances had been very few and far between. This, however, had not been his fault. It was partly owing to the fact that the works he had to superintend required a great amount of personal supervision. This was an experience known to many of them; for the technical assistance afforded them was, in many instances, of the most meagre description, and absence from home could not therefore be undertaken without serious thought and consideration. This was one of the reasons which had prevented him attending as often as he could have wished during the past year. By their kindly forbearance, these absences had been overlooked; and if his health was spared, he hoped, during his year of office in the chair, to pay better attention to the business of the Institution, and to attend oftener, so that at the end of the year he might deserve their confidence as he at present possessed it.

THE SECRETARYSHIP.

The HONORARY SECRETARY proposed an alteration in Rules 2 and 3, by the substitution of the words "two Honorary Secretaries" for "Honorary Secretary" in the places where these words occur. He said he suggested this alteration at the last meeting of the Committee, after filling the office of Secretary for nine months, and with an intimate acquaintance with the Institution from the commencement. The suggestion was not a new one with him; for he had advocated the appointment of a senior and junior Secretary for many years. The work at the meetings was—as Mr. Hutchinson, the late Secretary, would bear him out—really too much for one man. The issuing of circulars was a serious matter, for 120 of them had to go out four times a year; and this, with the engagement of rooms, and looking generally after the arrangements for the meetings, was too much for one gentleman to do with any degree of comfort. Then when the Secretary retired, a new man came who knew nothing about the work. If the resolution he proposed was carried, there would be two Secretaries. The senior Secretary would look generally after the conduct of business, and the other undertake the drudgery and detail work, and qualify himself for the senior position when it became vacant. He did not advocate this from any selfish motive, because his term of office was drawing to a close. He thought, however, that if The Gas Institute had done much the same thing, and had an Honorary Secretary as well as a paid Secretary—though he did

not advocate anything in the nature of payment here—it would have been very much better for the parent association. He had brought forward this proposal merely to see whether or not the members approved of it.

There was no seconder to the motion; and the President announced that, as this was the case, the proposal fell to the ground.

GENERAL BUSINESS.

The members then proceeded to discuss Mr. Dalgliesh's paper on "Oil and other Illuminants and their Effect on the Consumption of Gas,"* and Mr. Newbigging's paper on "Gasholders without Upper Guide-Framing,"† both of which were read at previous meetings. A report of the discussions will appear in next week's issue of the JOURNAL.

The PRESIDENT, in the absence of Mr. T. Newbigging (who, as announced in last week's JOURNAL, is on his way to South Africa), read a paper prepared by that gentleman, entitled "The Presence of Water or Moisture in Coal, and its Effects." This communication is given elsewhere to-day; and, on the motion of Mr. DALGLIESH, seconded by Mr. W. W. HUTCHINSON, the discussion was postponed until the next meeting.

The PRESIDENT, before closing the proceedings, took the opportunity of expressing, in the name of the Institution, their pleasure at seeing present Mr. Henry Woodall, the President of The Gas Institute. They were, he said, always glad to see the heads of the profession at their meetings, and to learn from the experience they had gained in the past.

Mr. WOODALL, who was received with applause, thanked the members for their kind greeting, and said he really ought to apologize for being so late. He came too late to contribute anything in the way of discussion. It was his loss that he was not present to hear the discussions; but it was his misfortune, on that and previous occasions, to have had business which had delayed him in another place until their meeting was well advanced. He was glad, however, to be with them; and it was always the greatest possible pleasure to him to be where gas managers assembled.

The members afterwards took tea together.

AMERICAN GASLIGHT ASSOCIATION.

THE ANNUAL MEETING IN TORONTO.

Having already noticed the proceedings on the first day of the annual meeting of this Association, held in Toronto last October, we proceed to give an account of those on the second day.

The first paper read was written by Captain Ross, of Cincinnati, and consisted of a description of his steam-stokers and improved charger. He remarked at the commencement, that the subject of working retorts by machinery was not novel; it had occupied the attention of some of the brightest and most intelligent gas engineers. Coming to his own apparatus, he said that the system of injecting coals into the retorts by means of steam had been objected to, as not capable of evenly distributing the coal, which might be packed at the front so as to prevent the free egress of gas; and it was stated that the concussion incidental to the blast might fracture weak retorts, or cause a variation in the seal. Questions had also been raised as to whether the condensed steam would not moisten the coal; and whether the weight of the charge could be properly adjusted. In reference to these objections, he said that by intelligently directed blasts, the coal was deposited in the retorts exactly as it would be by shovels; the first portion going to the end of the retort, the second striking on the first, and so on, thus securing even distribution. As the front part of the hopper did not cover one-half the superficial area of the mouthpiece, it was evident there could be no pressure inside the retort during the act of charging. A series of tests at the works of the Cincinnati Gas Company had proved that practically the seal was not affected; and in no single instance had a retort ever been blocked. Of course, a careless operator might distribute the coal irregularly, just as he might with the scoop or shovel; but, with the Ross machine, all the charging would be done by one man, who could be held responsible for its efficiency. Of the total volume of steam used, not exceeding 10 cubic feet could be retained in the retort; and this represented an insignificant quantity of moisture. The hoppers were gauged by ascertaining the number of cubic inches occupied by any given weight of coal to be charged, and the weight of each charge could be adjusted as easily as with the scoop. At the Cincinnati Gas-Works, the difference between the weight of the coal actually put in, and that calculated by theory, during a period of six months, was only 1½ per cent. Captain Ross next proceeded to describe the discharging machine, the construction of which is generally known, and passed on to a detailed description of the steam charger which he admitted was not perfect when first introduced, but had since been greatly improved. The working pressure was 60 to 80 lbs. per square inch, and three retorts could be charged concurrently in 5 seconds. From practical experience, he could say that, under the most unfavourable circumstances, the depreciation would not exceed 5 per cent. per annum. As evidence of the practical working of the machinery, some letters from well-known gas engineers were read. The first was from Mr. Keenan, Engineer to the Cincinnati Gas Company. At the East-end station, a pair of these machines were used for a stack of 224 retorts, charging every 5 hours with 333 lbs. of coal per charge. This required 45 retorts

* See JOURNAL Vol. L., p. 1091.

† See ante, p. 373.

to be drawn and charged per hour, and the work was usually done in 40 minutes, by a staff of 10 men, who worked 12-hour shifts. There were also one furnace man, three coke men, and four coal men, making a total of 18. There was one man on the discharger, two on the charger, and the remainder acted as lid men. The average yield of gas was 5·07 cubic feet per pound, representing a production of 908,000 cubic feet in 12 hours. From the results of several months' operations, it was found that the average cost, including wages, fuel, water, repairs, and sundries, was about £8, or 2·1d. per 1000 cubic feet of gas. The cost of effecting the same work by manual labour in the usual manner would be about £18, or 4·7d. per 1000 cubic feet. At the West-end station where the drawing machinery only was used, the cost was 3·1d. per 1000 cubic feet, as compared with 5·2d. under the old system. Mr. Keenan thought the Ross apparatus might be advantageously applied in any works using not less than 8 benches of sixes. He did not consider the depreciation exceeded that of hand tools; and the system had not injuriously affected his retorts. Letters from several other Engineers, including Mr. T. Forstall, of New Orleans, General Hickenlooper, of Cincinnati, and Mr. M. S. Greenough, of Boston, all certifying to the effect that considerable economy had followed the use of the machines, were also read.

After reading the paper, Capt. Ross replied to several inquiries. He said that the apparatus could be worked in a ground-floor retort-house; and a space of about 16 ft. 6 in. wide in front of the retorts was all that was really necessary. He preferred to use overhead store-bins for the coal; but these need not be higher than the level of the top of the charger. The discharger weighed 8 tons 10 cwt., and the charger 7 tons. Mr. G. Shepard Page said that the subject of stoking by machinery presented three aspects—philanthropic, as dispensing with hard work; prudential, as a remedy against strikes; and financial, as a means of reducing working expenses.

A paper on "Gas Coals, with Special Reference to Provincial Coal," was read by Mr. J. D. Perkins, of New York. After a few remarks of a general character, he gave a sketch of the early history of the subject in the United States. They were first discovered by Nicholas Denys, in 1672, at Cape Breton; and the first attempt in the way of regular mining was made in 1720 in the same locality. For some time after the first establishment of gas-works in the States, the principal supply of gas coal was imported from England. Even down to 1855, the only gas coal raised in the States was that from the Albion mines at Pictou, so that one company held the monopoly of it. Full details as to the establishment of the principal American gas collieries were next given, together with some details as to the working results and quality of the products. From these it appears that the Pennsylvania gas coals, on the average, yield 11,800 cubic feet of 16½-candle gas, and 15½ cwt. of coke per ton; and the Cape Breton gas coals, 10,800 cubic feet of 15½-candle gas, and 15 cwt. coke.

Mr. J. R. Smedberg followed with a paper entitled, "Observations during Many Years Experience in the Gas Business." Commencing with the year 1853, he remarked that exhausters were then matters of debate, clay retorts were unknown, and a favourite setting at Cincinnati, where he was then engaged, was one of three iron retorts. A Box washer, set next to the hydraulic main was considered to yield better results than a jet washer. The guide columns of Jeffreys great single-lift gasholder were handsome Corinthian shafts arranged in groups of three, and also adapted to serve as atmospheric condensers; and in small works the centre-mast gasholder was not uncommon. A yield of 4 cubic feet of gas per pound of coal carbonized was considered good work; and stoppages from naphthalene were rare. Mr. Smedberg proceeded to give an account of a number of interesting personal reminiscences relating to troubles experienced and overcome. In the course of the American War he ran out of coals and could not obtain a supply, so had to fall back on wood gas; and it was stated that a cord of ordinary fire-wood would furnish nearly as much illuminating material as that obtained from a ton of the best Pittsburg coal. A cord of dry oak was said to yield 16,000 to 17,000 cubic feet of 27-candle gas, consisting of 30 per cent. hydrogen, 33 per cent. marsh gas, 6½ per cent. hydrocarbons, and 26 per cent. carbonic oxide; and having a specific gravity of 0·580. Pine wood was found to yield a gas consisting of hydrogen 33 per cent., marsh gas 21 per cent., hydrocarbons 10½ per cent., carbonic oxide 27 per cent., and carbonic acid 5 per cent.; the specific gravity being 0·663. After this he began to make gas from the splendid light wood of Southern Georgia, producing 10,000 cubic feet per retort per day, or from 24,000 to 36,000 cubic feet per cord of wood, according to the quality. At Bluff, California, many years later, he found that the average cord of Sierra Nevada pitch pine weighed 3189 lbs. and yielded 21,000 cubic feet of nearly 17-candle gas. The volume, character, and behaviour of the product were largely modified by the amount of moisture present in the wood, the form and temperature of the retort, the weight and duration of the charge, and the kind of burner employed. He had found that the Hartley shale or Wollongongite of Australia yielded 14,000 cubic feet of 80-candle gas per ton.

Consideration of the "Question Box" was then proceeded with. In reply to the question, "What is the extra cost on wear and tear of meters where iron purification is used," Mr. Somerville said that the use of oxide certainly had the effect of stiffening the diaphragms of the meters; but he could not say what the extra cost was, though he believed it to be an important item. Mr. Scrivener felt warranted in saying that the use of oxide did not injure the meters at all. Mr. Young had not observed that the

use of oxide affected the meters in any way. Another question was: "What is the best way to treat men who are overcome by coal gas?" Mr. Clarke referred to a recipe given by a prominent physician, recommending that the man be laid on his back without the head raised, in the fresh air away from a crowd, that the clothing be loosened at the neck and waist, and a little brandy and water administered. A teaspoonful of a mixture of one part aromatic ammonia to 16 of water to be given every two or three minutes. The face and chest to be slapped with the wet end of a towel; and warmth and friction applied if the body or limbs were cold. If the breathing was feeble or irregular, artificial respiration should be used, and persevered with so long as there is any possible hope. Oxygen might be administered. Mr. White had been told by a physician that the best plan was, if the man was sensible enough to swallow, to give a tablespoonful of olive or common sweet oil. This might be followed by milk, brandy, or other stimulant. He had followed this plan in conjunction with the rules as to fresh air, loosening clothes, &c., as mentioned by Mr. Clark, for some years with success, and had had personal experience of its efficacy. Mr. Somerville remarked that the effects of coal gas soon passed off; but water gas seemed to influence the blood, and it was some weeks before it was got rid of. He would be glad to hear of a remedy for water gas inhalation.

A brief conversation subsequently took place on the "Advantages Gained by using Naphtha of High Specific Gravity in the Manufacture of Water Gas," on "Sunday Labour," and on the old bugbear "Naphthalene in Mains and Services;" but no new theories were advanced by any of the speakers on these questions. After the usual votes of thanks had been passed to the officers of the Association, the meeting terminated in the manner already detailed in our columns a few weeks since.

THE PRESENCE OF WATER OR MOISTURE IN COAL AND ITS EFFECTS.

By THOMAS NEWBIGGING, C.E., of Manchester.

[A Paper presented at the Quarterly Meeting of the Manchester District Institution of Gas Engineers, Saturday, Dec. 1, 1888.]

In my first paper, read before this Institution some time ago,* on the subject of "Water," I dealt with that substance *per se*—its physical character and effects, and its constituent gases and the properties of each. On the present occasion, I propose to speak of water in connection with the manufacture of coal gas. The part which water or moisture plays in the economy of gas manufacture is important and wide-reaching. Its presence is useful and even indispensable under certain circumstances; whilst in others it is highly objectionable. Let us now trace it throughout its various manifestations.

The spontaneous combustion of coal when stored in a dense mass, in a wet or moist condition, is a not unusual occurrence in the experience of gas managers. I do not know whether any of the members present have been unfortunate enough to have added this experience to their other qualifications; but if they have, I am sure they will be ready to admit that it is one of the most undesirable occurrences that has overtaken them during their professional career. I have had one experience of the kind; and the vivid recollection of it remains with me to the present hour. For several days I perceived in the retort-house a disagreeable smell, which produced a kind of sickly and choking or smothering sensation as I drew breath. At first, being inexperienced as to the cause, it did not strike me that anything was wrong, though the phenomenon was unusual and unaccountable. The objectionable smell continuing, and even becoming more pronounced, it suddenly dawned upon me that spontaneous combustion in the coal had taken place. A close examination of the heap of material (to the amount of about 1500 tons) stored in one of the adjacent coal-stores confirmed my suspicions; and without delay I had about a dozen men employed in reducing the thickness of the heap at the place where it appeared to me the fire was smouldering. The labour of getting down to the source of the mischief was one of great difficulty, and even danger. The centre of the mass began to give off suffocating and deadly fumes in considerable volume; and for hours the men toiled at the work—some of them being so far overcome as to be compelled to desist, and seek the open air to recover their breath. The fire had spread like the roots of a tree in every direction from the centre of the heap, and was only extinguished with difficulty, by deluging it with water from a hose-pipe which I called into requisition. Many tons of the coal were charred, and rendered worthless so far as gas making was concerned; and the sulphurous odour hovered about the premises for days after.

There is this liability to spontaneous ignition in almost all bituminous coals of a friable nature. It is due to more than a single cause. It may arise from the condensation of oxygen within the pores of the carbonaceous particles, just as oily cotton-waste will fire spontaneously in the same way by the rapid absorption of oxygen. According to Professor Abel and Dr. Percy, water or moisture does not accelerate, but rather retards spontaneous ignition under these circumstances. The danger of firing is greatest with those coals which contain a large proportion of iron pyrites in the shape of nodules, or "brasses" as they are called, and which are stored in a mass in the wet condition. These "brasses" become oxidized by the atmospheric oxygen dissolved in the water with which the coal is saturated; and the heat thus generated raises the coal to ignition point. The moral, of course, is to

* See JOURNAL, Vol. XLVIII., p. 1016.

avoid using coal of this character, which is costly in other respects; and if it must be used, then care should be taken to hand-pick the pyrites as far as possible, and to store the coal in a dry state, or otherwise to adopt means of thoroughly ventilating the mass with a swift current of air. Unless the ventilation is thorough, the admission of air will do more harm than good, as a sluggish current will not reduce the temperature, but rather tend to develop and increase it.

When coal is exposed to the weather, being stored in the open air without any protecting covering, it is not only liable to be wetted by rain on its outer surface, but it also absorbs and retains moisture within its structural interstices. Bituminous or gas-producing coal, from its comparatively soft or friable texture, is especially affected in this latter particular. Cannel, by reason of its close-grained and harder character, does not absorb water or moisture in the same degree. The effect of this excess of moisture in bituminous coal is to produce disintegration, reducing the size of the lumps, and converting them to a considerable extent into dust and culm. The exposure of the coal in the winter season in this climate is, of course, the most objectionable as regards disintegration. In hot climates the intense heat of the sun produces disintegration. The ill-effects of this absorption of moisture do not end there. Oxidation of the particles of the coal also ensues; and as this is only another name for *eremacausis* or slow-burning, the material is not only reduced in weight, but its gas-producing power, both as regards quantity and quality, and its coking qualities, are greatly impaired. This is the common experience of gas managers; and the desirability, and even the necessity—if good and satisfactory results are to be achieved—of providing covered storage room for the coal is therefore very generally admitted, and acted upon.

When coal in a wet or moist condition is placed in the retorts to undergo carbonization, the results are unsatisfactory in several respects. In the first place, the temperature of the retorts is reduced; and, as a consequence, extra fuel is consumed in restoring the temperature, and in drying the coal by evaporating the moisture, and driving it off as steam before the coal is in a fit condition to undergo destructive distillation.

If the mischief caused by the wet or moist coal ended here, it would be tolerable. But it does not. A portion of the moisture or steam is decomposed in contact with the sulphide of iron (FeS) produced by decomposition from the bisulphide of iron or iron pyrites (FeS_2) contained in the coal. The oxygen combines with the iron, forming the oxide of that metal; and the hydrogen with the sulphur, producing sulphuretted hydrogen. Bisulphide of carbon is also formed in considerable volume. In this way the whole of the sulphur present in the coal is caused to pass off into the gas, and has to be subsequently removed in the process of purification; thus increasing the cost of manufacture. On the other hand, when the coal is distilled in the dry state, rather more than one-half of the sulphur present is left behind in the coke.

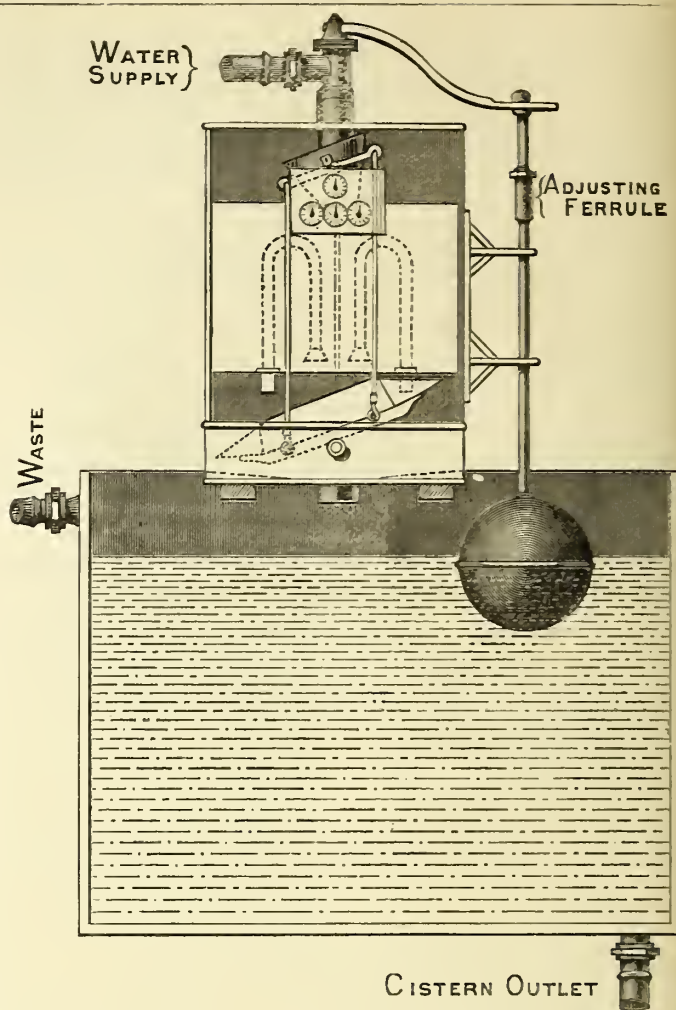
These are the principal drawbacks attending the presence of water or moisture in connection with gas manufacture. In a future paper, I hope to point out the advantages which the gas manager derives from the use or presence of water under other conditions.

COWAN'S "SYPHON" WATER-METER.

Habitual readers of the JOURNAL will not need to be reminded of the two series of letters that have recently appeared in our "Correspondence" columns—one series during the last few weeks, and the former one the early part of the past summer. As the outcome of the discussion, we are to-day enabled to publish an illustrated description of the "Syphon" water-meter, patented by Mr. William Cowan, of Edinburgh; remarking that an examination of the instrument itself will show that no-one need have any difficulty in fully understanding it. The principle is so simple, and the construction and action are so open to view, that prejudice is likely to be disarmed, and confidence inspired in the mind of the observer.

The water is measured in the two equal compartments of what is practically an open box or trough. Over the central division of this box hangs a reciprocating funnel, which receives the water passing from the ball-valve, and conducts it into the compartments alternately. In each of these chambers there is a syphon, the outlet end of which projects through the bottom of the chamber, and so discharges the contents each time the water attains the level at which the syphon becomes charged. The measuring capacity of each chamber is the quantity it is capable of containing between the level of the surface of the water which remains after the syphon has acted, and the higher level which had to be attained before that action could begin. The meter is practically two syphon chambers acting in combination, so as to be filled and emptied alternately; and, in being so emptied, to give an accurate register of the water they discharge.

The motion of the shaft which suspends and reciprocates the funnel, originates in the alternate discharge of the syphons. It will be observed in the illustration that, below the syphon outlets, there is a beam which has a bucket on each of its ends; and that the buckets are so placed that the end of the beam, which at the time happens to be "up," has its bucket enclosing the projecting end of the corresponding syphon. In this position, therefore, the bucket receives the first water the syphon passes; and consequently that end of the beam is made to descend whilst, by the same action, the opposite end and bucket are raised so that they may be similarly operated upon when the other syphon begins to discharge.



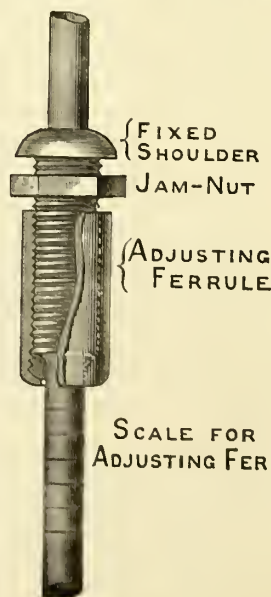
The result is a reciprocal motion of the beam, which is transmitted (by two connecting rods) to the beam above, which moves the funnel shaft and operates the index.

The primary purpose of the bucket-beam is to produce the motion which reciprocates the funnel and moves the index. But, in addition to this, the buckets serve the useful purpose of temporarily "sealing" in the water they receive, the outlet ends of the syphons. The seal so produced is suddenly withdrawn when the bucket descends; and thus aids the syphon action, especially when small streams or mere droppings are all that the chamber is receiving from the ball-valve. But for this provision, a mere stand-pipe action might be produced, and continue without charging the syphon. In the largest size of meter, a plunger hangs over each chamber from a beam on the funnel shaft. This beam, having the same reciprocating action as the others, lowers one plunger and raises the other each time the beam moves. The immersion of the plunger, just as the chamber has become filled, raises the water therein and charges the syphon.

The buckets also act as compensators for the slightly reduced quantity the chamber contains when supplied by mere droppings, as compared with its contents entering in a full stream. It will be readily understood that when the stream is large, the chamber is rapidly filled, and the syphon completely and easily charged. The bucket then is thrown down by the mere force of the water, with-

out being necessarily filled to its full capacity. In this case the bucket has nothing to do with the measurement, which is all effected in the chamber by the syphon. But it is otherwise when the water in the chamber rises very slowly; for in this case stand-pipe action, into the bucket, precedes the full action of the syphon. This has the effect of filling the bucket with water before it is thrown down; and this extra water in the bucket, on these occasions, compensates for any deficiency in the chamber, which the slowness in the supply may have produced. In this way it is that small streams and mere droppings may be as accurately measured by this meter as the largest quantity it is intended to pass.

The adjusting ferrule on the ball-rod is for the purpose of adapting the maximum passage through the valve to the power of



the meter. It will be readily understood that a valve which might be large enough to give the necessary supply when the pressure is 100 lbs., would be much too small for a pressure of 10 lbs. But meters must be made suitable for use under varying conditions of pressure; and, therefore, the adjusting ferrule is employed to restrict, or to enlarge, the maximum opening, so as to ensure that the maximum pressure can never pass into the meter more water than the meter is able to deal with. As lower pressures can have no disturbing effect, it is only necessary to employ the ferrule against that which is the highest, in the locality and position where the meter is fixed. In order to facilitate the adjustment of the ferrule, the ball-rod is marked with a scale which shows the proper positions of the ferrule in regard to several pressures.

Alluding to his invention, the patentee (to whom, of course, we are mainly indebted for the above interesting account of his meter) says: "If popularity has been denied to the gas-meter, it has chiefly been because so few persons have been able to understand that much abused apparatus. To an ordinary gas consumer, his meter is as mysterious as his watch; but, whilst the watch may be proved to be correct or incorrect by the man himself, the meter must be tested by others, and its accuracy ascertained by means the consumer can rarely be got to understand. If meters for measuring water are less unpopular than meters for measuring gas, it is not because the former are more easily understood; but, rather, because they are less generally used. In their varying constructions and principles, as well as in their actions, water-meters have hitherto been as much beyond the understanding of most consumers, as gas-meters of all kinds have been and are. So far as gas-meters are concerned, it is not likely that these instruments will ever be brought within the easy and complete comprehension of the ordinary consumer. But, as regards water-meters, there can be no doubt that this has been already accomplished in the case of the 'Syphon' water-meter.

"This meter, being on the low-pressure principle, is usually placed over the cistern; and, therefore, at the end of the service-pipe. In this latter respect, its position resembles that of a gas-meter; and this, of itself, ought to be a sufficient vindication of the arrangement which places the water-meter over the cistern. The meter, therefore, receives through its ball-valve the water the service pipe supplies; and passes it, after measurement, into the cistern below. But the distinguishing feature of this meter—in addition to its novelty and simplicity—is its power to measure every drop of water that passes from the ball-valve. There are persons who profess to think this a matter of little importance; but, if it be worth while to use meters at all, it is surely desirable that the measurement should be as effective in regard to small droppings as when large quantities are being delivered. When it is kept in view that most of the water used is passed into cisterns, it cannot be doubted that such meters as are incapable of recording the smaller streams and droppings which pass from the ball-valve, are very unsatisfactory instruments. The absurdity of using 'high-pressure' meters because they may be interposed in the line of main or service-pipe, and do not materially lessen the pressure, must be apparent in all those cases—and they are the vast majority—where the destination of the water is a cistern. If the fact were sufficiently borne in mind, we should hear less of the superior advantages of high-pressure meters, and water authorities would be more ready to consider the claims of any meter on the low-pressure principle which might be found capable of dealing effectually with the difficulty of measuring water into cisterns."

CALCULATING THE FLOW OF WATER THROUGH PIPES.

At the Convention of the National Association of Master Plumbers held a short time ago in Boston (U.S.A.), a paper was read by Mr. E. Murphy, of New York, on "Simple Methods of Calculating the Flow of Water Through Pipes." The paper has since appeared, and from it we make the following extracts.

Mr. Murphy began by explaining that the subject he had chosen was one which had for years possessed unusual interest for him; but he found it was not easy to procure the information he desired—the formulæ being so forbidding and inscrutable as to baffle all hope of his ever being able to solve them. He wished to discover some simple practical rules for finding the quantities of water discharged from pipes of varying diameters and heights, and from long lines of pipe at a distance from the main or reservoir; when account must be taken of loss arising from friction; how to calculate the volume of water discharged from aqueducts or sewers when the size and fall are given; the losses arising from using pipes of insufficient size in supplying tanks; and other matters of interest to an engineer concerned with the supply of water.

Before entering upon the main subject of his communication, the author briefly explained the laws of gravitation, according to one of which solid bodies fall 16 feet in the first second. He pointed out, however, that the velocity of the falling body at the end of the first second is 32 feet, because, starting from nothing, and the motion being gradually accelerated, 16 is the average between 0 and 32. Another of these laws is that, by squaring the number of seconds during which a body falls, and multiplying by 16, the total number of feet fallen can be told. Thus: In two seconds a body falls 64 feet, two seconds squared and again multiplied by 16 will give 64; and three seconds squared and multiplied (9×16), 144—the distance the body falls in three seconds. Another law is that while the distances fallen increase in one proportion, the time or the seconds advance in another, and the velocity in still another. The velocity attained in the first second

is increased by adding 32 feet for each succeeding second. Thus: For the first second velocity, 32 feet; for the second, 64 feet; and for any other second, 32 multiplied by the number of seconds. He then proceeded as follows.

In hydraulics, velocity is the chief factor to be determined in every problem. The rule for finding it is written thus:

$\sqrt{2gh} = v$. Although it looks suspiciously learned, it is simple in its application, and easily remembered. It means: Multiply 2 by 32 by the given height and extract the square root, and the velocity in feet for one second of time is found. In this formula g is the acceleration of gravity, or the velocity in feet per second acquired by a falling body in one second of time. This, as we have seen, is 32; and h is the height. Water will issue from an opening in the side or bottom of a tank or reservoir with a velocity equal to that attained by a body falling freely through a space equal to the perpendicular distance of the centre of the opening below the surface of the water. For example, in a cistern filled with water 25 feet deep, if we make a circular opening one inch in diameter at the bottom, we find the velocity thus, according to the formula $\sqrt{2gh} = v$; that is, $2 \times 32 \times 25 = 1600$; extract the square root, and the velocity for one second is found to be 40 feet. This rule applies to all bodies falling freely in space. The calculation is simple, with probably the exception of the extraction of the square root.

Having found velocity, the next step is to find quantity. Multiply velocity by the area of the orifice, and we find it would fill a pipe one inch square and $31\frac{1}{2}$ feet long in a second; and consequently $31\frac{1}{2}$ feet for one second becomes, by multiplying by 12 for inches and by 60 seconds for one minute, the number of cubic inches discharged in a minute, which, divided by 231, the number of cubic inches in a gallon, gives the discharge in gallons for one minute. The process is as follows:—Multiply velocity 40 by $\cdot 7854$ (area of 1-inch circle), which gives $31\frac{1}{2}$ feet nearly; $31 \times 12 \times 60 = 22,680$ (cubic inches), divided by 231, and 98 gallons is found to be the quantity discharged per minute. While this is the theoretical amount, it varies under certain conditions. If the orifice is cut in a thin plate, the amount would be about two-fifths less, or 38 per cent.; and if the orifice is prolonged by a short tube 3 or 4 diameters, the amount is increased another fifth, or 19 per cent.; and if the interior of the opening is rounded into a conical form, the amount is increased to within 3 or 4 per cent. of the calculation.

In calculating the amount of water delivered through long pipes, account must be taken of two kinds of loss: (1) Loss occasioned by cross currents and shape of the edge of the orifice, and (2) loss by friction. The latter is the principal, and nearly the only one considered. The friction of water on smooth surfaces is about $\frac{1}{2}$ lb. per square foot when water is moving at the rate of 10 feet per second. If the velocity is increased or diminished, the friction increases or diminishes in proportion to the square of the velocity. The proportion is as follows:—As 10 feet squared (= 100) is to 20 feet squared (= 400), so is $\frac{1}{2}$ lb. to 2 lbs. So that doubling the velocity increases the friction fourfold; and if the velocity is increased to 30 feet per second, the friction is increased ninefold. According to this, then, if a 1-inch tap be connected with a 2-inch pipe under any given head, the velocity is reduced to one-fourth, because the space in the 2-inch pipe being four times greater than the 1-inch, the water necessarily moves four times slower, as only the same quantity is passing through both. Hence, as the velocity in the 2-inch pipe is reduced to 1-4th, the friction is reduced to 1-16th of what it was in the 1-inch pipe. Besides, as the surface of a 1-inch pipe is twice as great as that of a 2-inch pipe containing the same quantity of water, and as friction is according to the extent of the surface, it may easily be seen that friction in the 1-inch pipe is 32 times greater than in the 2-inch. It is owing to this fact that pipes of the same length and head will deliver water according to the $2\frac{1}{2}$ power of their diameters; that is, a 2-inch pipe will pass nearly six times, and a 3-inch pipe nearly sixteen times, as much water as a 1-inch.

I will now give the rule for finding the quantity of water delivered through pipes of any length, diameter, and head. The formula is: Multiply the constant 425 by the diameter in inches multiplied by the pressure per square inch; divide by the length, and extract the square root to find the velocity. *

$$\sqrt{(425 \times d \times p) \div l} = v.$$

I will take the former example ($425 \times 1 \times 11$) $\div 100$, assuming the length of pipe to be 100 feet from reservoir or tap. The pressure in pounds per square inch is found by multiplying the decimal $\cdot 43$ by the head ($\cdot 43$ lb. giving the pressure for a square inch 1 foot high), $425 \times 1 \times 11 = 4,675$, which divided by $100 = 46\cdot 75$. Extract the square root, and it gives the velocity as 6.7 feet per second. This multiplied by the area $\cdot 7854 \times 12$ for inches $\times 60$ for seconds in a minute will give the number of cubic inches discharged ($6\cdot 7 \times \cdot 7854 \times 12 \times 60 = 3,787$, divided by 231) = 16 gallons nearly. This shows that in a 1-inch pipe 100 feet long, the quantity discharged is considerably lessened by friction.

Another useful rule for finding the velocity in pipes where the head is low (it is used a good deal by English engineers, and is credited to a Mr. Blackwell) is: Multiply head in feet per mile by diameter in feet, divided by 2.3, extract the square root, and the velocity is obtained. The remaining process is the same as mentioned before for finding number of gallons.

* The velocities found by this rule are about one foot per second less than those given by the Poncelet-Trautwine formula—

$$v = m \sqrt{d h \div (l + 54 d)}$$

in which m is a variable coefficient.

It may not be out of place here to point out the difference between, first, pressure in weight; second, pressure in square inches; third, volume discharged. If we assume a column 100 feet high and 1 inch square, the weight is 43 lbs., and the pressure is 43 lbs. per square inch. But you can make a column of water 100 feet high with only a pint of water, and the pressure at the bottom is still 43 lbs. per square inch. The volume of water discharged, however, from an orifice in the bottom of a tank 100 feet high is something altogether different. Thus in a tank of this height, and capable of discharging 1 gallon from an opening 1 foot from the top, the quantity discharged will not be as the height in pounds weight or in pounds per square inch, but as the square root of the height. In the case of the tank, 10 gallons will be discharged, or, as the square root of the head, 100 feet. So that knowing the height, we can easily compare the results to be obtained from orifices of different sizes. Thus it may be required to know what head a 2-inch tap will need in order to give as much water as a 1-inch tap with a head 6 feet high. As the 2-inch tap is four times larger, square it, and divide it into 64, and the answer is that the 2-inch tap with 4 feet pressure will deliver the same quantity of water.

Register of Patents.

STARTING GAS-ENGINES.—Bickerton, H. N., of Ashton-under-Lyne. No. 17,686; Dec. 23, 1887. [11d.]

This invention refers to the application of a small water-motor and connecting mechanism for the purpose of starting gas-engines. It is proposed to work the motor by the pressure of water in the ordinary water-supply mains. The motor is fixed to the bed of the gas-engine; and the ram is formed at its front extremity as a toothed rack for gearing with a spur-wheel mounted on the gas-engine shaft. This spur-wheel is not keyed direct to the shaft, but is in the form of an annular ring around the boss of the ratchet-wheel, or its equivalent keyed upon the driving-shaft, and which ring carries a pawl or clutch for engaging with the ratchet-wheel in one direction, but being free from it in the other direction. In this manner it is possible to impart two or more rapidly following strokes to the fly-wheel; and thus to keep up its momentum until the engine is fairly started. The ram of the motor is of less diameter than the cylinder, and is fitted at its back extremity with a cupped leather of the full diameter of the cylinder, so that the difference in area between the piston and cylinder can be utilized for bringing back the ram when the slide-valve is timed to open the communication with the exhaust.

GAS-LAMPS.—Thompson, W. P.; communicated by F. Deimel, of Berlin. No. 17,877; Dec. 29, 1887. [8d.]

This invention relates partly to a chimney for lamps, which when placed on a burner causes the flame to assume a spherical form like that of a regenerative burner.

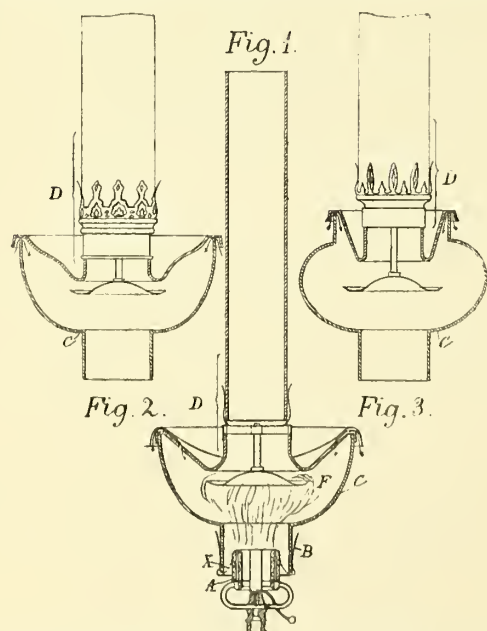


Fig. 1 shows a vertical section of an Argand burner turned into a regenerative lamp by placing on the burner the new chimney. Figs. 2 and 3 show modified forms of the invention.

On the bell holder B of the Argand burner A (fig. 1) the glass globe C is placed, so that the usual flame is obtained. By placing the chimney D on the globe C, this flame is turned into a regenerative lamp. The chimney consists of the usual straight tube D, and of the chimney holder provided with a deflector hanging downwards. The holder can be used for the purpose of heating and leading to the upper part of the flame the fresh air required for combustion, and can then be made hollow; or it can be formed of one single plate having the shape of a saucer (figs. 2 and 3); or it can consist of a cross piece, in which case the air is heated by its contact with the chimney and led from the latter to the flame. If a hollow chimney holder is applied, its upper part is advantageously made of metal; whilst the lower part can be made of porcelain or enamelled metal. The latter is provided with air inlets; whilst the air is admitted at the edge of the globe, between the upper and lower part of the holder. The air entering the globe from the outside is compelled to pass into the highly-heated chimney holder, and comes in contact with its surface. Thence it is led to the upper part of the flame. The

deflector which hangs down from the chimney holder, is preferably saucer shaped, and so arranged as to present its hollow surface to the flame F. The gas issuing from the burner strikes against the deflector; and in consequence of the hollow in the deflector, the air rising upwards inside the flame, which has partly become mixed with gas on its way, is collected and heated. The combustion of the gas is, therefore, assisted; so that the flame assumes the appearance of a perfectly uniform ball. The upper part of the flame is supplied with air, which enters through the inlets in the chimney holder; the air having travelled between, and in contact with the sides of the holder. This effects a complete combustion of the gas and produces a "white bright lighting flame."

The method of obtaining a white flame in the new lamp chimney is therefore different, says the patentee, from that used in the regenerative lamp. The heated air for effecting the complete combustion of the gas is not admitted direct to the burner, but behind or above the place of ignition; and therefore the disadvantage of overheating the gas before its escape from the burner is avoided. The temperature at the mouth-piece of the burner is the same as is usual in gas-burners; and it cannot cause a decomposition of the gas. The combustion will gradually increase; and if a comparison with well-known burning devices be made, the working will be found to be similar to that of fireplaces provided with smoke consuming devices—that is, with a supply of air to the back part of the flame. In order to obtain a complete and uniform burning of gas and a noiseless flame, it is necessary to make an essential alteration in the introduction of the air to the burner itself. If gas-burners were to be used as they are in practice, there would arise whirling currents in the flame; and these currents are easily recognized by means of the wandering dark stripes they produce. In order to avoid these disadvantages, says the inventor, it is necessary to divide, as finely as possible, the air which enters from below into the globe holder, and admit it to the flame. This effect is obtained by placing a fine wire gauze net X in the globe holder B. A perforated plate does not fulfil the intended purpose, for the edges of the perforations cannot be made otherwise than sharp, so that the air flowing through them meets always with a resistance which prevents the uniform combustion of the gas. If, on the contrary, a wire gauze is used, the openings in the latter have all their edges rounded, and the air flows through the holes without meeting with much resistance.

MANUFACTURING GAS.—Meeze, A. G., of Redhill. No. 7097; May 12, 1888. [8d.]

This invention relates to the manufacture of illuminating gas "by the mutual decomposition of steam and hydrocarbon fluid in contact with suitable heated surfaces—such as deflecting and impact devices—of cast iron or other material, and by combining with the nascent gases and vapours of such decomposition, a suitable regulated proportion of natural gas, hydrogen, carbonic oxide, or a mixture of hydrogen and carbonic oxide, such as that obtained in the production of what is commonly known as water gas in a heated condition."

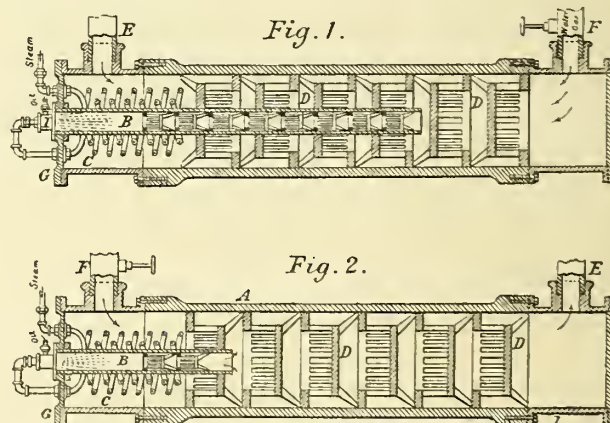


Fig. 1 represents a section of a through retort, containing a steam superheating coil, an ingression pipe, and deflecting and impact devices, and having attached, at opposite ends, a gas supply and a gas eduction pipe. Fig. 2 represents a through retort of modified form, in which a short ingression pipe is used, and the gas inlet pipe is connected to the same end of the retort as the steam and oil injector. A number of such retorts may be set in a bench, and fired like ordinary coal-gas distilling retorts. It is also proposed to adapt existing coal-gas retorts for carrying out the process, by fitting them with the necessary internal devices and connections.

The body of the retort is filled with deflecting and impact devices D, each composed of an annulus, a disc, a connecting body having numerous narrow longitudinal openings, and inclined spacing or separating legs. These deflectors are made of a shape to correspond with the cross section of the retort, so as to provide uniform passages between them and the walls of the retort. Two or more of the deflectors at the rear end of the retort (where the water gas is supplied) are made with solid discs to act as heaters for the inflowing water gas; but the remainder have their discs provided with central perforations, to receive the ingression pipe or small retort B. This internal retort is preferably made of thin wrought iron, about one-fourth to one-sixth the diameter of the surrounding retort, and long enough to extend from the front to about two-thirds or three-fourths the length of such outer retort—as shown in fig. 1. It is fitted at its front end in an opening in the lid G and is provided with a flange or ring shrunk thereon, which may be bolted to the lid, and is supported centrally as shown. Deflectors made with rings, discs, and legs, and preferably of cast iron, are fitted in the retort B, from its rear open end to near its front end; leaving sufficient space at the front for the proper injection of steam and oil. The injector I is fitted to the retort lid, so as to open centrally into the retort B. The double steam superheating coil C is preferably arranged at or near the front of the retort A, around the retort B; and a steam-supply pipe connects with its induction and through the lid, while another pipe

leads from its outlet end through the lid to the injector I. A supply-pipe for petroleum, shale oil, or other hydrocarbon fluid, also connects with the injector. The steam pipe preferably connects with the front end of the injector, while the oil-pipe connects with its top or side, as shown. A pipe F connects with the back mouthpiece, for supplying hydrogen, natural gas, or water gas. A stand-pipe E, leading to the hydraulic main or seal box, connects with the front mouthpiece. The lid G, steam coil C, and injector I, may be so connected that they may be removed together, without disturbing the ingression pipe or retort B. The deflectors D in the outer retort, may be made of fire clay or other refractory material, though preferably of cast iron.

Vapours and gases—such as steam, oil vapour, and hydrogen gas—cannot be effectually heated, decomposed, and combined by radiation from contiguous hot surfaces, says the patentee; and he has found it necessary to cause the vapours and gases to pass, by direct and repeated impact, in contact with the hot surfaces extending through the area of the retort, in order to effect their uniform and economical decomposition and combination, to form a homogeneous fixed gas. For securing the best results above stated, the deflecting and impact devices are found to admirably answer the purpose; and they are important features in successfully carrying out the process. For some reason, however, which the inventor is unable satisfactorily to explain, cast-iron deflecting devices are more efficient than those made of other material. It would appear, he says, that during the gas-making process, the molecules of the iron deflectors occupy a position of unstable equilibrium, and by acting as a sort of “common carrier,” promote the necessary chemical interchanges.

In the modified form of apparatus represented in fig. 2, the ingression pipe or small internal retort is made short, and arranged to discharge steam and hydrocarbon fluid near the front end of the large retort, in contact with the deflecting and impact devices D. The supply-pipe for admitting a chemically active diluting agent (such as natural gas, hydrogen, or water gas) connects with the front end of the retort, so that the steam, hydrocarbon fluid, and diluting gas are caused to pass together in contact with the deflectors throughout the whole length of the retort. There being only a short ingression pipe, the discs, except the first, are here made solid throughout, and present a larger heating surface than where the ingression pipe passes through them; but, of course, the special advantages of the ingression pipe itself are sacrificed. The gas stand-pipe E connects with the rear mouthpiece.

In order to manufacture gas, the operation is as follows:—The retorts are fired in the ordinary way, and when heated to the proper gas-making temperature, a supply of high-pressure steam from the boiler is admitted through an ordinary regulating valve to the superheating coil C, whence it passes, in a highly superheated state, to the injector I. The hydrocarbon oil is then admitted in regulated quantity from the supply-tank to the injector, from which it is thrown in a vapour spray, by the jet of superheated steam, into the ingression pipe or retort B. The steam and oil vapours are thoroughly mixed and highly heated, nearly to the point of decomposition, by contact with the deflecting and impact devices in their passage through the small retort, and are discharged therefrom into the main retort, where the production of fixed gas at once begins. After gradually admitting oil to the injector, hydrogen—light carburetted hydrogen (such as natural gas or water gas)—is admitted in regulated quantity through the pipe F into the larger retort, where it is heated by contact with the deflectors D. The heated gas meets the highly-heated current of oil-vapour and steam flowing from the retort B, and the mixture flows in contact with the deflecting and impact devices surrounding the retort, or arranged beyond its discharge end, resulting in their complete decomposition and recombination, so as to form “a fixed high-grade illuminating gas.” In this reaction, it is claimed that the hydrogen gas present chemically unites with the rich hydrocarbon vapour or gas in the nascent state, to form fixed carburetted hydrogen gas of a merchantable character, and some of the carbonic oxide and marsh gas enter into new combinations, by which the light-giving quality of the final product is improved. The hydrocarbons are thus utilized and prevented from being destructively decomposed, with the formation of lamp-black or hard carbon on the one hand, or on the other hand, from passing off in the form of tarry condensable vapour.

OPENING, CLOSING, AND SECURING THE GLASS SHADES OR GLOBES OF WENHAM LAMPS, AND LIGHTING AND MANIPULATING THE LAMPS.—Hempel, E. J., of Dresden. No. 12,880; Sept. 6, 1888. [6d.]

The object of this invention is to provide means for opening, closing, and securing the glass shades or globes of the ordinary type of regenerative gas-lamps, and for lighting and otherwise manipulating them. The device for this purpose consists of a rod or handle, fitted with wires, a lighting lamp, and a hook used in combination with a ring, pins, and a set-screw fitted to a locking bar, so as to permit of the opening, closing, and lighting of the lamp at one operation.

APPLICATIONS FOR LETTERS PATENT.

17,037.—JOAQUIN, F., CARULIA, R., and GLOVER, E. M., “Improvements in the manufacture of sulphate of ammonia.” Nov. 23.

17,044.—TAYLOR, W., “Improvements connected with gas-burners.” Nov. 23.

17,088.—BRAITHWAITE, JUN., C. L., and BRAITHWAITE, I., “Improvements in apparatus for controlling or regulating the discharge of water or other liquids.” Nov. 24.

17,097.—PARKES, W. E., “An apparatus for heating of water by means of gas.” Nov. 24.

17,102.—SCOTT, G., “Improvements in the construction of gas-producers and furnaces.” Nov. 24.

17,167.—KORTING, E., “Improvements in gas and petroleum engines.” Nov. 26.

17,204.—PRICE, H. A., and TURNER, H. C., “A regulation jet for gas, steam, &c.” Nov. 27.

17,264.—GRUBE, E., “Improvements in gas-generating burners.” Nov. 27.

17,337.—WESTMAN, G. M., “Process for the manufacture of illuminating gas and coke.” Nov. 28.

17,413.—CROSSLEY, F. W., and ANDERSON, F. H., “Improvements in igniting apparatus for gas or oil motor engines.” Nov. 29.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

THE GROSVENOR GALLERY ELECTRICAL INSTALLATION.

SIR,—On a recent visit to London, when I arrived (about 6 p.m.) at what I thought ought to be the Charing Cross Station of the Metropolitan District Railway, I found I could not read the name of the station on the lamps which gave a very faint glimmer of a reddish hue. I discovered that they were supplied from the Grosvenor Gallery Electric Light Company, and gave so poor a light that it was almost perilous to move about the station. The ticket taker, although he had an incandescent lamp close to him, could not check the tickets by its faint glow, and had to light a gas-lamp before he could read the figures on the tickets. I used my umbrella as a very rough photometer—placing it at about an equal distance from the gas and the electric lights—with the result that, while the shadow of the first was well defined and strong, it was barely possible to see the shadow of the second in the brighter field illumined by the gas-light. I came to the station again at 11 p.m., and found things a shade better; but I should guess that the light given by the 16-candle (?) electric lamp did not average more than 4 candles. The present price charged by the Grosvenor Gallery people is 7½d. per nominal unit, or equal to 6s. 3d. per 1000 cubic feet of gas. Now if the light given was only one-fourth of the nominal power, the cost would be really equal to 25s. per 1000 cubic feet. What would be said of gas companies if they performed their duties in this way?

It is said, in excuse, that the Company have taken on more consumers than they can supply. Again, What would be said of a gas company under contract to give a minimum pressure of 1 inch of water if they gave only 2-10ths? I believe a good many of the consumers have contracted for so much per lamp; and most electricians say that the Ferranti meter is not to be relied on. I trust in justice to the consumer they will make proportionate allowance for supplying only 4 candles, instead of 16. Indeed, as there are men of the highest character on the Board, I am sure they will feel bound to take this course, and not make up a fictitious dividend by any avoidance of their obligations to the public.

I would be glad if you could get some competent person to test the lights at the station I have mentioned, and at other places.

Nov. 28, 1888.

A PROVINCIAL.

MR. ELLIS LEVER AND SALFORD GAS AFFAIRS.

SIR,—I have read in the JOURNAL of Tuesday last, a letter upon this subject from Mr. James Ward. It contains such extraordinary statements, that I think they should be answered.

Mr. Ward commences by stating that he was “one of the young members of the old Gas Committee.” Mr. Ward may have some satisfaction in knowing that the frauds were greatest during the past six or eight years of the Hunter, or shall I say more correctly, Sharp régime—for Mr. Alderman Sharp was the Chairman of the Gas Committee during the whole time that Hunter was the Gas Engineer. These frauds are more gigantic than most folks know. However sincere Mr. Ward may have been to introduce reform, his presence on the Gas Committee did not immediately effect any good to the ratepayers. I do not here wish to champion Mr. Ellis Lever; but I should not be surprised to learn that, if he ever did business with the Salford Corporation, he would be compelled, like many of the other contractors, to submit to blackmail. As to Mr. Lever's relationship with Mr. Hunter, and the alleged offer of the use of a house at Colwyn Bay, &c., Mr. Ward must know that to keep the Engineer or the Gas Committee at arm's length was not the best way to secure a contract. Mr. Ward was himself a great friend of Mr. Hunter; but it does not necessarily follow that the friendship was for any dishonourable motive. Mr. Ward's statements prove the adage “that a little knowledge is a dangerous thing;” for he has forgotten, or has never known, that Mr. Alderman Sharp, who was Chairman of the Gas Committee, in a statement made by him on oath at the trial, *Regina v. Lever*, said he “had made up his mind that, so long as he (Sharp) was on the Gas Committee, Mr. Ellis Lever should never have a contract.” Allow me, also, to tell Mr. Ward that it was not a question of price, nor, as he very naively admits, a question of quality, of coal that guided the Gas Committee in their selection of the contractor.

Let us consider the matter of the contract when the Gas Committee refused Mr. Ellis Lever's offer at 9s. 6d. per ton, and accepted another gentleman's at 8s. 6d. Mr. Ward says: “In no single instance was a tender at 9s. 6d. considered. Why this sophistry, Mr. Ward? You who know so much about gas making and purification! Do you know what became of the tenders before they were submitted to the Gas Committee, or what became of them after? Was there a single tender sent in by any would-be contractors retained in the archives of the Corporation, and obtainable for reference (say) in May, 1887? How many tenders were considered when the final bargain was made in coal by the Gas Committee, which resulted in a saving to the ratepayers of £8000? How many cubic feet of gas per ton was made with the extraordinary coal described three times by Mr. Ward, regarding which it is not necessary to consider the quality, but only to look well to the purifying? Is it not a fact that for years, during the time this extraordinary cheap coal was being used, numerous—almost daily—complaints were made as to the quality of the gas. It is asserted, on the most reliable authority, that the illuminating power rarely, if ever, exceeded 15 candles. Will Mr. Ward tell us how much of this coal was weighed by the Railway Company who carried it, or by the Gas Committee's servants who received it. Further, was the stock of coal taken? During the past twelve months it has been asserted in the Council that they were 30,000 tons short; but it has been admitted, and I believe is a fact, that in the past twelve months there is 3000 tons in some way unaccounted for.

I think if we were to go into facts, Mr. Ward's figures would be easily disposed of; and it would not be difficult to show, as Mr. Lever asserts, a possible loss of £25,000. If Mr. Ward tells us what was the cost of this peculiar system of purification in each year that he was a young member of the old Gas Committee, I will show him that he should never prophecy before he knows. Was Mr. Ward a member of the deputation who visited gas-works in other towns, to seek information as to the

advisability of erecting at the Salford Gas-Works a sulphate plant; and did that deputation take the Gas Engineer to show them, I presume, what a gas-works was like, and then leave him outside? The only part, I believe, the Manager was allowed to take in the proceedings was to partake of the good cheer which the deputation always comforted themselves with.

I am perfectly convinced that if the Gas Committee had done its duty by the ratepayers, none of these frauds would have been perpetrated, and Samuel Hunter would probably have never been in prison. Mr. Ward has not forgotten that the "Investigation Committee," in their report to the Council, said that "the Gas Committee stood discredited and condemned." Mr. Ward was a member of that Committee. If he seeks to defend the transactions of the Committee of which he was only a young member, why does he not take up the cudgels against this condemnation of the Investigation Committee? He may also answer a few of the questions I have put to him, which I venture to submit are as pertinent to the question of the Salford gas mismanagement as any he has propounded.

Forest Hill, S.E., Nov. 29, 1888.

SAMUEL HAYWARD.

THE IRONMONGERS' EXHIBITION.

SIR,—While thanking you for your exhaustive and critical review in this week's JOURNAL of the late Ironmongers' Iron and Metal Trades Exhibition, I would suggest that your remarks as to its scope running so far into the builders' and furniture exhibition are a trifle unjust. On the one hand, the bulk of my exhibition would be mere sections or "hanging on" to the general idea of either of the exhibitions you mention; and, on the other hand, both these exhibitions, which you mention as "annual," have been dropped for some time. Being the first of the kind, some of the larger firms were naturally a trifle shy; but judging from the support I am already receiving for my next show (March, 1890), I think I can safely promise that all your objections will be met then. I can assure you that any suggestions as to the improvement of the show will be gladly acted upon.

Nov. 30, 1888.

HARRY ETHERINGTON.

PROPOSED NEW WATER-WORKS FOR ROSCOMMON.—An inquiry has recently been held at Roscommon, by Mr. R. O'Brien Smyth, one of the Local Government Board Inspectors, into an application to borrow £5000 for the construction of new water-works for the town. There was practically no opposition to the proposal. It is stated that the town has been in a deplorable condition as regards water; and it is intended to make the entire union contribute towards the expense of the scheme.

CROMER GAS COMPANY.—Mr. G. Breeze, presiding at the annual meeting of this Company last week, was able to announce an increase of profits over the preceding twelve months, and sufficient to justify the Board in recommending a dividend at the rate of 5 per cent. per annum, free of income-tax. In view of the cost of the replacement of retorts next year, and also an extension of retort power to meet the increasing consumption, the Directors were desirous to carry forward as large a balance as practicable, and therefore did not suggest a higher dividend.

THE GAS-WORKS AT THE HANWELL SCHOOLS.—Yesterday week the question which has several times of late been agitating the Managers of the Central London District Poor Law Schools at Hanwell—as to the alterations and improvements necessary at their gas-works—was again under discussion (see *ante*, pp. 731, 807). The Farm Committee recommended, and it was agreed to employ Messrs. Alfred Williams and Co., of Bankside, to carry out the work suggested by Mr. W. F. Broadberry. It is anticipated that, if a more suitable class of coal is employed, the cost of gas manufacture will be reduced to 2s. 7d. per 1000 cubic feet—or 5d. per 1000 feet less than the price at which the Brentford Gas Company offer to supply it. A saving will thus be effected of about £83 on such a consumption as that of last year, which was 4,023,670 feet.

THE HOLIDAY QUESTION AT THE BIRMINGHAM GAS-WORKS.—The gas stokers and yard-men from Alderley Street and Swan Village who benefit by the resolution recently passed by the Council, according to a week's holiday during the summer, gave a complimentary breakfast to Mr. Councillor R. Nixon and Messrs. J. R. Oswald, J. Cawley, and R. Benson, last Sunday week. Mr. J. Cawley, Chairman of the Committee, presided; and the Company numbered about 100. After breakfast, the following resolution was passed:—"That the thanks of this meeting be tendered to the Mayor and Corporation of Birmingham for their kindness in conceding a week's holiday to the men engaged in the Gas Department, and that a copy of this resolution be forwarded to the Mayor and Chairman of the Gas Committee." Mr. Nixon, in acknowledging the resolution, expressed regret that an endeavour should have been made to gain party capital out of the circumstances. He had scrupulously avoided any such possibility, because he thought that the introduction of party politics would have been unfair to the men, and might possibly have endangered the success of the agitation. He trusted that everyone would use to good purpose the time given, and so enjoy to the full the concession made. A resolution thanking Messrs. Nixon, Oswald, Cawley, and Benson for their services was also carried unanimously. These gentlemen having suitably replied, the proceedings were brought to a conclusion with a vote of thanks to the Chairman.

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Parliamentary Intelligence.

NOTICES GIVEN FOR PRIVATE BILLS (SESSION 1889) RELATING TO THE SUPPLY OF GAS, WATER, AND ELECTRICITY.

BARROW-IN-FURNESS CORPORATION.—This is an application by the Barrow-in-Furness Corporation for leave to introduce a Bill empowering them to construct new water-supply works and to take water from the River Duddon and elsewhere. The notice comprises provisions in regard to the compulsory purchase of lands, the variation and extinguishment of water rights, and the supply of water for domestic and trade purposes. An extension of the time within which the water-works authorized by the Corporation's Act of 1875 may be constructed is desired; and authority is asked to form gas and water reserve funds, and a fund for working capital for gas and water purposes. Clauses in relation to financial and other general matters are included.

BARROW HEMATITE STEEL COMPANY, LIMITED (WATER SUPPLY).—This Company intend making application for leave to introduce a Bill giving them powers to construct water-supply works, purchase lands and water rights, and to divert and use the waters of Crosby Gill and of the River Duddon. They seek authority to apply their existing funds to the purposes of the Bill and to raise additional capital. A provision is inserted in the notice authorizing the transfer to the Corporation of Barrow-in-Furness of the powers conferred by the intended Act and any works constructed thereunder.

BARRY AND CADOXTON GAS AND WATER.—This is an application by the Barry and Cadoxton Gas and Water Company for leave to construct works specified in the notice—including a service reservoir, wells, and pipe-lines. The applicants require permission to purchase lands, waters, and other property, and to lay down, remove, and renew their pipes. Adjustment of the existing capital and further powers in this respect are sought. A provision is to be included in the proposed Bill asking for authority to dispose of the undertakings of the Company to the Local Board; and, upon transfer, to invest this Board with all the powers and privileges of the Company. The Local Board is to be empowered to apply their existing funds, and raise additional money, for the purpose of such purchase. A clause providing, in the case of sale, for the winding up of the affairs of the Company is embraced in the notice.

BELFAST WATER.—Power is intended to be sought by the Belfast Water Commissioners to construct filtering-basins, a reservoir, and incidental works. They also ask for an extension of time for the exercise of compulsory powers to take land, and for the completion of certain works, authorized by the Belfast Water Act of 1884. Provisions are to be inserted in the proposed Bill in regard to new borrowing powers, the conversion of existing mortgages of the Commissioners into stock, and as to granting and charging for plumbers' licenses.

BRISTOL WATER.—Notice is given by the Bristol Water Company that they purpose making application for powers to construct, among other things, a reservoir (to be called the Yeo reservoir), to be formed by means of an embankment across the valley of the River Yeo, and a pumping station; also the necessary water towers, filter-beds, &c. They also wish to be enabled to abandon certain works authorized by the Act of 1888—chiefly the pumping station known as No. 2, and various lines of pipes. Provisions are to be included in the proposed Bill in reference to the breaking up of roads, the laying of pipes, the acquisition of lands, and agreements with mill and mine owners, and public bodies. For the purpose of carrying out the intended works, additional capital is required.

BURNLEY CORPORATION EXTENSION.—Notice is given by the Corporation of Burnley of their intention to apply for leave to introduce a Bill authorizing the extension of the borough boundaries, and the limits within which they have power to supply gas and water. It is sought to repeal and amend all Acts empowering the Padiham Local Board to supply gas and water within the township of Habergham Eaves, and to prohibit the Board continuing to supply gas or water within the township; and sanction is sought to purchase the mains and other works belonging to the Board situated therein. The Corporation wish to be enabled to enlarge their existing gas-works, and to construct additional works both for gas manufacture and the conversion of residual products, upon land which they desire to be authorized to acquire. Permission is required to apply existing funds, and the enlarged borrowing powers asked for, to the purposes of the proposed Bill.

BURY CORPORATION WATER.—The Corporation of Bury give notice that they intend to apply for authority to construct new works for water supply—comprising chiefly a reservoir to be called "Clough Bottom," a catchwater drain or conduit, and an aqueduct. In order to carry out these works, sanction is sought to compulsorily purchase lands, to divert roads and footpaths, and various streams. The owners and occupiers of mills and other works are to be protected; and provision is made with respect to compensation water. The Corporation ask for permission to revise the charges for water supplied by them, and to apply for the purposes of the proposed works their funds, and any moneys which they may now be authorized to raise. It is desired to repeal a portion of sections 129 and 131 of the Bury Improvement Act of 1885 as to sinking funds, and to make other provisions for the repayment of money borrowed by the Corporation in respect of their water undertaking, and the payment off of the annuities created for water-works purposes under the Bury Improvement Act of 1872.

CHELTEMHAM IMPROVEMENT.—In the notice of an application to be made for general powers, the Cheltenham Corporation have a clause to authorize trustees or other persons holding annuities under the Cheltenham Corporation Water Act of 1878 to invest the proceeds thereof, on purchase or redemption, in the purchase of Cheltenham Corporation Stock.

CLEVELAND WATER.—The Cleveland Water Company intend to ask for leave to alter and vary the existing rates, rents, and charges, and for power to increase them, and in particular to fix or prescribe the minimum rents or charges at which they shall be bound to supply water to houses or other premises.

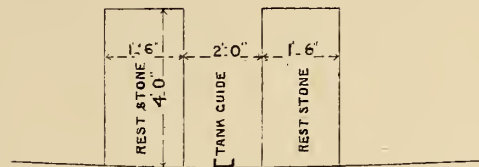
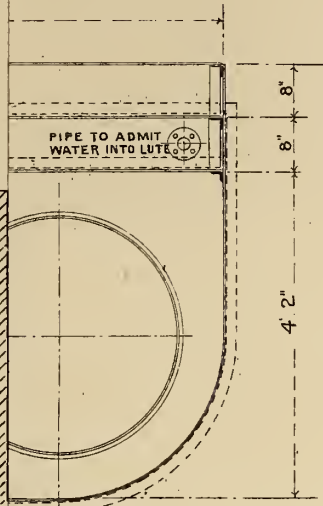
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SYDNEY GASHOLDER

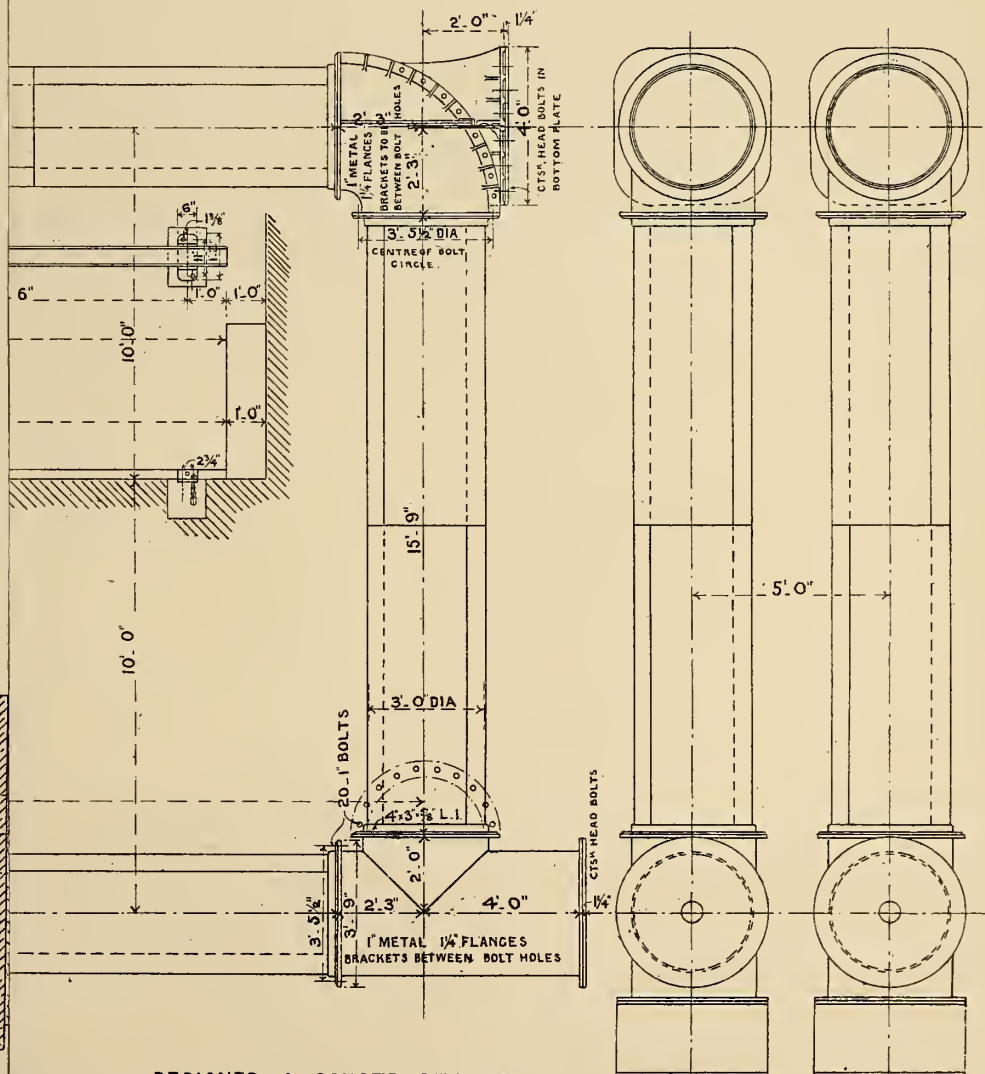
— FOUNDATION BOLTS, TANK GUIDES, INLET & OUTLET PIPES & —

DRAWING N^o 1.



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C. & W. WALKER.

advisability of erecting at the Salford Gas-Works a sulphate plant; and did that deputation take the Gas Engineer to show them, I presume, what a gas-works was like, and then leave him outside? The only part, I believe, the Manager was allowed to take in the proceedings was to partake of the good cheer which the deputation always comforted themselves with.

I am perfectly convinced that if the Gas Committee had done its duty by the ratepayers, none of these frauds would have been perpetrated, and Samuel Hunter would probably have never been in prison. Mr. Ward has not forgotten that the "Investigation Committee," in their report to the Council, said that "the Gas Committee stood discredited and condemned." Mr. Ward was a member of that Committee. If he seeks to defend the transactions of the Committee of which he was only a young member, why does he not take up the cudgels against this condemnation of the Investigation Committee? He may also answer a few of the questions I have put to him, which I venture to submit are as pertinent to the question of the Salford gas mismanagement as any he has propounded.

Forest Hill, S.E., Nov. 29, 1888.

SAMUEL HAYWARD.

THE IRONMONGERS' EXHIBITION.

SIR,—While thanking you for your exhaustive and critical review in this week's JOURNAL of the late Ironmongers' Iron and Metal Trades Exhibition, I would suggest that your remarks as to its scope running so far into the builders' and furniture exhibition are a trifle unjust. On the one hand, the bulk of my exhibition would be mere sections or "hanging on" to the general idea of either of the exhibitions you mention; and, on the other hand, both these exhibitions, which you mention as "annual," have been dropped for some time. Being the first of the kind, some of the larger firms were naturally a trifle shy; but judging from the support I am already receiving for my next show (March, 1890), I think I can safely promise that all your objections will be met then. I can assure you that any suggestions as to the improvement of the show will be gladly acted upon.

Nov. 30, 1888.

HARRY ETHERINGTON.

PROPOSED NEW WATER-WORKS FOR ROSCOMMON.—An inquiry has recently been held at Roscommon, by Mr. R. O'Brien Smyth, one of the Local Government Board Inspectors, into an application to borrow £5000 for the construction of new water-works for the town. There was practically no opposition to the proposal. It is stated that the town has been in a deplorable condition as regards water; and it is intended to make the entire union contribute towards the expense of the scheme.

CROMER GAS COMPANY.—Mr. G. Breeze, presiding at the annual meeting of this Company last week, was able to announce an increase of profits over the preceding twelve months, and sufficient to justify the Board in recommending a dividend at the rate of 5 per cent. per annum, free of income-tax. In view of the cost of the replacement of retorts next year, and also an extension of retort power to meet the increasing consumption, the Directors were desirous to carry forward as large a balance as practicable, and therefore did not suggest a higher dividend.

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DEANHEAD WATER.—The Commissioners of the Deanhead reservoir purpose applying for authority to use and maintain their existing Deanhead reservoir and works situated on the Blackburne Brook, in the parish of



Huddersfield, to construct additional works, and to divert and impound certain waters for the proposed new works. Provisions are inserted in the notice in regard to compensation water, breaking up of roads, compulsory purchase of land, &c., and permission is sought to supply water by agreement or otherwise in the townships of Stainland with Old Lindley and Barkisland, to make contracts for the supply of water in bulk to local authorities, and to borrow further money upon the credit of the income receivable from the sale of water.

EASTBOURNE WATER.—The Eastbourne Water-Works Company intend to seek authority to construct certain new works, to alter existing works, and to have the period limited by their Act of 1881 extended for the completion of reservoirs named in the present notice. Further share and loan capital are needed for the objects of the proposed Bill and the general purposes of the undertaking.

EAST KENT DISTRICT WATER.—It is proposed to apply for powers to incorporate a Company for the supply of water to Sandwich, Ash, Eastry, St. Margaret's-at-Cliffe, and other places in Kent. For this purpose authority to construct works at East Langdon, to acquire lands, waters, &c., and to lay pipes, is required. Power is desired to levy rates, to supply water in bulk, and to make agreements with any sanitary authority and other body for the sale of the concern.

EDINBURGH AND DISTRICT WATER.—The Edinburgh and District Water Trustees announce their intention of applying for power to borrow additional money to enable them to complete works already authorized, including works for the more effective filtration and distribution of the water supplied by them. They also wish to be authorized to alter or cancel existing agreements, and to enter into others in regard to the supply of water to local bodies.

FAVERSHAM GAS.—The Faversham Gas Company, Limited, notify their intention to apply for power to dissolve the Company, annul the Memorandum and Articles of Association, and to re-incorporate the shareholders into a Company of the name of the "Faversham Gas Company," in which will be vested the existing works, &c. Provisions are to be included in the proposed Bill, in regard to the conduct of the Company's affairs, the arrangement of capital, the conversion of existing share capital into stock, additional capital, and borrowing powers. Authority is asked to maintain and enlarge the works, and to supply gas in Faversham and certain parishes and townships named in Kent. The applicants desire sanction to construct new works, to manufacture and store gas, and to manufacture and convert residual products on lands described in the notice. Clauses are to be inserted as to the acquirement and disposal of land, the acquisition of patent rights, the breaking up of roads, the making of agreements with public bodies, and other minor matters.

GARW WATER.—It is proposed to make application for leave to incorporate a Company, and to authorize them to supply water to Bettws, Cwmdn, Llangeinor, and a number of other places mentioned in Glamorganshire. Power is sought to maintain the existing, and to construct additional works, to take lands, springs, and streams, and to levy rates. The Bill will amend as much of the Bridgend Gas and Water Act, 1869, as empowers the Bridgend Gas and Water Company to supply water in any of the districts defined in the notice. Permission is asked to acquire the Porthcawl Water-Works, and also the undertaking of the Garw Water and Light Company, or to dissolve and re-incorporate the last-named Company, with further powers. Special provisions are to be included for preventing pollution of streams, &c.

GREAT WIGSTON GAS.—The Great Wigston Gaslight and Coke Company, Limited, intend to apply for powers of dissolution and re-incorporation without limitation, but with the capital of the undertaking rearranged and increased. Authority is sought to continue, maintain, and extend the existing gas-works, manufacture gas therein, and supply it within an area to be defined. The usual powers to make agreements with local authorities and others, to levy rates and charges, and to manufacture and supply stoves and fittings are included in the notice.

HEYWOOD CORPORATION.—Application is proposed to be made by the Heywood Corporation for an extension of the time limited by the Heywood Water Act, 1877, for the construction and completion of the reservoir on Ashworth Moor and other works connected therewith, and for the power to purchase at the end of such period, and upon such terms and conditions as may be mentioned in the intended Act, the annuities issued by them in respect to the purchase of their gas and water undertakings, or otherwise to provide for the determination of such annuities. Provisions as to issuing licenses to plumbers and to prohibit unlicensed persons from executing any work connected with the Corporation water mains and pipes are included in the notice; and further powers in respect to borrowing money for the purposes of the water undertaking are sought.

HUDDERSFIELD CORPORATION WATER.—This is an application by the Huddersfield Corporation, who desire to have transferred, by agreement or compulsorily, and vested in them, the undertaking and property of the Commissioners of the Wessenden Reservoir. The applicants wish to be empowered to make agreements with the Commissioners; and to have the property intended to be transferred to them constituted a part of their water undertaking. Authorization to use existing funds, enlarge present borrowing powers, and raise additional money is required.

HYTHE CORPORATION WATER.—The Corporation of Hythe purpose seeking authority to impound and use for the general purposes of their water-works undertaking the waters of the Black Rook Spring, and to purchase land adjacent thereto. Enlarged borrowing powers are sought for the foregoing and other purposes.

KETTERING WATER.—The Kettering Water Company, Limited, propose making application for power to enable them to dissolve and re-incorporate the proprietors in a Company without limitation, in which Company all the works, &c., will be vested. Further money powers are sought, and also authority to construct additional works, and to purchase lands. Clauses are included in the notice in reference to the rates and charges to be levied by the Company, the supply of water by meter, and the making of agreements with sanitary and other authorities.

LIVERPOOL CORPORATION WATER.—The Liverpool Corporation have given notice of their intention to make application for various general powers, which include a provision to confer upon them authority in respect to the prevention of waste, misuse and fouling of water, and the registration of plumbers and others.

LONDON HYDRAULIC POWER COMPANY.—This Company intend to apply for power so raise further capital, and to alter some of the provisions of the Wharves and Warehouses Steam Power and Hydraulic Pressure Company's Act, 1871, and of the London Hydraulic Power Act, 1884, or of any other Act relating to the Company.

LONG EATON AND DISTRICT WATER.—This is an application for leave to incorporate a Company to supply water in the parishes and townships of Long Eaton, Sandiacre, and Stapleford, in Derbyshire and Nottingham; and for this purpose authority is asked to construct works. The powers necessary for a Water Company to carry on business are sought.

MANCHESTER CORPORATION WATER.—Application is intended to be made by the Manchester Corporation for power to make certain deviations and alterations (fully set forth in the notice) in the line and levels of the aqueduct from Lake Thirlmere to Prestwich authorized by their Water Act of 1879, and to make amendments in the provisions of that Act as to roads and sinking funds. Authorization is also sought to maintain and use two lines of pipes in the county of Chester.

METROPOLIS LOCAL MANAGEMENT.—The Metropolitan Board of Works give notice of their intention to apply for leave to bring in a Bill (in order that the London County Council may be enabled to proceed with the measure if they should so resolve) to confer upon them, *inter alia*, powers "to control and regulate the laying . . . of mains and pipes for water or gas, or hydraulic power purposes, and to remove or limit the liability of vestries and district boards for damage or injury to such mains and pipes."

METROPOLITAN ELECTRIC SUPPLY.—Authority is sought by the Metropolitan Electric Supply Company, Limited, to produce and supply electricity within the parishes of St. James, Westminster, and St. Martins-in-the-Fields, Waterloo Bridge, and the Victoria Embankment. The Company seek to be empowered to break open streets, and to interfere with sewers, pipes, &c., to enter houses and premises supplied by them for any purpose relative to the supply, to levy rates and charges, to make contracts with local authorities, and to apply their funds for these purposes.

MORLEY GAS.—This is a proposal by the Morley Gas Company to apply for powers to acquire additional lands for the purposes of their undertaking, to raise further capital, and to make agreements with public bodies as to the supply of gas.

NEWCASTLE AND GATESHEAD WATER.—Notice is given by the Newcastle and Gateshead Water Company of their intention to apply for permission to construct additional works—embracing a reservoir, a relieving tank, and various pipe-lines or conduits. Powers are asked to break up roads, lay pipes, purchase lands, houses, mines, &c., to make agreements with land, mine, and mill owners, and to give compensation, in money or water, as the circumstances may require, to any person or body injuriously affected by the proposed Bill. Increased share and loan capital is required.

NEWRY IMPROVEMENT.—The Town Commissioners of Newry purpose making application for power, among other things, to amend or repeal all or some of the provisions contained in the Newry Improvement and Water Act, 1871, and in the Newry Commissioners' Gas Act, 1878, relating to the borrowing and repayment of money, and to authorize them to re-borrow the money repaid under these Acts, and to repay all or some of their existing mortgages, and to make further provisions in relation to these matters.

PADIHAM AND HAPTON LOCAL BOARD.—It is proposed by this Board to apply for an Act to extend the boundaries of their district. They also desire authority to construct a compensation reservoir and other works connected with the water supply, to acquire certain lands, and to use their existing funds and any moneys they may now be authorized to raise for these purposes.

PLYMOUTH DOCK (DEVONPORT) WATER.—It is proposed by the Plymouth Dock Water-Works Company to obtain authority to construct various works specified in the notice, to obtain additional land, to extend the limits of supply, to change the name of the Company, to make agreements with the Secretary of State for the War Department, the Lords of the Admiralty, and public bodies, and, in order to carry out their proposals, to increase the share and loan capital.

RASTRICK WATER.—It is intended to make application for the dissolution of the Rastrick Water Company, Limited, and the incorporation of the shareholders into a new Company, with additional borrowing powers. Authority is asked to maintain the existing works, and to construct a new reservoir and other works; and leave is desired to compulsorily purchase lands. Confirmation of an agreement with the Halifax Corporation to supply water in bulk to the Limited Company is sought; and the applicants ask that so much of section 9 of the Halifax Water and Improvement Act of 1868 as authorizes the Corporation to supply water in Rastrick may be repealed.

RICKMANSWORTH AND UXBRIDGE VALLEY WATER.—The Rickmansworth and Uxbridge Valley Water Company announce their intention to apply for power to alter and extend the limits of the area of supply, so as to include Harmondsworth, Sunbury, Shepperton, and Littleton. Authority is asked to construct new works, and to enter into agreements for the supply of water in bulk to water companies and other bodies. The usual provisions as to the application to these purposes of the existing funds and of the additional capital to be raised will be included in the suggested Bill.

SCARBOROUGH IMPROVEMENT.—The Scarborough Corporation purpose applying for a number of general powers to be conferred upon them, among which is authority to make better provision in regard to the supply of water for domestic and other purposes, and to arrange for the redemption of the water annuities.

SOUTH KENT WATER.—This is an application for the incorporation of a Company to supply water to Mereworth, Wrotham, and a number of other small places in Kent. Sanction is sought to construct the necessary works, acquire lands, levy rates and charges, and make agreements with local authorities both as to the supply of water and the sale of the undertaking.

SWANSEA CORPORATION WATER.—In the notice of an application to be made by them for general powers, the Swansea Corporation announce their intention of asking for an extension of the time granted by their Water Act of 1884 for the purchase of land and for the construction and completion of the Upper Liliw Reservoir and other works.

TUNBRIDGE WELLS WATER.—The Tunbridge Wells Improvement Commissioners give notice of a Bill to confer on them, among other things, additional powers in regard to the water-works, to enable them to make further provision as to the rents and charges for the supply of water for domestic and other purposes and by meter, to prevent waste, misuse, and fouling of water, to remove pipes and fittings, and to recover rates and charges by distress.

TUSCAN GAS COMPANY, LIMITED.—This Company intend to apply for an Act to extend, alter, and amend their Memorandum of Association, and to change the title of the Company.

WAKEFIELD CORPORATION WATER.—It is proposed by the Wakefield Corporation to seek for an extension of the time limited by the Wakefield Corporation Water-Works Act, 1880, for the construction and completion of certain works—including, among other things, four reservoirs. They also wish to be empowered to purchase compulsorily or by agreement, lands, mills, and other property for the purpose of their intended works; and to be authorized to borrow money for the execution of these works.

WEST HAM GAS.—The West Ham Gas Company intend to apply for power to raise additional capital, enlarge and extend their borrowing powers, adopt the sliding scale, and deal in meters, stoves, engines, and other appliances incidental to the use of gas. They wish to have the

illuminating power of their gas, as well as the burner apparatus with which it is to be tested, and the testing-places, prescribed. An important clause in the notice is the application for an extension of the provisions of the City of London Gas Act, 1868, with respect to amalgamations, so as to enable the Company, subject to the conditions and regulations prescribed by that Act, to amalgamate with any other Company supplying gas in the Metropolis, or in any district adjoining that of the Company. The auction clauses are asked for in respect of the new capital, which is to be raised on debentures. The Company seek to be enabled, where the powers to borrow for the purposes of capital on the security of their undertaking, or to create an insurance, reserve, or any other fund are limited to a definite proportion of the paid-up share capital, to reckon the premiums invested in the undertaking from every source, as part of the paid-up share capital, and to regulate the amount of such borrowed money or funds accordingly; also, when a reserve fund is provided by the shareholders, at their own expense, out of moneys they might otherwise distribute as dividend, to regulate the amount, investment, and entire appropriation of such fund as they think fit.

WIGAN EXTENSION.—The Corporation of Wigan notify their intention of making application for an extension of the borough boundaries, and to provide for the government of the extended borough by means of District Committees, who will manage the gas and water undertakings of the Corporation and the water undertakings of the Ince, Hindley, and Pemberton Local Boards, which bodies it is proposed to dissolve. Provision is also intended to be made for the debts and liabilities of each such undertaking to be charged upon and the receipts carried to the credit of the respective district. The Corporation further seek to acquire the gas undertaking of the Hindley Local Board. Powers in regard to the issue of Corporation stock and other financial arrangements are sought.

WINDERMERE DISTRICT GAS AND WATER.—This is an application by the Windermere District Gas and Water Company for authority to issue and apply for the purposes of the water undertaking the present unissued capital authorized to be raised under their Act of 1869 without the consent of the shareholders, as provided by section 10 of the Act; and for this purpose to amend the section. Additional borrowing powers are asked for; and also sanction to construct new works connected with the water supply. Provisions are included in the notice referring to compensation water, the levying of rates, &c. The Company also desire to be enabled to supply water for other than domestic purposes without the permission of the owners or occupiers of mills or manufacturing works using the waters of Dubbs Beck.

WOODHALL SPA COMPANY.—It is proposed to ask for power to incorporate a Company bearing this title, to take and maintain the water-works situated in Lindley—viz., a reservoir and pumping station in a field belonging to the Right Hon. Earl Fortescue, a service reservoir, and the line of pipes, aqueduct, and other works connected therewith. They seek for authority to divert and appropriate all streams and waters that may be found on land which belongs to, or may be acquired by them, and to make regulations for the prevention or misuse or contamination of water. The applicants also desire to be invested with power to purchase certain lands in the parish of Woodhall or Kirkstead, to be used as works for the manufacture of gas and residual products; and sanction is asked to the supply of gas and water by them in Woodhall, Kirkstead, Langton, Kirkby-on-Bain, Thornton, Roughton, and Martin. Compulsory powers of purchase of lands and waters are sought; and also authority to levy rates and charges, to acquire and maintain sewers and works belonging to the Woodhall Spa Estate, and to make agreements with the proprietors of the latter.

YEADON WATER.—The Yeadon Water Company intend to seek for powers to construct a new reservoir and other works; and for this purpose to take certain lands. The extension of the present limits of supply is desired, and also authority to alter the existing rates and charges. Provisions relative to agreements with local authorities, the fouling of water, &c., are included in the notice. To the foregoing objects the Company wish to apply existing funds, any moneys which they still have power to raise, and any additional capital they may be allowed.

NOTICES OF APPLICATIONS TO THE BOARD OF TRADE (SESSION 1889), UNDER THE GAS AND WATER WORKS FACILITIES ACT, 1870.

BRIGHTLINGSEA WATER.—Application is proposed to be made by the Brightlingsea Water Company for power to maintain, enlarge, and continue the existing water-works, and to impound therein springs or streams near the site thereof; and also to construct further works. Sanction is required to levy rates for water, and permission to take steps to prevent the pollution and misuse of the Company's water. The applicants desire the capital and borrowing powers to be defined and regulated; and to be permitted to effect contracts for the supply of water in bulk.

BUCKLEY GAS.—Application is to be made for an Order to authorize the undertakers to be named therein, or a Company formed for the purpose, to construct and maintain gas-works, and to supply gas in Buckley and the neighbourhood. All the powers necessary to the carrying on of the business of a Gas Company are sought for.

CORSHAM WATER.—The Corsham Water Company announce their intention of applying for authority to continue and maintain existing water-works, and to supply water within the parishes of Corsham, Pewsham, and Lacock. They also wish to be empowered to construct additional works, and to therein impound the underground waters of certain springs situated in the parish of Pewsham. Sanction is asked to supply water by motor, to make and sell motors, and to let motors on hire; and, further, to make arrangements for the supply of water in bulk or otherwise to local authorities. Permission is also sought to sell absolutely or to lease for a term of years, any part of the undertaking.

FAVERSHAM WATER.—Application is to be made by the Faversham Water Company for authority to maintain and continue water-works and supply water in so much of the parishes of Faversham, Preston, Davington, Ospringe, and other places in Kent, as lie within a radius of a mile and a half from the Faversham Town Hall. Further money powers are sought, as well as authority to make agreements with local bodies for the supply of water in bulk.

HARPENDEN WATER.—It is intended to apply for power to enable the undertakers to be named in the proposed Order to maintain and construct water-works, and to supply water in the parish of Harpenden. Provisions in reference to water-rates, the manufacture, purchase, and sale of meters, and contracts with local authorities are embraced in the notice. It is desired that the capital in respect of the existing works should be determined; and sanction to raise further money is asked.

LLANDRINDOD WELLS WATER.—This is an application by the Llandrindod Wells Water Company for powers to raise additional capital for the purposes of their undertaking.

MARKET RASEN GAS.—The Market Rasen New Lighting Company, Limited, seek to obtain authority to maintain and continue their existing works and plant, and to make such extensions as may, from time to time, be necessary. They also desire power to sell gas in bulk to any local authority authorized to supply gas, or to any gas company, for re-sale in adjoining districts, and to be enabled to acquire patent rights and licenses in relation to the manufacture and distribution of gas. For the various purposes of the proposed Order, additional capital is desired.

MARLOW WATER.—Application is intended to be made by the Great Marlow Water Company, Limited, for authority to maintain and continue their existing works, and to construct such works as may be deemed necessary for the purposes of the Order. They wish to be empowered to supply water in the parishes of Great Marlow, Little Marlow, Woburn, and Medmenham (Bucks), and Bisham and Hurley (Berks); and to have their capital fixed and defined.

MELTON MOWBRAY GAS.—The Melton Mowbray Gas Company, Limited, purpose applying for authority to maintain and continue their existing gas-works, and to manufacture and supply gas within the parishes of Melton Mowbray and Thorpe Arnold, in the county of Leicester, for which, and for the general purposes of the undertaking, additional capital is required. The usual powers as to supplying gas meters, fittings, stoves, &c., levying rates and charges, and making agreements with local authorities are sought.

OTLEY GAS.—Authority is intended to be sought by the Otley Gas Company for authorization to maintain, alter, and re-erect their works; and to supply gas to Otley, Newall-with-Clifton, Farnley, and Weston. Permission is asked to the supply of gas in bulk, and to the extension of the Company's mains. The notice includes the usual powers as to breaking up of streets, purchase of patent rights, &c. To enable the Company to carry out their proposals, additional capital is required.

POCKLINGTON WATER.—The Pocklington Water Company, Limited, notify that they intend applying for power to construct new works; and they ask for sanction to purchase lands for this purpose.

ROMFORD GAS.—The Romford Gas Company propose to ask for power to maintain or discontinue their existing works, and to erect new works for the manufacture, storage, and supply of gas, coke, and residual products. Sanction is required by the Company to acquire and hold patent rights and licenses in relation to the manufacture and distribution of gas and the utilization of residual products. They also desire to be empowered to purchase lands, to make contracts with local authorities, to raise additional capital, and to manufacture, purchase or hire, and supply gas-meters, fittings, and stoves.

ST. IVES (HUNTS) GAS.—The St. Ives (Hunts) Gas Company, Limited, intend seeking authority to maintain and enlarge their existing works, to manufacture gas and residual products, to supply gas subject to the provisions of the Gas-Works Clauses Acts of 1847 and 1871, and to exercise all powers, rights, and privileges as are necessary for, and incidental to a Gas Company. They ask that the existing capital may be defined, and authority given them to raise further capital.

WARMINSTER GAS.—It is proposed by the Warminster Gas and Coke Company to apply for an Order to authorize them to continue and from time to time repair, improve, and enlarge their existing works. Power is asked to supply gas in the parishes of Warminster and Bishopstrow, and to manufacture coal tar, coke, pitch, asphaltum, ammoniacal liquor, oil, and other residual products. Additional lands are required, and also increased borrowing powers. The notice includes provisions relative to the supply of gas in bulk, extension of mains, acquisition of patent rights, rates and charges, &c.

NOTICES TO THE BOARD OF TRADE UNDER THE ELECTRIC LIGHTING ACTS, 1882 AND 1888.

BIRMINGHAM ELECTRIC LIGHT AND POWER.—Application is intended to be made by Messrs. A. Chamberlain and G. Hookham for powers to produce and distribute electricity for public and private purposes within an area (defined in the notice) in the borough of Birmingham; and for this purpose they desire authority to break up streets, acquire land, fix wires, and supply lamps, meters, and fittings. Provisions as to making agreements with the Local Authority, the Postmaster-General, and others are embraced in the notice.

BRIGHTON AND HOVE ELECTRIC LIGHTING.—It is proposed by the Brighton Electric Light Company to ask for sanction to produce and supply electricity for public and private purposes "in all the streets and thoroughfares in the borough of Brighton and parish of Preston, and the town of Hove," including a number of private streets specified in the notice. All the powers necessary for the undertakers to conduct such business are sought.

CHELSEA ELECTRICITY SUPPLY COMPANY.—This Company have given notice of their intention to apply for two Orders to supply electricity (1) in the parish of St. George, Haover Square, and (2) in the parish of Kensington. The applicants ask for authority to construct the necessary works, lay wires, break open streets, acquire land, levy rates, and make agreements with local authorities.

DUBLIN ELECTRIC LIGHTING.—The Corporation of Dublin give notice of their intention to apply for authority to supply electricity for all public and private purposes within the city, and for this purpose to erect and maintain works and lines, and exercise all the necessary powers incidental to the business. The streets in which lines are first to be placed are specified in the notice; and the applicants do not propose to ask for power to break up any streets not under the control of the Local Authority.

ELECTRICAL POWER STORAGE COMPANY.—This Company intend to apply for two Orders, authorizing them to produce and supply electricity in (1) Paddington, and (2) St. Martin's-in-the-Fields and the Strand district. They ask for powers to enable them to construct works and to make all arrangements necessary to the carrying out of their proposals.

KENSINGTON ELECTRIC LIGHTING.—The House-to-House Electric Light Supply Company, Limited, purpose making application for power to supply electricity in the parish of St. Mary Abbots, Kensington; certain streets and places (specified in the notice) being excepted. Authority is sought to make charges, acquire land, construct works, make arrangements with local authorities, and to open streets.

KENSINGTON AND KNIGHTSBRIDGE ELECTRIC LIGHTING.—Authority is sought by the Kensington and Knightsbridge Electric Lighting Company, Limited, to supply electricity for public and private purposes in the parishes of St. Mary Abbots, Kensington, and St. Margaret, Westminster, for which object they require power to construct the necessary works, acquire lands, break up and interfere with streets, and make arrangements with local authorities.

LIVERPOOL ELECTRIC LIGHTING.—The Liverpool Electric Supply Company, Limited, propose to apply for power to produce and supply electricity for lighting and other purposes in the city. They wish for authority to break up streets and roads, and lay down wires, as well as for constructing the necessary works; also to acquire land and other rights, and supply lamps, meters, and fittings. The district to be supplied is defined

in the notice, which also contains a clause to enable the Company and the Corporation to enter into agreements as to supplying electricity, breaking up roads, &c., and, if necessary, to authorize the Corporation to exercise any of the powers proposed to be conferred upon the Company. The usual authority as to levying rates and charges is sought. The Liverpool Electric Lighting License of last year is to be amended or revoked.

LONDON ELECTRIC SUPPLY.—The London Electric Supply Corporation, Limited, intend applying for sanction to supply electricity for public and private purposes to the extensive area constituting the following parishes and districts:—The parishes of St. Martin-in-the-Fields; St. Margaret and St. John (united), Westminster; St. James, Westminster; St. George, Hanover Square; Chelsea; St. Mary Abbots, Kensington; Paddington; St. Marylebone; St. John, Hampstead; St. Pancras; St. Mary, Islington; St. James and St. John (united), Clerkenwell; St. Leonard, Shoreditch; St. Luke and St. George-in-the-East; the Strand district; St. Giles; Holborn; Whitechapel; the City of London and the Liberties thereof; Lincoln's Inn; Gray's Inn; the Inner and Middle Temple; all the County of Middlesex; Greenwich; the parishes of St. Mary, Rotherhithe; St. Mary, Lambeth; St. Mary, Newington; St. George-the-Martyr, Southwark, and St. Mary, Bermondsey; the districts of St. Olave, St. Saviour, and Christchurch in the county of Surrey. The Company propose constructing a central station at which the electricity will be generated, and a system of distributing stations and mains; and they seek for authority to acquire all the necessary plant therefore. Permission is asked to enter into arrangement with local authorities in regard to the breaking up of streets, &c.; to make contracts to supply such bodies with electricity; and to apply for the above purposes the funds of the Corporation and the money to be borrowed under the Order. The applicants propose to take powers to cross the Thames by the bridges of the London and Brighton, South Eastern, and Chatham and Dover Railway Companies, to interfere with various tramways and railways, to levy rates and charges, and for other purposes.

METROPOLITAN ELECTRIC LIGHTING.—The Metropolitan Electric Supply Company, Limited, have notified their intention of applying for Provisional Orders having reference respectively to North London, South London, Mid London, and West London. In the notice relating to the first-named district, the Company wish to be authorized to distribute electricity in the parishes of St. James, and St. John, Clerkenwell; St. Mary, Islington; and St. Pancras and St. John, Hampstead. The proposed South London Order embraces Lambeth, Streatham, and Clapham. In the notice referring to Mid London, the Company contemplate supplying electricity to a very wide area, comprising the parishes of St. John the Evangelist, Westminster; St. Margaret, Westminster; St. George, Hanover Square; St. Giles-in-the-Fields; St. George, Bloomsbury; St. Andrew, Holborn-above-Bars; St. George-the-Martyr; St. Sepulchre, Saffron Hill; Hatton Garden; Ely Rents and Ely Place; the Liberty of Glasshouse Yard; St. Anne, Soho; St. Paul, Covent Garden; St. John the Baptist, Savoy, or precinct of the Savoy; St. Mary-le-Strand; St. Clement Danes, and the Liberty of the Rolls, together with the Charter House, Gray's Inn, Lincoln's Inn, Staple Inn, Furnival's Inn, and the Close of the Collegiate Church of St. Peter. Authority is sought in the proposed West London Order to supply St. Marylebone, Paddington, and St. Mary Abbots, Kensington. The various powers required by the Company, as set forth in each of the notices, are similar in almost every respect; and, stated shortly, they are to authorize the Company to produce, store, and supply electricity, to construct works, break up and interfere with streets, &c., purchase lands, patent rights, &c., to make agreements with local authorities, to levy charges for the supply of electricity, to apply the funds of the Company to the purposes of the Orders, and to sub-divide, if deemed necessary or expedient, the area of supply.

NOTTING HILL ELECTRIC LIGHTING.—The Notting Hill Electric Light Company notify their intention of making application for power to supply electricity in the parish of St. Mary Abbots, Kensington. For this purpose they ask for authorization to acquire lands, and to construct the necessary works. Provisions as to rates and charges, and making arrangements with local authorities, are comprised in the notice.

STRAND ELECTRIC LIGHTING.—The House-to-House Electric Light Supply Company, Limited, ask for authority to supply electricity in the streets, thoroughfares, and houses in the Strand district; and the powers necessary to carry out this proposal are desired.

SWANSEA ELECTRIC LIGHTING.—The Corporation of Swansea notify their intention of applying for power to produce, store, and supply electricity within the borough; and for this purpose to acquire land, construct the necessary works, lay down wires, &c.

WESTMINSTER ELECTRIC LIGHTING.—This is a proposal by the Westminster Supply Corporation, Limited, to obtain authority to produce and supply electricity for both public and private purposes in various parishes (named in the notice) in the City and Liberties of Westminster and the Strand. Authorization is sought to fix charges, to acquire lands, to make arrangements with local authorities, to open streets, and to lay wires.

NOTICE OF APPLICATION TO THE LOCAL GOVERNMENT BOARD (SESSION 1889) UNDER THE PUBLIC HEALTH ACT, 1875.

ROSS IMPROVEMENT.—It is intended by the Ross Improvement Commissioners to make application for power to purchase the private gas-works existing at Ross, and to carry on the business generally of gas manufacturers and suppliers. For this purpose, the applicants desire to be allowed to borrow money.

UNLAWFULLY USING GAS AT DERBY.—On Tuesday last, at Derby, Henry John Robinson was summoned by the Derby Gas Company, that between the 9th of October and the 15th of November he did unlawfully use and burn gas supplied to his premises by the Company. A fitter in the employ of the Company deposed that on the 9th ult. he went to the defendant's house to take the state of the meter, and to cut the gas off. He unscrewed the connection, and put a cork in the pipe. The state of the index at that time was 253. Another of the Company's workmen stated that on the 15th of November he examined the meter. The cork had been taken out and gas had been used, the index registering 303. Defendant denied that he had unstopped the meter; and said he had no notice that the gas was going to be stopped. He was sure he never took any cork out, and alleged that the gas burned as usual after it was supposed to have been stopped. He called his daughter, who said the gas was lit immediately after the first workman had gone, and burned as usual. This man, however, said he tried the gas after he had stopped it, and found there was no supply. The Company's collector said the supply was stopped owing to the defendant becoming bankrupt. The Company did not wish to press the case, but they desired to deter others from doing the same thing. The Bench inflicted a fine of 20s. and costs, in all 29s. 6d.

Miscellaneous News.

THE HALIFAX GAS SCANDAL.

The event of last week, as far as Halifax Gas Affairs are concerned, was the seizure on Tuesday—at the offices of Mr. Carr's Solicitors—of the press-copy sheets containing coal tests, which are to be the subject of a criminal examination against Mr. Carr at the forthcoming Leeds Assizes. The *Halifax Courier* understands that last Thursday week (the day before Mr. Carr answered to the charges made against him at the Borough Court) some negotiations were entered into by which Mr. Alderman Horsfall made a proposal to Mr. Storey, that if he gave up the whole of the missing leaves, the Mayor, representing the Corporation, would not press the case against him for mutilating the test-book. For some reason or other, these negotiations were not successful; and so the case was heard and sent for trial. In the course of the hearing, it will be remembered, the chief clerk at the gas-works admitted he had spoiled perhaps 8 or 9 of the leaves in the test-book, leaving about 70, all of which Mr. Carr's Counsel said would be produced. Only three, however, were produced, as samples of the rest. Nothing more transpired; and it was understood by most people that the prosecution would have to go to the Assizes without the missing leaves in their possession. On Tuesday morning, however, a somewhat daring, and a very unusual course was resorted to. On the application of the Town Clerk, Mr. J. H. Swallow, J.P., issued a search warrant; and, armed with this, Detective-Inspector Newburn, accompanied by the Mayor and Town Clerk, drove up to Mr. Storey's office. Mr. Storey and his partners were all away—only two boys being within. There were 79 pages missing from the book in question, 70 of which Mr. Storey was understood to have; and the whole of these were seized by Inspector Newburn and taken to the Town Hall. As soon as they were found, the Mayor and Town Clerk drove off; the Inspector remaining behind until Mr. Storey's return.

The following correspondence—sent to the local press by Messrs. Storey and Co.—has been published, accompanied by a brief prefacing letter in which Mr. Carr's Solicitors say: "The unprecedented and questionable course taken by the Mayor and Town Clerk of entering our offices on Tuesday last, accompanied by Detective-Inspector Newburn, leaves us no alternative but to ask you to publish the following letters, to which we have received no reply." The letters are all addressed to the Town Clerk, Mr. Keighley Walton:—

Halifax, Nov. 24, 1888.

Dear Sir,—Although Counsel only put in four or five of the missing sheets, it must not be inferred that the remaining sheets at all affect the Corporation or its funds; and as an impression has been allowed to go abroad that the sheets were kept back because they implicate our client, we are quite prepared to furnish you with copies of the whole of them, in order that you may see that there is not a tittle of evidence of fraud of any kind against our client. He courts, and will require, the fullest investigation into the matter; and does not wish it to be said that he has concealed anything. A perusal of the sheets or copies thereof will, we think, convince you and the Mayor of our client's innocence.

At any rate, after you have had the opportunity of examining what we are prepared as above to furnish, you will doubtless feel it your duty to point out, if you can, anything which you think constitutes fraud, and to give us notice thereof, so that we may be prepared to deal therewith.

We repeat what we have all along said, that the sheets relate solely to private analyses, and do not affect the Corporation in any way.

Your reply in the course of to-day or Monday will oblige.—Yours truly,
(Signed) STOREY & Co.

Halifax, Nov. 27, 1888.

Dear Sir,—We enclose you a letter, which was written previous to our Mr. Storey's leaving the office this morning, and only awaited the completion of the transcripts to be forwarded to you. We think you had better have it, in order to show that we are acting in good faith.

We have also to request that you will give us an opportunity of completing the transcripts and examining them with the press copies.

With regard to your action this morning, we may have something to say later on.—Yours truly,
(Signed) STOREY & Co.

[Enclosure.] Halifax, Nov. 27, 1888.

Dear Sir,—We have now made transcripts of the press copies of leaves taken from the letter book, with a view to hand such transcripts to you, as promised; but as it may be more satisfactory to you to have the original press copies instead of the transcripts, we now hand the whole of them to you.

In doing so, we think it due to our client to say that he has all along regarded, and still regards, the information contained therein to be his private property, as it has no reference to any matter connected with the Halifax Gas-Works. He most distinctly and emphatically disclaims any felonious or fraudulent intent whatever in instructing the clerk (Milner) to remove the leaves from the book. In regard to the few pages which appear to be missing, our client is unable to give any information respecting them. He can only suppose they may have been injured or destroyed in the process of making copies, as was admitted by Milner, who made the copies, to be quite possible. At any rate, they are not, and never have been, in our client's possession.—Yours truly,
(Signed) STOREY & Co.

It is understood that Mr. Carr's case will come on for trial at the next Leeds Assizes, which commence on the 10th inst.

THE GENERAL GAS COMPANY OF FRANCE.

In the report presented by the Directors of this Company at the annual general meeting on the 23rd of October last, they stated that during the twelve months ending June 30 they had been subjected to competition with the electric light in several of the French towns, whereas previously this competition had only been experienced at Tours. The receipts, however, and consequently the profits, had not fallen off; on the contrary, the accounts showed that they had considerably increased as compared with the preceding year. This fact would, the Directors thought, have the effect of removing any apprehensions to which the competition of electricity might give rise in regard to the future of gas. In addition to the works already possessed by the Company, two others (at Brest and at Piræus) were acquired towards the end of the financial year; but, of course, they had little effect on the result of the working. The capital account was thus increased from 27,557,352 frs. to 30,913,990 frs. The profits resulting from the works possessed by the Company amounted to 714,824 frs.; the interest accruing on the investments in other undertakings, to 1,505,094 frs.—making a total of 2,219,378 frs. and being an increase of 142,337 frs. on the profit for the preceding year. Adding to this the balance brought forward (630,211 frs.), made a total of 2,849,589 frs. Taking from this sum the general expenses, interest, and the payment

to the sinking fund—in all, 756,964 frs.—there was left a net balance of 2,092,625 frs. After making the various deductions for the reserve fund, Directors' fees, &c., there was left a sum of 968,896 frs. available for division among the proprietors. The Directors recommended that 200,000 frs. of this should be distributed as dividend, and the remainder carried forward. This would allow a dividend of 30 frs. per share. The statutory reserve fund was brought up to 470,375 frs.; bonds and other securities to the amount of 512,500 frs. were paid off; and there was left to the good 768,896 frs. The above-named dividend was declared. In order to meet the expenditure necessitated by the increasing business of the Company, the Directors were authorized to raise additional capital to the extent of 5,000,000 frs. by the issue of bonds.

ORIENTAL GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Wednesday, at the London Office, 14, St. Mary Axe, E.C.—Mr. H. M'LAUCHLAN BACKLER in the chair.

The SECRETARY (Mr. A. Hersee) read the notice convening the meeting; and it was agreed to take as read the report of the Directors and the statement of accounts for the year ending June 30 last, an epitome of which appeared in the JOURNAL for the 20th ult. (p. 899).

The CHAIRMAN: Gentlemen,—I have now to make a few remarks; and they will be but few, because there is very little to say. The report itself, though not a long one, deals with the principal subjects that have been under the consideration of the Directors during the year, apart from the ordinary daily management to which they give their attention. In the first place, as regards the accounts for the twelve months, there is nothing particular in them, except, I am sorry to say, a further increase of the rate of exchange, which has caused us an additional loss of £1337. This, as you know, we have not the slightest power over. It is very discouraging I must say to us (as it must be to all others who have money to receive from India) to find that, notwithstanding the endeavours made to improve the position of the Company to a higher state of success than that which it has attained—although that is very satisfactory—all these efforts are annulled by such a circumstance as this, and a circumstance which seems to be interminable, so far as I can tell, at all events. We have lost, as I have said, £1337 more than we did before; and consequently, although we have an increase of revenue, and although the greatest exertions have been made by our able Manager, Mr. Niven, to add to the business of the Company, and with some success, still this is all annulled by the increase in the rate of exchange. This we cannot help; and therefore it is no use remaining any longer on the subject. I will now proceed to make a few remarks on the accounts in other particulars, which, however, are of less importance than that which I have mentioned. You will see the capital outlay is very small indeed this year. I commented last year on the smallness of the amount; but it is still less on the present occasion. I am sorry it should be so small, because, as I then said, if we had to spend money out of our capital, it would be because that capital would be more productive by the expenditure incurred. We are therefore, pretty nearly at a standstill, although not entirely so, as you see by the additional receipts which we have had for gas. Then another item in the accounts which would attract the attention of those among you who are well acquainted with gas matters—and I know there are several—is the additional expenses for coal. You would naturally say, "You have spent so much more on coals—about £1400 more—and yet the gas-rental has only increased by £983." I will explain this circumstance to your satisfaction. In the first part of the year, we found our coke was selling readily; and we thought it would be advantageous to use coal instead of coke in the furnaces for the heating of the retorts. We did this; and it was very satisfactory indeed. We should have continued to do so; but, later in the year, we found that an inferior quality of coke was being introduced into the Calcutta market which was the product of coal dross from the collieries, and was brought down cheaply to Calcutta. The inferior quality of it, however, would always prevent it from being a serious competitor with the gas coke we produce. But at the same time, the Indian natives are not so particular as we should be; and if they can get anything cheaply, that is sufficient inducement to them to use it, which they did in this case to some considerable extent—so much so that our stock of coke increased towards the close of the year; and we thought it necessary then to suppress the use of coal, and return to the employment of coke as fuel. This we may alter again as circumstances require. You will see by this that Mr. Niven, who has the direction of these matters at Calcutta, has not been unmiudful of our interests, and that he has done all in his power to meet the difficult circumstances of the case as they arose. With regard to the other side of the capital account, we have paid off £935 of debentures, which fell due, and which we did not renew, though perhaps we may do later on. We have added £1000 to the reserve account; and altogether the financial state of the Company is on an excellent basis. Passing on to the other paragraphs of the report, you will observe, of course, that there is an increase in public lighting. The addition is not very large; but at the same time we cannot expect a great increase in public lights, as has been explained to you frequently before. The extent of public lighting depends entirely upon the amount of rate voted for this purpose. If the rate produces a large sum, then the Company are likely to get more public lighting; but if it remains at a standstill, then we do not get any additional benefit. I should mention with regard to public lighting, that in Calcutta it is remunerative, which is not the case in many instances, especially in other companies working abroad in which many of us here are interested. With regard to private lighting, I think it is satisfactory. We have had 179 new consumers, and 1423 burners added. The increased quantity of gas consumed during the year has been used by the natives. I am pleased to see this door opened, because, once opened, I believe it is there we shall find the additional profit which we hope to derive from the extension of our business. No doubt this is a difficult matter; and Mr. Niven has had his attention drawn specially to it—not that he requires reminding, because he is most zealous in endeavouring to extend the Company's business. Then as to the Company's works, Mr. Niven reports that they are in a satisfactory condition, and the apparatus and holders are in good working order. Turning again to the accounts, there are several items which are not exactly the same as last year, though they do not differ very materially. Referring to mains account, wear and tear and repairs, and retort account, they all show differences from the previous year; but, taking the whole of the items together, you will find that the difference is only about £17. We have a staff of men who are employed according to the requirements for their labour—sometimes it may be for one thing and sometimes for another. And this is the only reason for the differences you may have noticed in these items: The men have been differently employed to what they were in the previous year; consequently, the sum being the same, the details are somewhat different. The extension of mains by 2200 yards does not require comment. I only wish it had been much more than this. We have in

Calcutta, as you are aware, an able Committee, composed of two gentlemen, who have rendered the Company good services. We have not had occasion during the past year to call for any special effort on their part to serve us; but their vigilance has been constant and successfully exercised. They work in perfect harmony with Mr. Niven; and you know how necessary it is that all who are engaged in one undertaking should work well together—it is very difficult to achieve success without it. The next thing I have to refer to is the death of our late friend Mr. W. White, which we all felt very much indeed. He was a regular attendant at the Board meetings; and he was most anxious to devote himself to the interests of the Company at all times. We have lost a good friend in him; and our Company, an able adviser. Of this we have acquainted the family; and we made bold to think the shareholders would associate themselves in it. On the death of Mr. White, it was incumbent upon us to elect another Director; and we turned immediately to one of the Auditors (Mr. H. L. Hammack), who has been a candidate for the office for some years. This gentleman unites in himself all the qualities necessary to make an able Director of this Company. We have already found that we were fully justified in nominating him to this post; and it will be for you to confirm this nomination. Mr. Hammack, who is a son of one of the original Directors of this Company, is a Director of the Commercial Gas Company; and his knowledge of gas affairs, combined with his well-known business and administrative abilities, will commend themselves to you as they did to us. Mr. Hammack having resigned the position of Auditor, which he has held, with great satisfaction to us, for some years, there was a vacancy which we were bound to fill up. The applicant for the office was Mr. J. Blacket Gill, who has been a candidate for several years. Mr. Gill is also the son of one of the original Directors of this Company; and he is likewise a Director of the Commercial Gas Company. The experience which these gentlemen have acquired in connection with the Commercial Company will, I am sure, be brought usefully to bear upon the management of our affairs. Passing to the balance of the general revenue account—that is, the profit after all deductions—there is sufficient to pay the same dividend as last year. It is a large amount—£27,155—and it will leave a good balance to the credit of this account after we have paid the dividend. I therefore think we may congratulate ourselves on the position of our affairs, notwithstanding the circumstance to which I have alluded in my opening remarks. Reviewing what I have said, the business which we are doing is a good substantial business; and apart from all the adverse circumstances which arise, whether it be from competition in coke, or whether it be the bad state of business (which affects people in Calcutta, as elsewhere) or whatever the adverse circumstances may be, I hope we shall still maintain our position—we hold our own, as is familiarly said; and if we do this under adverse circumstances, with the rate of exchange as it has been, we may reasonably hope in future, with the increase arising out of the sale of gas, that we shall derive a very great benefit, which will counterbalance the adverse effect of the exchange, and will enable us to look with certain hope to brighter days than we have experienced in the past, however satisfactory those days may have been. I now beg to move—"That the report of the Directors and the statement of accounts now submitted be received and adopted."

Mr. H. SOLOMON seconded the motion, which was at once carried unanimously.

On the motion of Mr. C. HILL, seconded by Mr. J. R. PEILL, the retiring Directors (Messrs. H. M'L. Backler and H. L. Hammack) were re-elected. The CHAIRMAN and Mr. HAMMACK having thanked the shareholders for re-instating them on the Board,

The retiring Auditors (Messrs. E. Garey and J. Blacket Gill) were re-elected, on the proposition of Mr. EASTMAN, seconded by Mr. T. HILL.

The CHAIRMAN next moved the declaration of a dividend of 10 per cent. for the twelve months ending June 30th last, to be payable, free of income-tax, on Dec. 4, less 4 per cent. paid on account on June 4 last.

Mr. HAMMACK seconded the motion, which was agreed to.

The CHAIRMAN, in moving a vote of thanks to the Secretary, the Engineer, and the staff generally, referred in eulogistic terms to the services of Mr. Hersee and Mr. Niven.

Mr. SOLOMON seconded the resolution, which was carried *nem. con.*

The SECRETARY having briefly returned thanks on behalf of himself, Mr. Niven, and the staff,

The usual compliment was passed to the Chairman and Directors, and the proceedings terminated.

COCKERMOUTH AND WORKINGTON WATER SUPPLY.—A dispute which has been pending for some time past as to the quantity of water the main leading from Crummock Lake, which supplies the Cocker-mouth Urban, Cocker-mouth Rural, and Workington Urban Sanitary Authorities with water, is capable of delivering, is shortly to be brought to an issue. Under the provisions of the Workington Water Act, 1883, the Cocker-mouth Urban and Cocker-mouth Rural Authorities have applied to the Local Government Board for an engineer to be appointed to ascertain the quantities of water the main is capable of delivering; the Workington Authorities having bound themselves, under their Act of 1883, to take, or pay for, all the water the main can deliver, after the two Cocker-mouth Authorities have obtained what they require, under the provisions of the Crummock Joint Water Act. In response to this application, Mr. H. Robinsou, C.E., has been appointed Arbitrator on the subject; and this gentleman has arranged to take evidence about the middle of December.

THE WATER SUPPLY OF MELMERBY.—Last Tuesday, Mr. Arnold Taylor, Local Government Board Inspector, held an inquiry at Melmerby, near Ripon, with respect to an application to the Local Government Board by the Rural Sanitary Authority of the Ripon Union for sanction to borrow £1100 for works of water supply for the township of Melmerby. Mr. C. F. P. Edmundson, the Clerk to the Sanitary Authority, stated that the present supply of water at Melmerby was obtained from about twenty wells, a number of which were liable to contamination from fold-yards and other places. It was proposed to utilize the Hallikeld Springs, which were about 1000 yards from the village, lifting the water by means of Blake's hydraulic rams to an elevator above the village into a reservoir, whence it would gravitate for use by consumers. The cost of the scheme was estimated at £1057. The population of the township was 305 at the last census. The inhabitants who would benefit by the supply numbered 259; and as the springs ran at the rate of 70,560 gallons per day, of which the hydraulic rams would lift 5547 gallons, the daily supply would be equal to 21½ gallons per head of the population. The Marquess of Ripon had consented to give the land required, on condition that one of his farms was supplied with water; while other interested persons could be dealt with at a reasonable price. The water, as analyzed by Mr. Fairley, was stated to be moderately hard and of good quality. Evidence in support of the application was then given. The Inspector being informed that no charge would be made to consumers for the water, suggested that a rate should be levied upon those who had the benefit of the supply. At the close of the inquiry the Inspector examined the springs whence the supply is to be obtained.

A COMPARISON OF OIL AND GAS AS ILLUMINATING AGENTS.

In connection with an exhibition of oil lighting, heating, and cooking appliances held, during the week ending the 24th ult., in the Holly Park Lecture Hall, New Southgate, Mr. DEFRIES, the well-known maker of safety oil-lamps, delivered a lecture, in which he compared with gas the "economy and superiority" of oil as an illuminating agent.

The lecturer, commenced by remarking that he had been asked to say a few words in order to demonstrate the economy and superiority, in every respect, of lighting by mineral oil, as contrasted with lighting by gas. The task set him, he said, was not at all difficult; for nothing was simpler than to prove, as he was going to, that gas lighting, having now been in use for the best part of this century, and having got to the top of the tree as an illuminating agent, was now past its zenith, and was going down hill, not only on account of the unpopularity of the monopoly it had enjoyed, but because its great rival—mineral oil—was proving uncontestedly its utter superiority in use on the scores of economy, intensity of light, and health. Incidentally he had been told, and had even seen it published in newspapers, commenting on some very successful installations of mineral-oil lamps for lighting towns that he had recently carried out, that in giving up gas and using mineral oil, the local bodies responsible for the change were taking a "retrogressive step," and "going back to the oil-lamps of our grandfathers." Nothing could be more untrue. When he stated that gas-lamps were used in the London streets nearly ninety years ago, and that about forty years since the use of mineral oil was unknown, they could judge if the giving up of gas and the employment in its place of mineral oil was a step backward or forward. He would give some figures, that would prove, he said, beyond a shadow of a doubt, that gas could not compete with mineral oil. He based his calculations on gas at 4s. 6d. per 1000 cubic feet (which was what he believed they paid in that town), and burned in an ordinary burner, and mineral oil at 8d. per gallon—at which price it could readily be purchased—as consumed in a Defries' safety lamp. A Defries' mineral-oil lamp with a No. 1, or 43-candle power, burner consumed a pint of oil in five hours; thus giving a light equal to 43 candles at a cost of 1d. for five hours. A No. 6 Bray's gas-burner was supposed to consume 6 cubic feet of gas per hour; but generally burned 7 or 8 feet. However, he would take it at 6 feet. Burned in this manner, gas was supposed to give the light of 2½ standard candles for each cubic foot consumed per hour. It would therefore be seen that three such burners, consuming 18 cubic feet per hour, were supposed to yield a light of 45-candle power, and to consume in five hours 90 cubic feet of gas, which at 4s. 6d. per 1000 cubic feet, was equal to 4½d., or in plain figures 5d. So they saw clearly that, burned in the best mineral-oil lamp known, and the one in most general use, a given light could be obtained from oil at one-fifth the cost of a similar light from gas. Oil lighting cost therefore one-fifth the cost of gas. There were, doubtless, many persons who, either in their dwelling-houses or their places of business, paid £20, £30, £40, and perhaps £50 a year for gas. The man who was now spending £50 a year for gas lighting could have an equal light from Defries oil-lamps at a cost of £10 a year for oil; and so save £40 of his present annual expenditure.

No form of gas-burner, he continued, had yet been constructed which would perfectly consume all the carbon or sulphur in gas. A few months' experience with gas-burners showed on ceilings, decorations, and pictures that free unburnt carbon came away. The products of half-burned carbon and impurities showed their effect in the death of flowers kept in a room where gas was burning. But a more serious, though less striking mischief, was the effect of gas on the health of its users. In addition to daylight, a pure atmosphere was necessary to enable flowers to live in a room. It was, he said, a fact not properly appreciated that the health of a human being was injured by an atmosphere that was fatal to the life of flowers. It followed very clearly that an ordinary sitting-room lighted with gas, and having an atmosphere in which flowers could not live, was responsible for many of the sufferings of mankind. If they could reckon the total amount of headache and dyspepsia which it had caused, he thought they would arrive at an aggregate of human misery which was simply appalling. On the other hand, mineral oil properly burned, or in other words used in lamps that had practically a perfect combustion, did not vitiate the atmosphere of a room to any appreciable extent. Flowers would live in a room so lighted—picture frames, gilt ornaments, decorations, and furniture were not affected by its use; and the atmosphere of a room so lighted was perfectly wholesome and did not injure the health of a human being.

A great advantage of mineral-oil lighting, as compared with gas lighting, the lecturer said, was that you obtain a softer yet more brilliant, and much steadier light. Now there were many effective methods of lighting rooms by lamps, and results could be produced with them which could not be obtained at all from gas. A good lamp, properly trimmed, burned without a flicker. To light a dining-room properly, the best method was to suspend in the centre of the room a powerful yet shaded single burner lamp of about 60-candle power. The effect produced was that the ceiling was lighted with the soft light of the lamp emitted through the opal glass, while the table and the bottom of the room generally was brilliantly lighted, yet without there being any glare. The colour of the light emitted from a perfect lamp more nearly resembled daylight than any other form of artificial lighting; so much so that, although they might replace a four-light gasolier, supposed to be giving a light of 60-candle power, by a lamp having a 60-candle power burner—actually and not nominally 60-candle power—the room would appear to be better lighted than it originally was by gas. The most effective manner in which to light a drawing-room, was to place a few stand lamps in corners of the room on tables. In a room of (say) 24 feet by 18 feet, three lamps of about 40-candle power each were ample to light the room with a soft, warm light, and to produce at the same time a most charming effect. For the purpose of study or reading, he recommended lamps giving a pure white light of about 20-candle power. His reason was, that such a light was just about ample for the purpose, yet not too little to fatigue the eyes; and, moreover, a burner giving such a light emitted very little heat.

Turning to the question of street lighting by mineral oil, Mr. Defries said this was a matter of the very greatest importance to the ratepayers of the whole kingdom. It was impossible to state (for he had no means of finding out) how many public street lamps there were in the country; but they might be estimated at one per hundred of the population. At Erith, which with its surroundings was not very densely populated, it was 1 to 60. This would give an estimated total of 350,000 public gas-lamps now in use in the kingdom, taking the population at 35,000,000. The gas-burner generally employed was a No. 5, giving a light of about 12 to 13, or (say) 14 candle power, although in many cases a smaller burner was used. The cost per lamp per annum averaged between £3 10s. in large towns to £4 10s. and more in small towns. Taking it that they all cost £3 12s. 6d., each lamp burning every day in the year from sunset to sunrise, the price being inclusive of the necessary labour to light and extinguish and clean the lamps, they found the sum annually expended in the United Kingdom for street lighting was £1,268,750. Now, it was admitted that the light given was not sufficiently powerful, and yet the price paid was by nearly every district already considered most excessive.

He would show how more than double the light at present obtained from gas could be obtained from mineral oil, and at the same time a saving of more than a third effected in the whole of this cost for the "inferior" gaslight. The system which had been found to answer its purpose well, by means of which lamps, independent of each other, may have a reservoir placed high above the burner, and if necessary hold enough oil to burn a week with once filling, was the joint invention of two gentlemen, and was worked by the Company with which he (the lecturer) was associated. The idea of the inventors was to so construct a lamp with a reservoir of any width, but of a given height, that it should supply its oil to a burner fitted on a wick case, which wick case should be provided with a space for the flow up it of a head of oil equal to the head in, or the height of, the reservoir. The equilibrium had, of course, to be maintained; and they found that the finest spring they could use that would exert an equal and unvarying pressure on the head of oil in the reservoir and the head of oil in the wick case was a column of air, which was being constantly changed. By the simplest of all natural means, they had constructed, in accordance with these principles, what might be, he thought, considered a perfect lamp, which had no vacuum, and burned in consequence equally well whether hot or cold, and had not a single moving part in it, and so could not become deranged. This was the system that was considered by many Local Boards, in addition to scientists who were well able to judge, as rendering street lighting, by means of mineral oil, not only a possibility, but an accomplished fact. He might mention that they had 15,000 to 16,000 of these lamps now out in use; each, with a reflector, giving a light of about 30-candle power. He had proved, by the work done in the districts referred to, the exact cost of maintaining the lights, providing the oil, labour, &c.; and he found it to be, as nearly as possible, 47s. per lamp per annum, supposing the lamp burned from sunset to sunrise every day in the year.

In concluding his remarks, Mr. Defries said that mineral oil was capable not only of theoretically lighting the public streets, but was practically doing it. He had estimated the number of existing street gas-lamps of 14-candle power at 350,000; and their annual cost to the ratepayers at £1,268,750. The same number of mineral-oil lamps, yielding more than double the light at present given by the gas-lamps, would cost only £822,500; and the ratepayers had it in their power, therefore, to at once save an annual outlay of £446,250, while doubling the light in the streets. Surely, he observed, this was proof enough of the absolute superiority of mineral oil, burnt in suitable lamps, over gas. The saving by the change was not so large as it was to private consumers; but, of course, labour was a large item in street lighting, and his proposal was to give double the light of the gas-lamps. In any case, towns that now paid £4 10s. for gaslight, could save by this change nearly half their present outlay.

The proceedings closed with a vote of thanks to the lecturer.

THE HARGREAVES THERMO-MOTOR.

A CREOSOTE ENGINE.

At one of the recent Meetings of the Liverpool Polytechnic Society, Mr. J. HARGREAVES, of Widnes, described, by the aid of a sectional model, his new thermo-motor.

Mr. HARGREAVES, in his opening remarks, said that in a steam-engine there were two great sources of loss—First, there was the loss in the boiler where the products of combustion were sent into the air at a high temperature, the heat necessary for which was all wasted; and, secondly, there was the loss to the engine due to the latent heat being taken away by the condensing water. For these reasons there was only about 12 per cent. of the total heat utilized; all the rest being thrown away. In the engine he was about to describe, he claimed that he obtained a larger duty from the fuel by burning it in the cylinder itself, so that all, or nearly all the heat generated by combustion might be extracted from the fuel before it was rejected. Very high temperatures might be employed; and the higher the temperature, the greater the efficiency. Commencing at the air pump, water was injected into it to reduce the temperature of the air, and, by vaporization, to increase the pressure. The mixture of air and water vapour was then passed into the saturator, where it was still further saturated with water vapour if necessary; but in practice it was unnecessary. After leaving the saturator, the mixture of air and water vapour passed into the superheater, where it was heated by waste gases. It then flowed through a regenerator filled with pieces of earthenware into the combustion chamber, where it met with a jet of limpid fuel, and was burnt at a very high temperature, and, consequently, with great increase of volume and pressure. The combustion chamber was lined with non-conducting material, so that the quantity of heat passing to the exterior walls of the combustion chamber might be regulated, and the interior of the chamber kept at a sufficiently high temperature to ensure perfect combustion of the fuel. Attached to the top of the combustion chamber was a metal cylinder, within which worked the main piston. The waste products of combustion passed out through the regenerator; giving up nearly all their heat—the temperature when leaving the regenerator being only about 350° Fahr. They then flowed through tubes in the superheater and saturator; giving up the remaining heat so thoroughly to a fresh supply of air and water vapour that the temperature of the escape-pipe was only about 180° Fahr. All rubbing surfaces, he remarked, must be kept at a reasonable temperature, or else a tight joint could not be obtained.

Attention was then drawn by Mr. Hargreaves to the water-jacket of the engine. In a gas-engine the cylinder was kept cool by a water-jacket; and all the heat taken up by the jacket was lost. The combustion chamber of his engine was jacketed much in the same manner; but it was made to generate steam so long as the inner surface of the combustion chamber was not cooled below a certain temperature. The water to supply the jacket was first taken through a hollow space in the piston, which it kept cool; and then into the jacket, where it was converted into steam. The jacket was in connection with a small supplementary boiler, which could be fired in the ordinary way when first starting, in order to get power to compress a supply of air for the main engine. The steam from the jacket, after passing through the small boiler, was led to the saturator, where it was injected into the mixture of air and water, until there was altogether about 30 per cent. of water vapour mixed with the air. Air at a comparatively low temperature containing this quantity of vapour would not support combustion, but when the mixture was highly superheated, as it was in passing through the regenerator, it would burn. The mechanical arrangement of this engine might be of any convenient kind. There seemed to be an impression that the engine was a very complicated one; but really it was not so complicated as an ordinary steam-engine. He was making another engine somewhat similar, in which there was only one superheating nozzle used; but, otherwise, it was much the same as the one before them.

In reply to various questions, Mr. Hargreaves said that about 20 per cent. of the indicated horse power was used in driving the engine itself. For starting the engine, a small portable furnace was used to heat the combustion chamber, and to compress a charge of air; and steam was got up in the small supplementary boiler, which worked a donkey-engine and

air-pump. For small engines a hand air-pump might be used. The complete engine, as he had described it, would be more economical than the simpler form. He could get 40-horse power with a consumption of two gallons of creosote per hour. In his experiments, the temperature in the engine had risen so high at times as to melt the bottom of the piston, and fuse the earthenware blocks in the regenerator. To get the best results, an extremely high temperature must be used. It was a question of properly proportioning the thickness of the non-conducting material to prevent the cylinder lining being melted. The regulation of heat was to a certain extent automatic, for when the temperature of the combustion increased, there was more steam generated in the jacket, which steam increased the proportion of water vapour in the air and so lowered the temperature of combustion. If too much steam was generated, the temperature would be too low, and more heat would be carried away, because all the heat of vaporization could not be recovered. All the heat in the steam in a latent form was lost. It was more economical to use air; but if air alone was used, the temperature became so high as to melt the whole interior of the engine. However, by making the non-conducting material of proper thickness, the engine became self-regulating by means of the difference in the generation of steam, which might become so large as to put the fire out if the non-conducting material were not properly proportioned.

In the course of the discussion which ensued,

Mr. MILLER remarked that the heat in the jacket of the Britton gas-engine was not lost, because the jacket was used to generate steam, which was utilized in the engine by mixing it with the gas and air, to be burnt just in the same manner as in the Hargreaves engine. He understood the Britton gas-engine worked better with the mixture of steam and gas than with gas alone.

Mr. HARGREAVES said in the gas-engine referred to, the steam was obtained at the cost of reducing the temperature of the cylinder much below that of the best gas-engines. No regenerator was used; and all the latent heat of the steam was lost. In his own engine, the volume of steam was increased about four times in passing through the regenerator alone; so that four times more work was obtained by superheating the steam than by using it simply as steam. It was a prominent feature of his engine to use it as a "red-hot" steam-engine.

Professor SHAW considered that the Hargreaves engine was one of the most interesting things going at the present time. One of the greatest difficulties to get over was the question of durability of materials.

Mr. J. JOHNSON asked if Mr. Hargreaves had tried chromo iron; it would stand very high temperatures.

Mr. HARGREAVES replied that he had not found anything better than China clay blocks for filling the regenerator, and good cast iron for the metal parts. He would be glad if someone could discover some material having the infusibility of fire-clay and the tenacity of iron. Asbestos, no matter of what quality, was of no use; as it all became very brittle and powdery when highly heated. Chromo iron would stand a high temperature; but there was also the question of standing the vibrations and shocks when working. There was one thing he had not pointed out, and that was the advantage he obtained by mixing water spray with the air. It was a law that if liquid, at a certain temperature, was exposed to air at the same temperature, the vapour of the liquid added its own pressure to that of the air. For instance, if air was heated in a vessel from 32° to 212° Fahr., the pressure would at first remain at 5 lbs.; but by agitating or spraying the water so that its vapour could be absorbed by the air, the pressure would be increased to about 20 lbs. per square inch above the atmosphere. In this way heat was recovered that could not be possibly utilized by any other means. It was the latent heat that was utilized.

A vote of thanks was accorded to Mr. Hargreaves, who, in acknowledging it, remarked that he had still more details to work out before he could give the members of the Society a full and complete paper on the subject.

We understand that the Widnes Foundry Company have constructed one of the Hargreaves motors; and it is now driving the machinery in the boiler-shop. It is said that with a daily consumption of ten gallons of crude oil, the cost of which is quoted at 1½d. per gallon, it does the work which, with an ordinary engine, previously required 25 cwt. of coal.

HOYLAND SILKSTONE COAL AND COKE COMPANY, LIMITED.—This Company was registered on the 17th ult., with a capital of £70,000, divided into 7000 shares of £10 each, to acquire as a going concern the business of a colliery proprietor and coke manufacturer, now carried on by Thomas Henry Birch, Jacob Higson, and John Higson, at Hoyland, in the parish of Wath-upon-Deane, in the county of York.

RIPON WATER SUPPLY.—A meeting of the Ripon City Council was held in Committee, last Wednesday, to consider the progress of the new water-works at Lumley Moor, now completed with the exception of the filter-beds. The Engineer (Mr. R. Carter) stated that the first filter-bed would be completed in a day or two; and after some discussion as to the desirability of turning on the supply, it was resolved, by the casting vote of the Mayor, that the water should be turned on at Lumley Moor on the 10th inst. Subsequently, the Water Supply Committee decided to invite the ex-Mayoress (Mrs. Baynes) to perform the ceremony.

THE PUBLIC LIGHTING OF BRISTOL.—During the recent discussion as to the proposal of the Bristol Gas Company to adopt the sliding scale, attention was directed to the cost of public lighting in the city; and at one of the meetings of the Sanitary Committee, when the matter was under discussion, a question was asked as to whether the time had not arrived when steps should be taken to introduce electric lighting in the main thoroughfares. In reply, it was stated that at the present time the electric light was much more expensive than gas, but that the subject would continue to receive the consideration of the Electrical Committee appointed by the Council. In this connection, the following figures, giving the cost of the public lighting during the three months ending September last, will prove interesting. The price of gas supplied to the street lamps was 2s. 2d. per 1000 cubic feet. The number of public lamps with No. 5 burners was 4853; with No. 7 burners, 16; with No. 10 burners, 4. There were also 16 large lamps consuming 18 cubic feet per hour; one, 15 feet; 111, 21 feet; 33, 25 feet; and 11, 33 feet. The total consumption of gas during the quarter, including the new lamps erected, was 28,216,787 cubic feet, divided as follows:—Consumed by ordinary lamps, 24,230,966 cubic feet, costing at 2s. 2d. per 1000 cubic feet, less 5 per cent. discount, £2499 19s.; consumed by large lamps, 3,925,821 cubic feet, at 2s. 2d. per 1000 feet, less 10 per cent., £382 15s. The expenditure for lighting, extinguishing, cleansing, and repairs, &c., to 5050 lamps, at 15s. per lamp per annum, amounted to £946 17s.; for lighting, extinguishing, and cleansing new lamps erected during the quarter, £2 4s.; for new services and alterations to lamps, £84 6s. 7d.; and for gas consumed at offices and hospitals, £3 7s. 1d. The foregoing sums added together make a total of £3919, which was the cost of the public lighting during the three months named.

EDINBURGH AND LEITH GAS COMMISSIONERS.

At the Meeting of the Edinburgh and Leith Gas Commissioners yesterday week—Provost ARKEN (Leith) presiding—a variety of matters occupied the attention of the members.

The Works Committee reported the termination of the strike at the Leith Gas-Works, and that alterations in the working hours and wages of the men had been made, which, if continued during the whole year, would entail an increase of about £1750 in the working expenses. Bailie Archibald briefly explained the position of matters, and the result of the strike. The total number of men, he said, who gave notice was 156; but five withdrew their notice; leaving 151 who went out on strike. Of these, 89 had been taken back; and this left 62 of those who gave notice still unemployed. The retort men had claimed 6½d. an hour; and the Committee recommended that their wages should be raised to the scale before the reduction in May, 1886. They struck work, however, not because they did not get what they wanted, but in the interests of the labourers; and the Committee had authorized the Engineer to raise the wages of first-class labourers to 5d. per hour. The increase of £1750 in working expenses was estimated on the assumption that the hours of labour would be reduced from 56 to 51 per week; but it was believed that by employing only good men, they would get as much work in the 51 hours as in the 56 hours formerly, so that the increase would not be nearly so great. Replying to Mr. Robertson, Bailie Archibald said he had no information as to whether or not the ringleaders of the strike had been taken back; and the Sub-Committee had given no instructions in this matter. It had been left entirely with the Engineer. On the termination of the strike, they had intimated to the Engineer that, although the men had acted rather precipitately, a preference should be given to them over strangers when any vacancies occurred.

With regard to the application for a supply of gas to Colinton (see *ante*, p. 728), the Works Committee recommended the Commission to introduce gas, on receiving a guarantee from two mill-owners to use gas for five years, the terms to be 4s. 2d. per 1000 cubic feet during the first three years, and 8d. beyond the Edinburgh rate for the next two years. The report was approved; and the guarantees having been received, the estimate of Messrs. McLaren, of Glasgow, for the new main pipe was accepted—the price being £4 6s. per ton.

The next matter under consideration was the insurance of three gasholder stations; and it was remitted to the Finance Committee to effect insurance for £38,000. It was stated that the annual premium would be only about £65.

The acceptance of an offer received from Glasgow, to buy 1500 tons of coke, at 4s. 9d. per ton, was recommended by the Works Committee. Mr. Kinloch Anderson complained that they were selling coke at such a low price to Glasgow people, while they were charging double that rate to Edinburgh purchasers. Bailie Steel stated that coke was sent from Glasgow to Edinburgh, and sold at a lower price than the Commissioners were charging; and if they had a market for it at their door, he did not see that they should send it to Glasgow. Mr. Colston said that there were about 2500 tons of coke in stock at the time; and it was with the view of getting quit of it, that they had accepted this offer. The recommendation was then agreed to; and the whole question of the price of coke in future was remitted to the Works Committee.

A letter was read from Mr. Dewar, Superintendent-Surveyor, in which he stated that, after considering the working of the establishment, he thought the best thing for the peace of the office would be his retirement from his present situation; and he claimed, under the provisions of the Act of Parliament, a pension of £250 per annum. A conversational discussion arose on the matter, in the course of which Mr. Pollard suggested that, as there was a dispute between Mr. Dewar and the other officers, the matter had better be remitted to a Special Committee. Mr. Kinloch Anderson stated that the cause of the difference was that they had tried to make a place for Mr. Dewar when there was not an opening for him. The letter was sent to a Special Committee for consideration.

A statement in regard to the public lighting was subsequently made by Bailie Archibald, in the course of which he said that the Works Committee were unanimous in their opinion that burners should be supplied to all the public lamps by the Commission; but until they learned at what price gas was to be supplied to the Corporations, they could not decide as to the description of burner. There were great complaints in Edinburgh and Leith—especially in Edinburgh—as to the public lighting. He had been making some inquiry into the matter; and he had the concurrence of the Engineers in suggesting that the price of gas for the public lamps should be 2s. 6d. per 1000 cubic feet, without discount. If this were agreed to, it would enable the Corporations to supply No. 2 patent jets, which burn 2 cubic feet per hour, or about 8000 feet a year; and the charge for each burner would be 20s. They would have 2 cubic feet of gas per hour, instead of 1½ feet as at present; and this would make a very great difference in the public lighting. With the low price of coal, and their present favourable position, he thought they should decide the matter at once; and he therefore moved that they reduce the price of gas supplied to the public lamps to 2s. 6d. per 1000 cubic feet, and supply burners free of charge—leaving it to the Corporations to determine what burner they should use. The present rate for a No. 2 burner was 27s. 5d., less 2½ per cent. discount, or, as nearly as possible, 3s. 3d. per 1000 cubic feet net; so that his proposal meant a reduction of 9d. Bailie Turnbull seconded the motion, which was unanimously agreed to.

ELECTRIC LIGHTING AT BARNET.

At the Meeting of the Barnet Local Board last Tuesday week, a report was presented by the Surveyor (Mr. W. H. Mansbridge) giving a list of the electric lamps found out from the 7th to the 16th ult.—numbering in all 13. The Chairman (Mr. C. Steves) reported that the Lighting Committee were going round the district in order to see the effect of the lighting at different points where gas-lamps had been removed and no substitutes provided. A great many complaints had reached the Board of the failure of the electric light; but a far larger number of complaints had reference to the non-replacement of lights which existed when gas was used. The Committee had not yet completed their perambulations; and therefore their report was not yet complete. Mr. Samuels said the Committee were really considering how best to provide light for the places which had suffered by the change from gas to electric light. Subsequently a letter was read which had been received from the electric light contractors stating their willingness to supply and fit any additional lamps on the present contract, of 16-candle power, at £2 14s. per annum. They also offered to fit up one 2000-candle power arc lamp for the inspection of the Board, without any charge for the experiment; but for this they would prefer to wait until they had a new engine running, which would be in a few days. The Clerk said he had seen Mr. Joel since the receipt of the letter; and he was willing to put up a 300-candle power incandescent lamp free of charge, so that the Board might see the effect of larger lamps, both arc and incandescent. The Chairman observed that he had told Mr. Joel that they must certainly

have more light in some parts of the town; and that it was a question whether they should use electricity, gas, or oil. Mr. Schmidt said he was afraid that 16-candle lamps would not give satisfaction; and that they ought to have 32-candle power like those now in use. Mr. Pooley observed that he was rather inclined to try 16-candle lamps; there could not be much difference between them and what they now had as 32-candle lamps. (Laughter.) After some further remarks of a conversational nature, the matter dropped. Before the Board adjourned, a letter was read from an inhabitant in the Sebright Road, stating that since the gas-lamp was discontinued, he had to "grope his way" to his gate, and that the residents would esteem it a great boon if they could have a gas-lamp again or even an oil-lamp.

THE ELECTRIC LIGHTING EXPERIMENT AT BRADFORD.

Considerable progress is reported to have been made during the last few weeks with the experimental installation of the electric light which the Corporation of Bradford have decided to carry out. The erection of the station is being proceeded with as quickly as circumstances will permit. Workmen have been employed for some days in laying the cables along Kirkgate and some of the other thoroughfares in the centre of the town; and it is believed that the whole of the preparations will be completed before Christmas. A sum of £15,000 has been granted by the Town Council to the Gas Supply Committee to cover the cost of the installation and incidental expenses connected therewith. Should, however, the experiment be successful, and the tradesmen and others in the centre of the town show a disposition to avail themselves of the facilities offered them by the Corporation for lighting their premises by electricity, it is probable that the area of supply will be extended. The number of applications which the Committee have already received lead them to expect that such an extension will soon become necessary; and, foreseeing this contingency, they are carrying out the present works as though they were but a part of a larger scheme, which the Provisional Order obtained for the purpose authorizes them to effect. Two main cables are being laid to the Town Hall and the Free Library; and it is anticipated that both these buildings will be lighted by electricity, which will also be supplied to tradesmen and others along the streets through which the cables pass. Connecting wires, it is said, can with little difficulty and at a moderate cost, be laid under adjacent streets; so that, if need be, the whole of the centre of the business part of Bradford can be lighted by electricity during the course of a few months from the present time.

THE PROPOSED MODIFICATION OF THE THIRLMERE WATER SCHEME.

As intimated elsewhere to-day—in our "Parliamentary Intelligence"—the Corporation of Manchester intend applying to Parliament next session for permission to deviate from the Thirlmere scheme as authorized to be carried out. Alluding to this proposal, a correspondent of the *Manchester Guardian* says: "All lovers of English scenery will hear with satisfaction that the Manchester Corporation are petitioning Parliament amongst other things for leave to depart temporarily in some measure from the original design of the Thirlmere water-works undertaking. Parliamentary notice of their wish has been served; and we can hardly doubt that when the question comes on for hearing, the House will be unanimous in granting the leave that the Manchester Water-Works Committee seek. It is not only that the reduction of the scheme will entail a temporary economy, but it will also in an important degree diminish the immediate damage to the beauty of Thirlmere. There is only one Thirlmere in the world, and lovers of beautiful England will greatly rejoice at anything which shall help to preserve to us its charm even for a generation. All who knew intimately the western shore of the lake were troubled; they felt not only that those who filled the fields there, and had tilled them for generations, were to be drowned out by the projected raising of Thirlmere Lake to 50 feet above its present level, but they realized also that by the Act of Parliament a huge main road, as useless as it would be costly, was in contemplation all along above the western shore. This road in its engineering would destroy permanently two or three of the finest crags in the Western Cliffs; and its debris and embankment would be a visible scar for centuries all along the Armboth Fells, and would by its very making quite prevent people getting down to the lake shore, take from the height of the Fells, and give a long level line of ugliness to the eye. And who wanted it? It was thought the public needed it. On inquiry this was seen not to be the fact. The present road on the east was to be widened in part, if not wholly. The few farmers were content with the old packhorse road for market purposes; the ratepayers of the district knew that a great road in a rainy country takes a great deal of repairing, and rates were high enough as it was. Unless, therefore, Parliament compels the waste of the ratepayers' money, the road for the present will remain in abeyance; the level of the lake will be raised only 20 feet; and the western shore of Thirlmere will be spared. The ex-Mayor (Sir John Harwood) and his coadjutors on the Water-Works Committee deserve all credit for their prudence in this matter."

THE PROPOSED PURCHASE OF THE TONBRIDGE WATER-WORKS BY THE LOCAL BOARD.—The question of the advisability of applying to the Local Government Board for permission to borrow the necessary funds for purchasing the undertaking of the Tonbridge Water Company (reference to which was made in the *JOURNAL* last week, p. 949) was discussed at a specially convened meeting of the Local Board last Tuesday. In the end it was decided by nine votes to six, not to apply for borrowing powers; so that no further steps will be taken in the matter.

NORTHERN COAL TRADE.—The coal trade of the north has begun to display its winter characteristics. The demand for the steam coal of Northumberland has fallen off, and is likely to fall still further; and this is affecting prices, and will probably do so for some months—until there is again the summer demand. On the other hand, the inquiry for gas coal is very heavy; and the collieries find a difficulty in supplying all the orders they have—for in no previous year has the demand for gas coal been as large as it is now. Steam coal is now quoted at about 8s. 9d.; but second-class is about 6d. lower. There is a glut of small steam coal in the market; and the best kinds are quoted at 2s. 6d., though a discount is often allowed to effect a clearance. For gas coal the prices vary considerably; but about 7s. 6d. may be put as that for best qualities. The tenders for coal for the chief local railway are attracting attention—as was to be expected, when it is remembered that there is paid by this one Railway Company more than £15,000 monthly for coal for locomotive purposes alone. It is anticipated that there will be a keen competition for the contracts, and that the Northumbrian pits will endeavour to supply more; but at the same time it is expected that the price will be slightly above what it was a year ago. Household coal is dull; the season not being cold enough to develop the demand as usual. There is a large call for coal for steamship use; and fair prices are obtained. Other branches of the coal trade present little change this week.

THE DETECTION OF WATER LEAKAGE AND WASTE BY THE DEACON METER.

Our Edinburgh Correspondent in his "Notes" a few weeks since, referred to an attempt which had been made to induce the Edinburgh Water Trustees to adopt the Deacon waste-water meter. The Works Committee took the matter in hand; and, after consideration, decided, before coming to any decision, to obtain reports on the matter from their Water Engineers. In the meantime the *Scotsman* has been collecting information respecting its working from various places where the Deacon system is in operation; and last Tuesday published the first of the letters they had received in answer to their inquiries.

The first letter was from Mr. J. Hepworth, Assoc. M. Inst. C.E., the Engineer and Manager of the Carlisle Gas and Water Works. He stated that the average daily consumption of water for domestic and all other purposes in Carlisle in 1875 was 38 gallons per head of population. In that year he directed the attention of the authorities to the excessive quantity of water supplied, and the desirability of preventing waste; and for this purpose recommended the adoption of the Deacon waste-water meter. The system was not adopted until 1878, when the average daily delivery of water had reached nearly 40 gallons per head of population; and even then the system was only partially introduced. Six meters were fixed in as many districts, comprising about one-third of the entire population supplied with water. The results revealed by the waste meters, he says, were somewhat extraordinary. The average consumption of water over the whole city was known to be about 40 gallons per head; but in one of the districts supplied through a waste-water meter, it was found that the water delivered was only about 16 gallons, while in another it was nearly 60 gallons per head. This led to a thorough examination of the whole of the water mains, services, and consumers' fittings. Numerous leakages were soon discovered, localized, as they were, to some extent by the system introduced; and within a short time, the 60 gallons delivery was reduced to 20 gallons. In the first year (1878-9), after the adoption of the system, out of 8000 inspections, 232 leakages from mains and services, and 812 leakages from consumers' water-fittings—principally water-closets—being a total of 1004 leakages, were discovered and repaired. In the following year, out of 5030 inspections, only 437 defects were found to exist. The reduction in the average daily delivery of water in one year was from 40 gallons to 23.50 gallons per head, and has remained at about the latter quantity until the present time. With the view of its further reduction, the Corporation have lately resolved to extend the system over the whole city; and Mr. Hepworth is of opinion that there is no justification for a higher consumption than 20 gallons per head per day for all purposes. The cost of the system as applied in Carlisle, when complete, will be about £1000; and its annual cost is estimated at £150. The annual saving effected exceeds its total cost; the estimated cost of filtering and pumping the quantity of water previously wasted being about £1700 per annum. The letter concludes by stating that the consumers use as much water as required; and not only has the cost of filtering, pumping, and distributing water been reduced, but the supply of water has been continued with greater regularity, at a higher and more constant pressure, and at a reduced charge to all consumers.

Reports prepared by Mr. A. R. Binnie, M. Inst. C.E., the Water Engineer of the Bradford Corporation, on the working of the Deacon system in the borough in 1886 and 1888, were forwarded by Mr. O. Nicholson, the Waste-Water Engineer. An abstract of the 1888 report was published in the *JOURNAL* last week (p. 948).

Regarding the working of the system in Bolton, Mr. R. H. Swindlehurst, M. Inst. C.E., the Corporation Water Engineer, in his reply, spoke in very favourable terms. He said that they had only six Deacon meters in use at present. The saving of water in those districts where they are fixed was most satisfactory, so much so that he had recommended the Corporation to apply the system to the whole of their area of supply. He also enclosed a copy of a report prepared by himself upon the results attained with the meters; but the Water Committee, he says, have not yet passed any resolution as to its adoption or otherwise. In the course of this report Mr. Swindlehurst stated: "The daily consumption when four of the meters were first put in, stood at 464,100 gallons; now it is reduced to 258,600 gallons—showing a saving of 205,500 gallons a day. This result, although perhaps startling to the uninitiated, is but similar to what has been discovered wherever the waste-water meter system has been tried. After careful consideration, and not wishing to over-estimate the quantity I expect the saving to be effected over the whole area of supply will average five gallons per head per day. It may prove more; but I shall be very much surprised if it is less. Five gallons per head per day on 195,000 persons amounts to 975,000 gallons a day, or 355,875,000 gallons per annum, which at 4s. per 1000 gallons, the cost price of the water, equals £5981 5s. per annum, taking which to represent a return at the rate of 5 per cent., would imply a capital cost of £118,625 on works to yield that quantity."

The Secretary of the Lambeth Water Company (Mr. J. H. Louttit) supplied some interesting figures regarding the results achieved by the use of the Deacon meters in his Company's area of supply. The Lambeth Company supply an area of about 100 square miles, containing at the present time 88,097 services, 44,823 of which receive constant supply at high pressure. Of these, 38,300 houses are controlled by Deacon's waste-water meters, without the use of which, or some similar appliance, it is believed, he says, the Company would have been quite unable to extend and maintain the system of constant supply, except at a ruinous cost. The number of meters in use is 86 4-inch and 4 6-inch; and each meter supplies, on an average, about 400 houses. When Deacon's system was commenced in 1880, the average consumption per head per diem for all purposes was 34 gallons, with a population of 12,200 people under meter inspection. At the present time, it is a little above 20 gallons per head, with a population of about 308,000; and it is hoped that still better results will be obtained.

Writing of his experience with the Deacon meter at Gloucester, Mr. R. Read, Assoc. M. Inst. C.E., the City Surveyor, says that he first advised the adoption of the system in February, 1881, as an alternative to spending £10,000 for an additional and very doubtful supply of water. After two-and-a-half year's discussion, he fixed the first meter in October, 1883, and completed the whole system by May, 1884; the city being divided into twenty meter districts. The whole cost of the installation was £2000; the meters and fixing taking half the amount, and additional valves in the mains, and stop-taps to the services the remainder. Previous to October, 1883, the supply had always to be shut off at night during dry seasons, and the consumption ranged from 950,000 gallons up to 1,000,000 in frosty weather per day. By June, 1884, the consumption was reduced to 600,000 gallons per day; or, in other words, the consumption was steadily reduced from 31 gallons per head per day to 16 gallons per head per day as a minimum in 1885. Since that date it had fluctuated between 16 gallons and 17½ gallons, notwithstanding a very large increase in the number of consumers. This consumption includes about 3 gallons per head per day for trade purposes, and an unsparing supply for flushing sewers. Mr. Read's experience convinces him that, however large the supply to a community

may be, unless it is controlled by a mechanical system of inspection like Deacon's, the people will exceed the limits of supply in a very short time. As an experiment, he fixed an ordinary meter to one of the dirtiest courts in the town, and found they used or wasted 40 gallons per head per day. Another meter was fixed to a new cottage, with a man, wife, and four children living in it, doing all their own washing; and the consumption for twelve months averaged 6½ gallons per head per day.

Mr. C. Gilby, Manager of the Bath Water-Works, states that the system is now in operation in districts of Bath and the neighbourhood containing a population of about 40,000. Formerly the supply was an intermittent one—on for from two to six hours daily. The consumption was then rather over 30 gallons per head. When the constant service was first introduced under the meter system, the average daily consumption was 43·7 gallons; and it has already been reduced to 22. The trade supply, he says, is 1·2 gallons per head, and is included in the above figures.

It was reported from Clevedon that during the year before the Deacon meters were introduced, there was an average consumption of 37 gallons a head per day, of which, it is said, 25 gallons were waste. During the year following their introduction, the supply was 23 gallons a day per head, of which nearly 10 gallons are assumed to be waste.

The Water Engineer of Abergavenny (Mr. J. Haigh, Assoc. M. Inst. C.E.), after four years' experience of the system, says he cannot speak too highly in its favour. By its use, he had succeeded in reducing the waste to the extent of 16 gallons per head per day, which means an actual saving of water to the town of 128,000 gallons per day. Formerly it was found that 37 gallons per head would barely meet requirements; whereas, by reducing the waste, 21 gallons per head is ample, and it is hoped to bring the waste down so that 15 or 16 gallons will suffice.

The testimony of Mr. C. Cullum, the Manager of the Newport Corporation Water-Works, was strongly in favour of the system. Formerly the daily supply was about 35 gallons per head; and last week, with Deacon's meter in use, the consumption was only 19½ gallons per head. In one district he found, by the use of the meter, that 59 gallons of water per head were taken daily; and now the quantity is not 20 gallons.

The evidence of Mr. W. H. Wilds, the Borough Surveyor of Hertford, was likewise very favourable to the use of Deacon's meters for the detection of waste. With a population of under 8000, and an intermittent supply of twelve hours per day for five days, but six hours per day for the rest of the week, the consumption and waste ran up to 16 or 17 million gallons of water per quarter. By means of Deacon's waste detection system, he was now supplying the town on a constant service with a consumption amounting to only 6 million gallons per quarter; and he says he is confident that, would his Water Supply Committee allow him to continue the constant night inspection, he could reduce this consumption by one-half.

Mr. J. W. Richardson, the Corporation Water Engineer of Birkenhead, in his answer to the inquiries made, also bears witness to the efficacy of the Deacon meter in detecting leakage from pipes and mains underground. According to his statement, the population now supplied by the Corporation is 93,000; and the borough is divided into twenty separate districts, the supply into each of which is through one of Deacon's waste-water meters. Previous to the adoption of these meters, there was a constant and careful house-to-house inspection for the prevention of waste, and this inspection, he states, did largely prevent waste, bringing the consumption from 35 to 25 gallons per head per day. There was, however, a large waste from pipes and mains underground that was not and could not be detected by inspection alone. Hence the additional value of the Deacon meter; for a very large proportion of the underground waste does not show itself on the surface, as is generally supposed. In one case in the town, there was an underground waste, from cracked mains, of nearly a million gallons per week discovered wholly through the waste-water meters. With the aid of stop-cocks to shut off the supply to all defective fittings, and the use of the Deacon waste-water meter, the supply in Birkenhead is reduced to 15·48 gallons per head per day. In 1882, previous to the fixing of stopcocks and the Deacon waste-meters, the rate of supply was as high as 25 gallons per head per day; the reduction being 9·52 gallons. Having had every means of testing the value of the use of the Deacon waste-water meters as against close and constant inspection without them, Mr. Richardson said he had no hesitation in saying it is impossible to check waste as soon, or in the same efficient manner, by inspection without the use of the meters, as with them.

The introduction of the Deacon meter into Widnes in 1886 has, writes Mr. Isaac Carr, the Manager of the Local Board gas and water works, resulted in a saving in waste of 35 million gallons per annum. Four of the meters are used to check the supply to 3700 houses, or to a population of about 20,000. Previously the waste was not excessive; being only at the rate of 7 gallons per head of population per day. But this, by means of the meters, has been reduced to 1·5 gallon per head. The present total consumption per head per day, including the 1·5 gallon waste, is 8·5 gallons. When the system was first commenced, a number of underground leakages that must have been running for years were discovered—such as old and forgotten service-pipes with open ends into drain-pipes, &c., which, but for the meters, would in all probability have still been running. The old-fashioned mode of house-to-house inspection is, Mr. Carr thinks, almost useless for the checking or discovery of underground waste. To do this effectually, meters must be employed; and the Deacon system, he says, is the best he knows of.

Although the system has only been in use in Chester for a very brief period, Mr. J. Dugdale, the Engineer and Manager of the water-works, is able to contribute satisfactory evidence of its usefulness. Time has not permitted of a complete inspection of the city being made, so that all the defects have not been remedied. Previous to its introduction, part of the supply was obliged to be limited to sixteen hours per day on account of the great amount of waste; but this, Mr. Dugdale says, has now been altered, and the whole supply is on constantly, and less water is delivered than before. This statement is verified by the following comparative table (which was given at the end of Mr. Dugdale's letter) showing the number of gallons of water consumed each day during the weeks ending Nov. 25, 1888 and 1887.

	1888.	1887.
Gallons.	Gallons.	Gallons.
Nov. 19	1,248,958	1,874,800
" 20	1,231,888	1,664,600
" 21	1,231,888	1,698,200
" 22	1,218,084	1,798,400
" 23	1,241,170	1,807,600
" 24	1,268,778	1,633,400
" 25	1,116,458	1,764,600

Judging from the diagrams and his past experience, Mr. Dugdale anticipates a much greater reduction than is shown in these figures.

Southampton, it appears from a letter sent by Mr. W. Matthews, the Engineer of the water-works, has likewise considerably benefited by the use of Deacon's meters. He states that the system was got into work about the middle of 1885. The meters, 22 in number, with the necessary fittings, cost £1340. In addition to this they had outside stopcocks fixed to about 2500 houses, where they were not already existing, at a further

cost of £1250. Prior to 1885 the consumption of water in the borough had been 61 gallons per head. Within a few months of setting the system to work, they were able to absolutely close one of the old pumping stations; effecting an immediate saving of about £700 per year. The consumption has now been reduced to 31 gallons per head, including that used for manufacturing purposes, which is at the rate of 200,000 gallons per day. Previous to 1885 Mr. Matthews says they were pumping 3½ million gallons per day, compared with 2 millions now; and he hopes to further reduce the consumption to 15 gallons per head, which, he considers, is ample, including what is necessary for trade purposes. The greatest waste in the borough was due to old and defective mains; and this system had enabled them to pick out districts, streets, and places where great waste was going on.

EDINBURGH CORPORATION WATER TRUST. PROPOSED ADDITIONAL SUPPLIES.

Under a remit from the Edinburgh and District Water Trustees, the Engineers of the Trust, accompanied by the Conveners of the Works and Finance Committees (Baillie Archibald and Mr. Colston), ex-Provost Wood, of Portobello, and the Treasurer (Mr. Oliver), visited the district of the Manor, the Talla, and the head waters of the Tweed on the 23rd and 24th ult., in connection with suggestions for augmenting the city supply from these localities. On the last occasion on which samples were taken of the waters of the Manor and Talla, the streams were at their minimum flow; and the water was remarkably pure. As the supply from these districts would consist to a large extent of impounded water, it was considered necessary, in order to arrive at a satisfactory conclusion as to the quality of the water, to see the streams in full flow. The party first visited the Manor on Friday (the 23rd ult.), when they found an immense volume of water flowing, of remarkable purity, and containing no apparent tinge of peat. The next day they visited the Talla and Fruid, and the high waters of the Tweed. On arriving at the point where the Talla flows into the Tweed, it was observed that, while the Tweed itself was considerably discoloured and turbid, the water from the Talla was so pure and of such abundance as to make a decided difference on the Tweed for fully a mile of its course. The same effect was observed at the junction of the Manor and the Tweed. A visit was next paid to the Fruid tributary; and there, as at Talla, a very large supply of comparatively pure water was flowing. The Manor scheme is estimated to afford a supply of 15 million gallons per day, after making full provision for compensation. It might be brought in in two sections—the first of ten million gallons, and the second of five million gallons. The water from the Talla might be brought in either separately or in conjunction with the Fruid water. If the first course is adopted, about 7½ million gallons of water may be obtained; and if both waters were united, and compensation given by the construction of a large reservoir in the Tweed, it is computed that a supply of 20 million gallons may be procured. The Manor scheme involves, it is understood, a tunnel of about 5 miles in length between the valley of the Tweed and the Leadburn ridge. The distance from Edinburgh is about 27 miles, and that of the Talla and Fruid about 37 miles; the latter scheme also involving some tunnelling. The sites for the reservoirs, particularly those for the Manor and Talla, were considered excellent. In a short time the Engineers will be able to present a report to the Trustees, as to the cost of the various schemes, including that of St. Mary's Loch; stating the quantities and qualities of the water which may be obtained from each.

LIVERPOOL CORPORATION WATER SUPPLY. PROGRESS OF THE VYRNYWY WORKS.

Tuesday last—says the *Shrewsbury Chronicle*—will long be remembered in the Llanwdddy district as the day on which two most important events connected with the history of the Liverpool Water-Works took place. In the first place, the construction of the Vyrnywy reservoir has so far approached completion that Mr. G. F. Deacon, M. Inst. C.E., the Engineer, commenced to close the valves of the discharge-pipes passing through the fine dam of masonry, with a view of commencing to impound the waters and to fill the large artificial lake, which before next summer will supply the city of Liverpool and other communities on its route with water. Though no impounding had been done up to that date, the recent rainfall has been so heavy that the water behind the masonry dam extended two miles up the valley; but now the lake will rapidly increase in depth and area. The whole of the water flowing down this valley will be intercepted until that is accomplished. Nearly all the buildings of the village of Llanwdddy and elsewhere are pulled down; and the last inhabitants will soon vacate the bed of the new lake about to be formed in Wales. Though often stated, the magnitude of this undertaking does not appear to be generally understood. Lake Vyrnywy will be nearly five miles long, and will be at once the largest and most picturesque lake in Wales. The masonry dam and the arches of the viaduct carrying the road over it have been completed; while the last work in connection with the parapet, at a height of 161 feet above the foundations, is in progress. The straining tower—in which necessary means are provided for drawing off water at any required level, and within which suspended peaty and other impurities will be arrested—is a considerable height above the overflow level, and will form one of the most striking and picturesque features in the lake. The filter-beds and intermediate reservoir near Oswestry are fast approaching completion.

WORCESTER CORPORATION WATER SUPPLY.

At the Meeting of the Worcester Town Council to be held next Tuesday, the Water and Sewerage Committee will present a report on the water supply of the city. They state that if the present source of supply is to be retained, it appears necessary to carry out the works referred to by Mr. Purohas (see below) at an estimated cost of £26,000. They would, however, prefer obtaining a substituted supply from Burcot, if it could be had at a reasonable cost; but they regard the price asked by the East Worcestershire Water-Works Company for the Burcot Wells as prohibitive. Failing the latter supply, they say it is desirable to sink a trial bore-hole at the site near Aston Fields, referred to in Mr. Etheridge's report of Jan. 16, 1885*, with a view of testing the opinions of the experts that by sinking to a lower level than the present Charford bore-hole, water would be obtained from the underlying Bunter sandstones of a similar quality to the Burcot water. The Committee recommend that they be authorized to take the necessary steps for sinking a trial bore-hole near Aston Fields, and to obtain the necessary surveys for the purpose of ascertaining the probable cost of bringing water from Aston Fields to the city. The works estimated for by the Surveyor (Mr. Purchas) are as follows: New subsiding tanks, to hold 2½ million gallons, including land about 2½ acres, at 2s. per yard, £6270; new filtering-beds, capable of filtering about 3 million gallons per day, £380; new reservoir, to hold 2½ million gallons, including pipes and valves, £18,000; covering pure water-tank, £850—making a total cost of £26,000.

* See JOURNAL, Vol. XLV., p. 309.

NOTES FROM SCOTLAND.
(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday.*

The Edinburgh and Leith Gas Commissioners held a meeting last Monday, at which they transacted a large amount of business. A report is given in another column.

The proposal by the St. Andrews Town Council, to take over the local Gas Company's undertaking, has been shelved for another year. At a meeting of the Council on Tuesday, Provost Paterson said that some scruples had arisen as to the reading of the Burghs Gas Supply (Scotland) Act; certain members thinking that if they were to confirm a previous resolution in favour of the transfer they would be bound to go on with it immediately. In deference, he said, to these scruples, and the desire of the electors for further information, he moved the following resolution:—"That this meeting be adjourned to a date not later than the last Tuesday of September, 1889, with power to the Provost to advance such meeting on the requisite notice, and that, failing other instructions, the Clerk be instructed to call an adjourned meeting for the above date, and also to address a letter to the St. Andrews Gas Company in the last week of July, 1889, requesting them to convene a special meeting of their shareholders for the same date as their annual meeting, to consider whether they will make an offer to the town of their property for £13,250." In support of his motion, the Provost said he could now show his hand. Under the Act of 1870, the Gas Company might have applied for a Provisional Order, giving them the control of the streets, which, as a private Company, they had not at present. They could not now do that. Had the Company obtained an Order, the Town Council would not have had the same power in the taking over of the gas-works. He did not want to approach the Gas Company at present. An unfair dividend, he said, was declared last year; but in May the books of the Company would be before the shareholders, and the Council would then be able to value the Company's property at a more correct figure. The present prosperity of the Company was, he considered, a bogus one. The motion was adopted. I may point out that the dividends paid by the Company have been: In 1881-2, 30s. per share, with 10s. bonus; in 1882-3, 40s.; in 1883-4, 40s.; in 1884-5, 40s.; in 1885-6, 40s.; in 1886-7, 30s.; and in 1887-8, 50s. This so far bears out the Provost's notion that an inflated dividend was paid on the prospect of the purchase of the undertaking by the Corporation.

Mr. Adam Pratt has not resigned the chairmanship of the Aberdeen Gas agitation on his appointment to the membership of the Gas Committee of the Town Council. The Sub-Committee, consisting of Mr. Collie, the Convener of the Gas Committee, and two other gentlemen, met on Tuesday to consider the cases of alleged overcharge, which, through the instrumentality of Mr. Pratt before his election to the Town Council, had been submitted to them. The Sub-Committee drew up a report, which set forth that, in their opinion, there was no ground for the complaints made. By Dr. Wallace's report it was shown that the quality of the coals used at the works was satisfactory. A list containing 134 complaints of increases was before the Sub-Committee; but this number was reduced to 84, and, even in these instances, the increases were accounted for, among other reasons, by the construction of larger mains. In certain districts from which complaints came, it was found that, while there were some small increases, the decreases were of a substantial character. The Gas Committee met on Wednesday, and received the Sub-Committee's report. Mr. Pratt took exception to the finding of the Sub-Committee, and protested against their conclusions; reserving his views on the matter until the public meeting of the Council. He urged that it was impossible to deal with so large a subject in detail until the report was submitted in print to the members of the Committee. It was therefore agreed to print the report, to circulate it among the members, and to discuss it a month hence.

A case of suffocation by gas at Aberdeen has this week terminated fatally. On Friday of last week, a young woman, from the country, entered upon her duties as domestic servant in a house in the west end of the city. Knowing nothing of gas, she blew the light out on going to bed; and in the morning was found by her mistress lying in a state of unconsciousness—the room at the same time being filled with gas. She was sent to the Royal Infirmary, where she died last Thursday.

An anonymous writer, under the name of "Scrutiniser," seems resolved on giving as much trouble as possible to the Dundee Gas Commissioners. It was he who took up, and has made his own, the question involved in the mixing of air with gas to assist in oxide purification, to which I have made reference on previous occasions. To most minds, Mr. McCrae's report on the subject disposed of it; but "Scrutiniser" is still unconvinced. In a letter to the local press on Thursday, he returns to the charge, taking for his text the published statistics, which show that 10,000 cubic feet of gas were derived per ton of coal carbonized. The published accounts, he says, show that as low as 7000 cubic feet of gas per ton are produced from a large quantity of the coal used; and he comes to the following conclusion:—"There are two strong and tempting reasons, from the Gas Manager's point of view, for the absorption of air; but we are only told of one—viz., the saving of labour and expense in the process of purification. There is another reason, not less potent. It is a cheap way of very materially assisting to swell the total make of gas and cover the very great waste and loss of gas which have taken place at the very commencement of its manufacture within these works for a very considerable time. Why should the consumer have to buy and pay for the free air of heaven at the rate of 3s. 8d. per 1000 cubic feet?" To this I would say that as long as the Commissioners supply gas of the requisite illuminating power—and that is not yet questioned—it is difficult to conceive what prejudice can be done to the consumer.

A strange question has arisen in connection with the administration of the new Falkirk and District Water Act. The measure was carried through the Houses in the face of strong opposition by the Carron Iron Company. After it passed, the Trust was constituted, and they laid an assessment. The Carron Company refuse to pay this assessment, on the ground that clause 71 of the Act provides that occupiers shall not be liable to pay the domestic rate "unless some pipe of the Trustees shall be laid down within 100 feet of the outer wall, fence, or boundary" of their property. It is likely that the opinion of Counsel will be taken on the question; and it may have to be fought out in the Law Courts.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday.*

The office of Gas Analyst to the City of Glasgow, rendered vacant by the death of Dr. William Wallace, is to be continued in accordance with resolutions recently come to both by the Magistrates' Committee and by the Committee on Gas Supply; and the intention, I believe, is that the appointment will be made on the understanding, if not by express stipulation, that the successor to Dr. Wallace will have the same work to do, and receive the same salary as he had. If I mistake not, the salary has for some years been £200 per annum, for which an examination of the gas made at the tree works owned by the Gas Trust must be carried out and reported on every week. I cannot say yet how many candidates there are in, or are likely to enter, the field for the vacant office; but I

know that one of them is Mr. R. R. Tatlock, F.R.S.Edin., F.C.S., &c., who has been one of the public analysts for the City of Glasgow during at least fourteen years, and for some five or six other burghs during various periods of time. Mr. Tatlock was partner with Dr. Wallace till within a few weeks of his death. In his application for the appointment, he does not publish any testimonials, considering that his qualifications for such an office are sufficiently well known to render them totally unnecessary. Mr. Tatlock is also candidate for the similar office at Paisley, which was also held by Dr. Wallace.

Some time ago I mentioned that Bailie (now ex-Bailie) Shearer, a prominent member of the Glasgow Gas Trust, had given notice that he would ask for a vote of £5000 from the annual gas surplus to be devoted to the purposes of the "Common Good." In course of time, the Gas Committee so framed their accounts, by "writing-off" here and "writing-off" there that the actual surplus for the last financial year was reduced to less than £2400, but which, with the balance carried over for the preceding year, made a total of £5200. So far as I remember, Bailie Shearer never returned to the matter at any meeting of the Council; and a feeling generally prevailed that the proposal had been permanently put on the "shelf." It now seems, however, that it has been taken down from the resting-place, a member of the Gas Committee, I am informed, having moved his colleagues, or a majority of them, in favour of recommending to the Council sitting as the Gas Trust, to vote a large proportion of the surplus—£3000 it is said—for public purposes. The consideration of the motion will come before the Council at the monthly meeting on Thursday next, on which occasion some stiff opposition is likely to be offered to the proposal by those Gas Commissioners who believe in the propriety of all gas surpluses being devoted to the legitimate purpose of reducing the price of gas to the consumers. There are, I am glad to say, still some persons who hold, as an article of faith and as an item of common-sense philosophy, the principle that "every herring should hang by its own tail," and that every municipal trust should deal exclusively with its own "ways and means." We shall see how members of the Council rise to the circumstances of the occasion. Within my recollection, the surplus funds of the Gas Trust have only been dipped into twice—possibly three times.

The Kilsyth Gas Commissioners, on the motion of ex-Provost Whyte, have resolved that in future no deposits be asked from gas consumers as security for the payment of their accounts. In some cases the deposit has been 2s. 6d.; and in others, 5s. They have also decided that all deposits in the possession of the Gas Trust be returned to those persons from whom they were exacted. It is confidently believed that the abolition of the "security" deposit will induce many persons to become gas consumers who have hitherto regarded the deposit as a stumbling-block, and as an unwarrantable impost.

By the way, this bit of news from Kilsyth reminds me that the Partick, Hillhead, and Maryhill Gas Company have just been taken to task by a correspondent in one of the local papers for what he calls a gross injustice—viz., the exacting of deposits of money as security by the Company, and of claiming the right to cut off the gas supply from any person who refuses to pay the deposit. He asks if the Company have not the same means of recovering debts as others, and urges that it would be time enough to cut off the gas supply when there were arrears due. Then he proceeds to remark that it is clear to anyone that the Company derive the benefit of the interest on a very large sum of money for which no return is given, and on money which does not belong to them.

In the early part of the week, the Glasgow pig-iron warrant market was inactive; but during the latter half of the week it rallied, and became more satisfactory than it has been for some time. Several influences have been at work; one of them being a growing disposition to limit the production, due to the cost of making it, and to the possibility of loss in disposing of the iron. The closing price for Scotch iron yesterday was 9d. per ton better than at the close on Friday last week. The top price reached was 42s. 0½d. per ton cash.

The coal trade is still a little slack in the shipping department on account of the slow arrival of steamers. Still, many firms are doing a fair business; and there are numerous vessels awaiting cargoes. Contracts for next year are now being talked of, and will shortly require to be arranged. Shippers are expecting rather better rates than during the present year. For months past they have been sending away large quantities of coals under contract at prices very much below those current in the open market; and, at the same time, advanced rates of freight have had to be found. On the whole, therefore, this part of the trade cannot have been very profitable. On the larger contracts a rise of at least 1½d. a ton is being spoken of for deliveries over the whole of next year; and this advance appears small, and would seem to indicate that the present high quotations of coals are not expected to be of very long continuance. Meantime the f.o.b. prices are maintained; being indeed in most cases a shade higher than they were a week ago.

DANGEROUS OILS.—At the Court of Aldermen, held at the Guildhall, last Tuesday—permission having been granted in several cases to store petroleum under certain regulations—the Lord Mayor stated that, after the terrible explosion at Calais, there was a feeling of insecurity in London—a feeling of alarm, he might say—lest they should be subjected to a similar calamity in the City. He had ascertained at the Thames Conservancy Board facts which he thought it would be very gratifying to the public to know. First, no volatile oil of any kind was allowed to be unshipped, if he might say so, westward of Thames Haven. Then no oil of the same quality was imported into this country at all. It seemed that the duty on oils of that character going into France was a very high one; and therefore only oils of a very low quality were imported there, while the best oils of that description were alone imported into England. His Lordship thought it desirable these facts should be made known to the public; so that the alarm felt might be at once quelled.

THE SWANSEA CORPORATION WATER COMPENSATION CASES.—The question of the costs involved in the action *Lewis and others v. The Corporation of Swansea* (argued last July before the Court of Appeal, as reported in the JOURNAL at the time) was mentioned in the High Court recently by Mr. Finlay, Q.C., for the Corporation. It may be remembered that the plaintiffs, who are manufacturers, brought an action to recover penalties from the Corporation of Swansea for having withdrawn a certain water supply from their works, &c. The result was that both parties were partially successful; but no costs were allowed to the defendants in respect to the points on which the plaintiffs had failed. The defendants raised no objection to the plaintiffs receiving the costs of the matters on which they had succeeded; but Mr. Finlay submitted that the order as to costs made on the last occasion should be varied so as to give the defendants a portion of the costs. Mr. McIntyre, Q.C., opposed the application. The Master of the Rolls, after consulting with his colleagues, said the order as to costs would be in this form—the plaintiffs to have costs of the action and trial before Mr. Justice Denman, and defendants to have costs of the issues, if any, found for them; and as to the present application, there would be no order as to costs.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Dec. 1.

Sulphate of Ammonia.—The improvement in the market has been rudely checked by a sudden change in the tendency of nitrate, as well as by the unexpected veering round of the principal operators in sulphate, who are now sellers at below the prices they were willing to pay a week ago. This metamorphosis makes one feel less secure about the future; for if the recent improvement in both commodities rests on substantial grounds, there is no occasion to lose heart at a critical moment, and without any sufficient reason. Almost the only danger appears to lie in the fact that large quantities of both sulphate and nitrate are in second hands; and that there exists a great desire to realize the good profits which present values still offer. The weaker nitrate market has, of course, caused the demand from sulphate buyers to fall away. The latter already see in the not-too-far-distant future the more tempting prices of a month ago return; and they will probably wait for a favorable opportunity for their purchases. There is, however, meanwhile no sulphate pressing on the market; and any possible depression seems to rest, to a great extent, with the makers in their manner of disposal of ready parcels. A very large production has, of course, to be got through this month; but, perhaps, in view of the present position, makers will not persist in pursuing their usual plan of clearing out their stocks before the end of the year. The closing quotations are: £12 10s., Hull and Leith; £12 7s. 6d., Liverpool. It is stated that nitrate will not fall much in price, owing to the bulk of it being held in strong hands; but, meanwhile, spot values have declined to 11s. 1½d., and there is great weakness apparent, both for present and spring delivery.

LONDON, Dec. 1.

Tar Products.—This market is now feeling the effects of a larger production; and some of the principal products are decidedly weaker, both in demand and price. This applies specially to benzole, pitch, and anthracene. Tar oils continue in good request; and for the first time for many years past at this season are somewhat scarce. Naphthalene continues unsaleable; and it is surprising that some ingenious inventor has not discovered a mode of utilizing this product for illuminating purposes—especially remembering that, at present, it has only a nominal value. The following prices have ruled during the week:—Tar, according to position, 18s. to 23s. per ton. Benzole, 90 per cent., 3s. (nominal) per gallon; 50 per cent., 2s. 4½d. Toluol, 1s. 6d. per gallon. Solvent naphtha, 1s. 3d. per gallon. Crude naphtha, 30 per cent., 1s. 2d. per gallon. Light oil, 3d. per gallon. Cresote, 2½d. per gallon. Pitch, 18s. to 20s. per ton. Carbolic acid (crude), 3s. 10d. per gallon. Cresylic acid, 10½d. per gallon. Tar salts, 15s. per ton. Anthracene, 30 per cent., "A" quality, 1s. 4½d. per unit; "B" quality, 1s. 2½d.

Ammonia Products.—There has been unusual excitement in the sulphate market; but the week closes with this article flat. Whether this is the result of the unexpected and rapid rise in price, or the reflection of weakness in the nitrate market, remains to be seen. The price of sulphate has averaged during the week between £12 15s. and £13 per ton; but the latter figure more nearly represents to-day's value. Prices of other products may be taken as follows:—Gas liquor (5° Twaddell), 8s. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 2d. per lb. Carbonate of ammonia, 3½d. per lb. Muriate of ammonia, brown, £18 per ton; white, £25. Sal-ammoniac, £30 per ton.

[From the *Chemical Trades Journal*, Dec. 1.]

Tar Products.—The benzol market is not so firm as it was a week ago; and to-day's prices may be stated as 3s. 1d. to 3s. 2d. for 90's, and 2s. 5d. to 2s. 6d. for 50/90's. The winter production is now preparing for the market; and the influx of larger supplies must have a telling effect in the course of time. The demand for solvent naphtha still continues good; and cresote is moving off as fast as it is produced. Crude carbolic acid is still firm at old rates, while anthracene, good 30 per cent., "B," is decidedly firmer at 1s. 3½d. The pitch market is still in good trim; and while 17s. 6d. is being paid in Liverpool and 18s. 6d. in London, the Yorkshire makers have realized as much as 20s. f.o.b.

Sulphate of Ammonia.—The sulphate of ammonia market is just now in a critical condition. The advance in price has stopped; and a slight relapse set in; so that, while £12 16s. 3d. was easily obtainable at Hull on Monday, not more than £12 12s. 6d. was able to be secured yesterday. Still, there should be no fear of any serious fall if makers remain cool, and do not attempt to press business in a falling market; stocks are low and there is not much offering, and makers as a rule are fairly well sold. We have only to reiterate the caution contained in our market report of Nov. 3, "Makers should be mindful that the act of running up the price to-day may leave them short of customers for to-morrow." Everyone cannot expect to realize the top prices; and it is only when a constant business is being done that the market can be declared healthy. To-day's prices are: Hull, £12 12s. 6d. to £12 15s.; Leith, £12 13s. 9d.; London and Beckton, £12 15s.

THE RIVER LEA AND THE SEWAGE OF TOTTENHAM.—At the meeting of the Hackney District Board of Works last Wednesday, Mr. Cox stated that the Metropolitan Board of Works had decided to grant the request of the Board to an extension of the privilege provided by the Lea Purification Act for the flowing of the Tottenham effluent into the main sewers of the Metropolis. The privilege under the Act would expire next June. He thought the Board should not rest satisfied with having obtained this extension, and allow themselves to be face to face with a similar state of things next year. He had been making inquiries; and he said most unhesitatingly that the effect upon the Metropolitan sewers was comparatively nil. He advised the Board not to go to sleep, but impress the matter early upon the attention of the new County Council, with a view to getting that body to grant a further concession.

SALFORD CORPORATION GAS AFFAIRS.—The Salford Gas Committee had under consideration, last Thursday evening, the question of admitting reporters to their meetings, which was referred to them by the Town Council the week before. The result was that three voted for the admission of the press and eight against. The Committee have been investigating a number of complaints respecting the demand of the collectors for deposits of money from old customers for the continuance of the gas supply. Instructions have been given that the indiscretion must not be continued. The new Gas Committee, in their endeavour to stimulate the consumption of gas, have abolished the old meter deposit, and only demand deposits from new consumers. During the last fortnight, tests have been made with a view to determining whether the gas maintains at a distance the illuminating power which it shows at the works. Tests have been made simultaneously at Eccles, the Broughton Town Hall, and the Salford works, with the best available instruments, with the gratifying result that the illuminating power is shown to be fully maintained at these places at 19-candle power. The tests are to be continued.

SOUTH AMERICAN WATER-WORKS SCHEMES.—In reference to the two water-works undertakings in South America, the shares of which have recently been offered in England to the investing public, it is reported that letters of allotment have been posted to applicants for the 13,350 shares of the Monte Video Water-Works Company; also that heavy contracts for lead and iron piping and other materials have been given out by Messrs. Baring Bros. and Co., in connection with the Buenos Ayres Water-Works scheme.

LECTURES ON COAL GAS AT BRISTOL.—The first of a series of lectures on coal gas was given last Tuesday evening, in the hall of the Merchant Venturers' School, Bristol, by Mr. Coomber. The lecturer explained, by the aid of diagrams, the various processes employed in the production and purification of coal gas, the properties of the impurities, and the effects which would be produced by them if not removed before the gas was supplied to the public. He intimated that Dr. Cook would give the second lecture on coal gas as a source of heat and light; and Mr. Munro the third, on coal gas as a source of energy in the gas-engine.

AN ARTESIAN WELL AT ALTRINCHAM.—The existence of water under Altrincham in sufficient quantity to be of practical value has at last been proved by the sinking of an artesian well at the "Royal" brewery of Messrs. Richardson and Goodall. Mr. E. Timmins, of the Bridgewater Foundry, Runcorn, sank the well; and it appears that it is capable of yielding more than two million gallons per week. The analysis is as follows:—Total solid matter per gallon at 212 feet, 31·60 grains; combined chlorine, 2·0; as common salt, 3·29; total hardness, 12°; sulphate of lime, 10·37 grains. The analyst remarks: "The water is of very good quality for a first sample, and bids fair to be a very first-class water. The residue is principally of calcareous salts."

THE PROPOSED ELECTRIC LIGHTING OF THE CITY.—At a meeting of the Court of Common Council last Thursday, the Chairman of the Commissioners of Sewers (Mr. W. H. Pannell) was questioned as to what progress had been made with the arrangements to supply the City with electric lighting; and, in reply, he said the matter had been referred to the Streets Committee, with instructions to take the advice of Mr. Preece. They had had printed reports from this gentleman and the Engineer to the Commission; and the Committee had proceeded so far satisfactorily that they had now virtually agreed upon the lines on which tenders should be invited. Every substantial electric lighting company would be invited to tender; but he could hardly say at present when the tenders would be solicited.

ELECTRIC LIGHTING AT IPSWICH.—Messrs. Lawrence, Paris, and Scott, the electricians, who are desirous of supplying electricity for lighting purposes in Ipswich, are, it appears from a communication read at the meeting of the Ipswich Paving and Lighting Committee last Friday, experiencing a little difficulty in regard to the laying of their wires. In the letter they stated that after they had made considerable progress in their arrangements for placing electric wires underground, they had been disappointed to learn that the Committee were legally advised they had no power to grant permission. They, however, were not to be deterred by this, and asked to be allowed to carry wires overhead, and also for the sanction of the Committee to apply to the Board of Trade for a Licence or Provisional Order to make overhead communication. After a little discussion, the Committee adopted a resolution, on the suggestion of the Town Clerk, granting their assent for overhead wires for a limited time, and urging Messrs. Lawrence and Co. in the meantime to adopt every means to obtain powers for placing their wires underground.

GRAND JUNCTION WATER COMPANY.—The report of the Directors of this Company for the half year ending Sept. 30 last states that, owing to the prevalence of wet and cold weather during the past summer months, there was a diminution in the quantity of water supplied for road watering, public baths, flushing sewers, and other purposes; and although the domestic supplies had somewhat augmented, there was a net reduction in the water-rental, as compared with the previous half year, of £1266. The expenditure compares favourably with the figures in the last account, as well as with those of the corresponding period of 1887; and the balance of undivided profit, after payment of the dividend, will show an increase over that of the preceding half year. The Directors recommend that a dividend at the rate of 9 per cent. per annum upon the ordinary share capital of the Company, and of 7½ per cent. per annum on the £25 "C" shares, and of 7 per cent. per annum on the new ordinary £50 shares, together with interest in accordance with the conditions of sale on payments on the shares issued in February, 1883, be now declared, and that warrants be issued for the payment of the same on Jan. 15 next.

THE COWPEN LOCAL BOARD AND ELECTRIC LIGHTING.—The public lighting question at Cowpen (to which extended reference was made in the *JOURNAL* last week) was again under discussion at a special meeting of the Local Board last Thursday. A letter was read from the representative of Messrs. Nicholson and Jennings, with whom, it may be remembered, negotiations have been proceeding in regard to the proposed introduction of electric light into the town. The communication stated that the writer's principals had carefully considered the Board's offer, but they were compelled to decline the contract for any sum than £600 per lighting season. In arriving at this conclusion they had taken all the surrounding circumstances into consideration, and to accept a less sum would mean a positive loss to them. They felt great regret at having to arrive at this determination, being really anxious to obtain the contract for lighting the township; and the writer trusted the Board would still see their way to agree to the terms offered—viz., £600 per lighting season for a term of five years without discount, or for six years with discount. In the course of the discussion which followed the reading of the letter, a motion was made that the tender be accepted; but on being put to the vote, only two members were in favour of it, and four against it.

LOCAL GOVERNMENT BOARD INQUIRY AT EPSOM.—Mr. S. J. Smith, one of the Local Government Board Inspectors, recently held an inquiry into an application by the Local Board to borrow the sum of £3400 for purposes of sewerage and water supply. Mr. White, Clerk to the Local Board, opened the proceedings by stating for what purposes the money was required, and said the Board would endeavour to find water in order to prevent any anticipated water famine, as was feared would happen last year. They proposed to sink a shaft in the neighbourhood of the present works, and to carry out a more efficient system of distributing the water. After some considerable amount of discussion as to the advisability of carrying out the plan proposed—one feature of which was to sink an 18-inch bore-hole to the depth of 200 feet at a cost of £450—the Inspector remarked that the Board had better obtain definite information as to the quality and quantity of the water they proposed to obtain before the whole loan was asked for machinery, &c.; and this it was understood was the course the Board would pursue. The Inspector expressed surprise that the present 6-inch main was both the "rising" main and the distributing main as well; and he said the Board would need to have a new rising main 1½ miles long to the reservoir, and make the old main the distributing main.

BRIGHOUSE WATER SUPPLY.—At the meeting of the Brighthouse Local Board last Friday, the Clerk was instructed to apply to the Halifax Corporation for a supply of water during the ensuing year; the maximum quantity not to exceed 360,000 gallons per diem, and the minimum 120,000 gallons.

THE PUBLIC LIGHTING OF UXBRIDGE.—The idea of resorting to oil-lamps for the lighting of the streets in Uxbridge (to which allusion has previously been made in the JOURNAL) has been abandoned; and the trial lamp which was erected by Messrs. Defries & Co. is to be removed, and gas re-instated.

THE NELSON WATER SUPPLY.—The Water Committee of the Nelson Local Board have given instructions to Mr. J. Newton, M. Inst. C.E., of Manchester, to prepare plans for a new reservoir at Ogden Clough, near Reedley. This step has been taken by the Local Board in consequence of the action of the riparian owners demanding an exorbitant compensation price for the water, and under the provisions of the recently obtained local Act.

AN INTERESTING CASE TO CONTRACTORS.—At the Brentford Police Court last Thursday, Messrs. J. Aird and Sons, of Lambeth, Contractors, were ordered to pay £353 to the Brentford Local Board, by whom they had been summoned for payment of extraordinary expenses incurred by that body in making up and repairing Gunnersbury Lane, damaged by the unusual traffic caused by the cartage of the defendants' materials to the Grand Junction Water Company's new reservoir at Ealing.

THE WATER SUPPLY OF OULTON AND WOODLESFORD.—For the better service of water to Oulton and Woodlesford, which villages are at present inadequately supplied with water by a pipe leading from the main of the Leeds Corporation at Thwaite Gate, it has been proposed by the Rural Sanitary Authority to construct a service reservoir with a capacity of 212,000 gallons. The estimated cost is from £2000 to £2500; and Messrs. Filliter and Rofe, of Leeds, are the contractors. Before the consent of the Local Government Board is given to the borrowing of a loan for this purpose, an inquiry is to be held.

BASINGSTOCKE WATER SUPPLY.—An application having been made by the Basingstocke Urban Sanitary Authority to the Local Government Board for their sanction to borrow the sum of £2000 for the purpose of extending the water-mains, and putting down more hydrants, a public inquiry was held on Wednesday last by Mr. Thornhill Harrison, C.E., one of the Local Government Board Inspectors. The Town Clerk (Mr. W. H. Bayley) having stated the requirements of the Council, evidence was given as to the necessity for an increase in the water-mains, and in the number of hydrants. The Inspector promised to lay the result of this inquiry before the Local Government Board.

SALES OF SHARES.—At the Auction Mart, Tokenhouse Yard, last Wednesday, Messrs. Edwin Fox and Bousfield disposed of fourteen £100 new shares in the *New River Company*. The prices realized were as follows:—Four shares sold at £358 each; six, for £357; and four, for £356.—Seventy £10 fully paid-up shares in the *Horneastle Water Company* were recently sold at an average price of £10 12s. 6d. each.—The following prices have lately been realized for stock in the *Tonbridge Gas Company*:—£200 of original stock, bearing interest at 10 per cent. per annum, sold for £424; £100, for £214; and £60, for £126. £62 10s. of additional stock, on which the interest is 7 per cent. per annum, secured £91; £50 of capitalized stock, carrying 5 per cent. interest, £56; and £47 10s. of ditto, £54.

UNLAWFULLY CONNECTING A WATER-PIPE.—At the Watford Petty Sessions last Tuesday, William Saunders, of Villiers Road, New Bushey, was charged with unlawfully connecting a water-pipe with the service of the adjoining premises without the consent of the Colne Valley Water Company. It appeared that the defendant was the owner of two houses adjoining each other, one of which he occupied himself, and the other he let. He had not had the water supplied in respect of the house occupied by himself; but some time ago it was discovered that a service-pipe had been connected with the service-pipe which supplied his tenant's house, and run through the wall separating the two properties. In defence Saunders stated that, after the connection was made, he had intended seeing the Water Company about it; and he added that the water had never been used. Looking at the circumstances of the case, the Bench decided to fine the defendant only 10s., and costs 16s.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.
(For Stock Market Intelligence, see ante, p. 976.)

Issue.	Share	When ex-Dividend	Dividend or Div. & Bonus	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.					£ s. d.
GAS COMPANIES.								
590,000	10	12 Oct.	10½	Alliance & Dublin 10 p. c.	10	18½—19	..	5 10 6
100,000	10	"	7½	Do. " 7 p. c.	10	12½—13½	..	5 11 1
800,000	100	2 July	5	Australian (Sydney) 5½ p. c. Deb.	100	110—112	..	4 9 3
100,000	20	29 Nov.	10	Bahia, Limited	20	24—25*	..	8 0 0
200,000	5	14 Nov.	7½	Bombay, Limited	5	7—7½	..	5 0 1
40,000	5	"	7½	Do. New	4	5—5½	..	5 9 1
380,000	Stock.	29 Aug.	11	Brentford Consolidated . . .	100	223—225	..	5 3 1
125,000	"	"	8½	Do. New	100	164—168	..	5 4 2
220,000	20	13 Sept.	10½	Brighton & Hove, Original .	20	43—45	..	4 13 4
320,000	20	28 Sept.	11½	British	20	43—45	..	5 0 0
50,000	10	13 Sept.	11	Bromley, Ordinary 10 p. c.	10	19—21	..	5 4 9
39,000	10	"	8	Do. " 7 p. c.	10	13—14	..	5 14 3
328,750	10	14 Nov.	8	Buenos Ayres (New) Limited	10	13½—14½	..	5 10 4
300,000	100	2 July	6	Do. " 6 p. c. Deb.	100	110—112	..	5 7 1
150,000	20	10 Aug.	7	Cagliari, Limited	20	25—27	..	5 8 8
550,000	Stock.	12 Oct.	13½	Commercial, Old Stock . . .	100	255—260	..	5 5 9
130,000	"	"	10½	Do. New do.	100	209—214	..	5 0 5
121,234	"	28 June	4½	Do. " 4½ p. c. Deb. do.	100	123—128	..	8 10 3
557,320	20	14 June	13½	Continental Union, Limited	20	44—46	..	5 13 0
242,680	20	"	13½	Do. " New '69 & '73	14	30—31	..	5 12 10
200,000	20	"	10½	Do. " 7 p. c. Pref.	20	37—39	..	5 2 7
75,000	Stock.	28 Sept.	10	Crystal Palace District . . .	100	205—215	..	4 13 0
234,069	10	27 July	13	European, Limited	10	25½—26½	..	4 18 1
120,000	10	"	13	Do. " New	7½	18—19	..	5 2 7
354,060	10	"	13	Do. " do.	5	12—13	..	5 0 0
5,468,500	Stock.	29 Aug.	13	Gaslight & Coke, A, Ordinary	100	250—254	..	5 2 4
100,000	"	"	4	Do. " B, 4 p. c. max.	100	100—105	..	3 16 3
665,000	"	"	10	Do. C, D, & E, 10 p. c. Pf.	100	257—262	..	3 16 4
30,000	"	"	5	Do. " F, 5 p. c. Pref.	100	125—130	..	3 16 11
60,000	"	"	7½	Do. " G, 7½ p. c. do.	100	182—187	..	4 0 2
1,300,000	"	"	7	Do. " H, 7 p. c. max.	100	167—172	..	4 1 4
463,000	"	"	10	Do. " J, 10 p. c. Pref.	100	255—260	..	3 16 11
1,061,150	"	14 June	4	Do. " 4 p. c. Deb. Stk.	100	118—121	..	3 6 1
294,850	"	"	4½	Do. " 4½ p. c. do.	100	122—127	..	3 10 10
650,000	"	"	6	Do. " 6 p. c. do.	100	172—177	..	3 7 19
3,600,000	Stock.	14 Nov.	10	Imperial Continental . . .	100	205—208	..	4 16 1
75,000	5	14 June	6	Malta & Mediterranean, Ltd	5	5—5½	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	113—115	..	4 6 11
541,920	20	29 Nov.	6	Monte Video, Limited . . .	20	19½—20½	..	5 17 1
150,000	5	29 Nov.	5	Oriental, Limited	5	8½—9*	..	5 8 1
60,000	5	28 Sept.	7	Ottoman, Limited	5	6—7	..	5 0 0
166,370	10	27 July	4	Pará, Limited	10	5½—6½	..	6 3 1
420,000	100	2 Nov.	6	People's Gas of Chicago—	100	104—107	..	5 12 1
500,000	100	1 Dec.	6	1st Mtg. Bds.	100	92—97*	..	6 3 9
100,000	10	12 Oct.	10	2nd Do.	10	15½—16½	..	6 1 2
500,000	Stock.	29 Aug.	15½	San Paulo, Limited	100	297—302	..	5 2 7
1,350,000	"	"	12	South Metropolitan, A Stock	100	233—237	..	5 1 3
141,500	"	"	13	Do. " B do.	100	245—255	..	5 1 11
550,000	"	28 June	5	Do. " C do.	100	135—140	..	3 11 5
60,000	5	29 Aug.	11	Do. " 5 p. c. Deb. Stk.	100	11—13	..	4 4 0
Tottenham & Edm'ton, Orig.								
* Ex div								
WATER COMPANIES.								
717,467	Stock.	28 June	9	Chelsea, Ordinary	100	260—265	..	8 7 11
1,720,560	Stock.	12 Oct.	7	East London, Ordinary . . .	100	200—203	+2	3 9 0
700,000	50	14 June	9	Grand Junction	50	128—127	..	3 13 2
708,000	Stock.	10 Aug.	10½	Kent	100	272—277	+2	3 15 9
1,043,800	100	28 June	9	Lambeth, 10 p. c. max.	100	255—260	..	3 9 3
406,200	100	"	7½	Do. " 7½ p. c. max.	100	200—205	..	3 13 2
200,000	Stock.	28 Sept.	4	Do. " 4 p. c. Deb. Stk.	100	117—120	..	3 8 8
500,000	100	27 July	12½	New River, New Shares . . .	100	350—354	+13	3 8 6
1,000,000	Stock.	"	4	Do. " 4 p. c. Deb. Stk.	100	123—127	..	3 3 0
902,300	Stk.	14 June	6	S'th'w & V'xhall, 10 p. c. max.	100	173—177	..	3 7 10
126,500	100	"	6	Do. " 7½ p. c. do.	100	160—165	-2	3 12 9
1,155,066	Stock.	14 June	10	West Middlesex	100	267—272	..	3 13 6

† Next dividend will be at this rate.

GWYNNE & CO., ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.
GWYNNE & BEALE'S PATENT GAS EXHAUSTERS & ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

Exhausters of nearly all sizes in Stock.

Prize Medals at all the Great International Exhibitions.

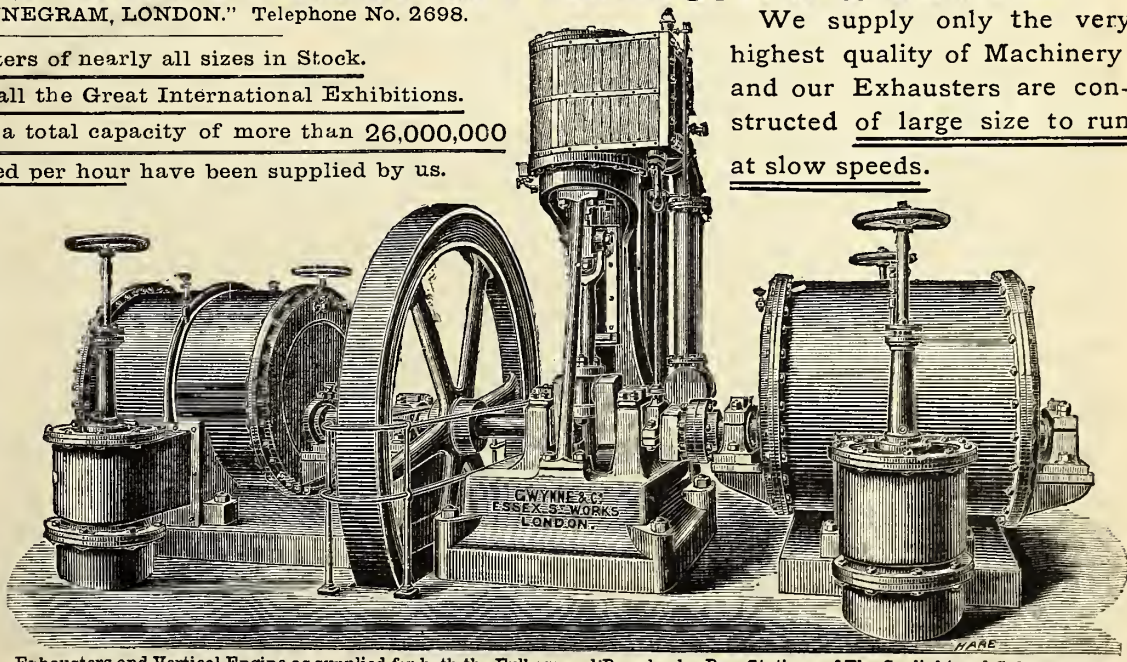
Exhausters equal to a total capacity of more than 26,000,000

cubic feet passed per hour have been supplied by us.

Our new Patent Non-Fluctuating Exhausters, to work without the slightest oscillation or variation in pressure, are strongly recommended.

MAKERS OF EVERY DESCRIPTION OF HYDRAULIC AND GAS MACHINERY.

Gwynne & Co.'s New Catalogue and List of Testimonials can now be obtained on application.



Exhausters and Vertical Engine as supplied for both the Fulham and Bromley-by-Bow Stations of The Gaslight and Coke Company.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN W.M. O'NEILL, Managing Director.

ANDREW STEPHENSON, Agent for the GAS PURIFICATION AND CHEMICAL COMPANY, Limited, Palmerston Buildings, Old Broad Street, London, E.C.

CANNEL COAL, &c.

JOHN ROMANS & SON, EDINBURGH. Gas Engineers, supply all the most approved SCOTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.

Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH; } Scotland.
No. 54, BERNARD STREET, LEITH, }

GAS Manager wants a Situation. Has been Six years in present appointment, and holds excellent testimonials. Thoroughly experienced, and not afraid of work. Age 35 years, and married. Apply by letter to No. 1660, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS Manager wants re-engagement. First-class testimonials. No objection to go abroad. Address No. 1663, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Second-hand Livesey WASHER, sufficiently large for 45,000 cubic feet per hour. Must be in good order. Price and full particulars to W. L., 55, Pyenest Street, Shelton, STOKES-ON-TRENT.

TO BE SOLD, on account of the removal of the Cornholme Gas-Works, Two HYDRAULIC MAINS, with Covers, fitted for 10 and 12 Retorts respectively; One small SCRUBBER; and Two PURIFIERS, each 8 feet by 3 ft. 9 in., with Four-way Valves complete.

Further particulars may be had on application to Mr. G. E. SAVILLE, Gas-Works, TADMORDEN.

FOR SALE—Suitable for a Gentleman's Mansion, &c.—A COMPLETE 3-INCH GAS-WORKS PLANT, consisting of three Mouthpieces for Settings of Beds of two and one, with 5-inch Ascension-Pipes, Cast-Iron Hydraulic Main, 12 inches diameter; Vertical Condenser, 10 feet high; two Purifiers, 4 feet 6 inches by 2 feet 6 inches by 2 feet deep, with Covers and Centre-Valve; Gasholder, 25 feet 6 inches diameter 10 feet deep, with Tripod Framing, Chains, and Weights, Inlet and Outlet Pipes and Valves.

All in first-class order; erected 1880. Further particulars and order to view to be obtained from the undersigned, to whom tenders are to be addressed on or before Dec. 3.

T. H. MARTIN, Assoc. M. Inst. C.E.
Gas-Works, New Barnet, Nov. 16, 1881.

PURIFIERS, &c., for Sale (cheap), erected complete, in perfect working order, practically equal to new.

Four Purifiers (London), 14 ft. square by 4 ft. deep, with Wrought-Iron Covers, Lifting Gear, and Crab. Makers, C. and W. Walker.
Also Four Purifiers (near Leicester), 12 ft. by 9 ft. by 3 ft. 6 in. deep, with 10-inch Centre-Valve and Connections, and Lifting Gear.
Also Cast-iron Tank and Gasholder, 40 ft. diameter by 12 ft. 6 in. deep, complete.

Also smaller sizes in Purifiers, and various sizes in second-hand Gasholders, Scrubbers, Condensers Station Governors, Exhausters, Station Meters Gas-Valves, &c. Enquiries invited.
Apply to SAM'L. WHILE (late Ashmore and While) 60, Queen Victoria Street, London, E.C.

(BY ORDER OF THE ROYAL COLLEGE OF SURGEONS.)

CRYSTAL PALACE DISTRICT.

SALE OF GAS SHARES.

THURGOOD and MARTIN have received instructions to Sell by Auction, at the Auction Mart, Tokenhouse Yard, E.C., on Thursday, the 6th of December, 1888, at Two o'clock precisely, in 219 lots and dividend, £24,780 in the STOCK OF THE CRYSTAL PALACE DISTRICT GAS COMPANY, producing Dividends at the rate of 10 per cent., 7 per cent., and 6 per cent. respectively; also 375 £6 FULLY PAID 7 PER CENT. SHARES in the Capital of the same Company, which is a specially safe and easy investment for large or small sums, the dividends being secured against fluctuation by ample Reserve and Insurance Funds, and the increasingly profitable district of the Company.

Particulars and Conditions of Sale may be had of MESSRS. WILDE, BENDER, and MOORE, 21, COLLEGE HILL, E.C., Solicitors; at the PLACE OF SALE; and of the AUCTIONEERS, 27, CHANCERY LANE, W.C.

SOUTH METROPOLITAN GAS COMPANY.

£50,000 FIVE PER CENT. PERPETUAL DEBENTURE STOCK OF THE ABOVE COMPANY, PRESENTING AN INVESTMENT OF THE SOUND ESTIMATION.

MR. G. A. WILKINSON is instructed by the Directors to Sell by Auction, at the Mart, on Friday, Dec. 14, at Two o'clock precisely, in numerous lots, to suit large and small purchasers, £50,000 FIVE PER CENT. PERPETUAL DEBENTURE STOCK in the SOUTH METROPOLITAN GAS COMPANY.

The districts supplied by the Company comprise nearly the whole of the South of London, from Wandsworth to Plumstead Marshes; and the demand has so much increased that the supply of Gas has been nearly doubled within the last ten years.

Particulars may be had of FRANK BURN, Esq., Secretary to the Company, 70th, OLD KENT ROAD; of MESSRS. JOHNSON, BUDD, and JOHNSON, Solicitors, 100, Winchester House, OLD BROAD STREET; and of Mr. G. A. WILKINSON, Auctioneer and Land Agent, 7, Poultry, City.

TIMMIS & CO., of STOURBRIDGE

Make only the best quality of FIRE-CLAY RETORTS, BRICKS, TILES, & LUMPS. Also SPECIAL SILICA BRICKS, to stand great heats. All descriptions kept in Stock.

For Prices apply to JAMES LAWRIE and Co., 63, Old Broad Street, E.C., Sole Agents for London and District. Telegraphic Address: "EIRWAL, LONDON."

ALEX. WRIGHT & Co., 55, 55a, and 56,

MILLBANK STREET, LONDON, S.W.
[Telegraphic Address: "PRECISION LONDON."] Makers of Wet and Dry Gas-Meters, Station Meters and Governors, Photometers, and Gas-Testing Apparatus, Test Gasholders and Meters, Registering and other Gages, &c., &c.

* See Advertisement on Page III. of the Wrapper of this week's issue.

W. C. HOLMES & Co., Huddersfield,

AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gas-holders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.

* See Advertisement p. 958 of last week's issue. Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

ACETATE OF LEAD BOOKS.

TEST Papers and Solutions for Gas- Works prepared by R. D. Gibbs, Summerfield Crescent, Birmingham.

Analysis of Coal, Oxide, and all Gas Materials.

FOR SALE—A valuable French and

GERMAN PATENT for Gas Apparatus. Is Selling rapidly in England. Good testimonials. For particulars, apply to No. 1658, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GLASGOW CORPORATION GAS.

THE Glasgow Corporation Gas Com- missioners are prepared to receive TENDERS for the Construction at the Tradeston Gas-Works of Two Sets of Four PURIFIERS, each 35 feet square.

The Drawings may be inspected, and copies of the specifications and forms of tender obtained, on application to Mr. William Foulis, the Engineer, 42, Virginia Street, Glasgow, on and after Monday, the 3rd current, upon payment of one guinea.

Sealed offers, endorsed "Tender for Purifiers," and addressed to the subscriber, will be received by him, on or before Monday, the 24th current.

The Commissioners do not bind themselves to accept the lowest or any offer.

J. D. MARWICK, Town Clerk.
City Chambers, Glasgow, Dec. 1, 1888.

CORPORATION OF LEICESTER.

RETORTS AND FIRE-BRICKS.

CONTRACT No. 10.

THE Gas Committee of the above Cor- poration are prepared to receive TENDERS for a supply of RETORTS and FIRE-BRICKS.

Specification, quantities, and form of tender can be obtained upon application to the Engineer. Tenders, addressed to Mr. Councilor Lennard, Chairman, and endorsed "Tender for Retorts, &c.," will be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, Dec. 8 prox.

The Committee do not bind themselves to accept the lowest or any tender.

ALFRED COLSON, C.E.,
Engineer and Manager.
Gas Offices, Millstone Lane,
Leicester, Nov. 10, 1888.

SOUTHWARK AND VAUXHALL WATER COMPANY.

TO COAL MERCHANTS.

THE Directors invite Tenders for the supply, at their several Stations, of about 20,000 tons (more or less) of COAL during the year 1889.

Specification and form of tender may be obtained at the Office of the Engineer, upon payment of 10s. 6d.; and the same must be sent in not later than the 10th of December, 1888, addressed to the Chairman, Southwark and Vauxhall Water Company, Sumner Street, Southwark, S.E., endorsed "Tender for Coal."

The Directors do not bind themselves to accept the lowest or any tender.

68, Sumner Street, Southwark, S.E.,
Nov. 29, 1888.

SOUTHWARK AND VAUXHALL WATER COMPANY.

TO PIPE FOUNDERS.

THE Directors are prepared to receive TENDERS from Manufacturers willing to supply

Cast-Iron WATER-MAINS and SPECIAL CASTINGS required by the Company.

Specification and form of tender may be obtained at the Office of the Engineer, upon payment of 10s. 6d.; and the same must be sent in not later than the 10th of December, 1888, addressed to the Chairman, Southwark and Vauxhall Water Company, Sumner Street, Southwark, S.E., endorsed "Tender for Pipes."

The Directors do not bind themselves to accept the lowest or any tender.

68, Sumner Street, Southwark, S.E.,
Nov. 29, 1888.

SOUTHWARK AND VAUXHALL WATER COMPANY.

TO ENGINEERS.

THE Directors are prepared to receive TENDERS from Manufacturers willing to supply

SCREW COCKS required by the Company.

Specification and form of tender may be obtained at the Office of the Engineer, upon payment of 10s. 6d.; and the same must be sent in not later than the 10th of December, 1888, addressed to the Chairman, Southwark and Vauxhall Water Company, Sumner Street, Southwark, S.E., endorsed "Tender for Screw Cocks."

The Directors do not bind themselves to accept the lowest or any tender.

68, Sumner Street, Southwark, S.E.,
Nov. 29, 1888.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased. 120 and 121, NEWGATE STREET, LONDON, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID for making SULPHATE OF AMMONIA of high quality and colour. Highest References and all particulars supplied on application.

JOHN RILEY & SONS, Chemical Manu- facturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitrol. References given to Gas Companies.

SULPHURIC ACID.

TENDERS are invited by the under- signed for 1000 tons (more or less) of B. O. V. and D. O. V. derived from Brimstone or Spent Oxide (of which about 200 tons would be D. O. V.), delivery at the Whitwood Colliery Sidings over 1889. B. O. V. to be 148° to 150° and D. O. V. 168° to 170° Twaddell. The former to be delivered in seller's tank-waggons, and the latter in bottles.

Tenders and samples not later than Tuesday, Dec. 11. Address WHITWOOD CHEMICAL CO., LIMITED., Whitwood Collieries, near NORMANTON.

SURPLUS TAR.

THE Gas Committee of the Corporation of Coventry are prepared to receive TENDERS for the purchase of the SURPLUS TAR produced at their Works, Coventry, for One year from Dec. 31 next. Make, about 1000 tons per annum.

Tenders, stating price per ton delivered into boat, to be addressed to the Manager, and marked "Tender for Tar," not later than Saturday morning, Dec. 15.

The Committee do not bind themselves to accept the highest or any tender.

GEO. WINSTANLEY, Assoc. M. Inst. C.E.
Manager, &c.
Gas-Works, Coventry, Nov. 26, 1888.

SURPLUS TAR.

THE Gas Committee of the Borough of Doncaster invite TENDERS for the SURPLUS TAR produced at their Works in the Holmes, Doncaster, for a period of One, Two, or Three years, to commence Jan. 1, 1889.

The Tar will be delivered into Tank-Barges in the River Don, alongside the Gas-Works, and in no other form.

Tender forms, and any other information, may be obtained on application to Robert Bridge, the Engineer.

Tenders, endorsed on Committee's form, will be received on or before Wednesday, the 12th of December next, by the undersigned.

The Committee do not bind themselves to accept the highest or any tender.

By order,
H. WAINWRIGHT, Chairman.
Gas-Works, Doncaster, Nov. 30, 1888.

BRISTOL UNITED GASLIGHT COMPANY.

AMMONIACAL LIQUOR.

THE Directors of this Company invite TENDERS for the purchase of the AMMONIACAL LIQUOR to be produced at all or either of their three Stations during a period of One, Three, Five, or Seven years, commencing on the 1st day of July, 1889.

The annual quantities and strengths of the Liquor produced at each of the Stations at present are approximately as follows:—

	Gallons.
Canons' Marsh Station, 1,000,000 of 14 ounce Strength.	
Avon Street " 1,300,000 " 15 " "	
Stapleton " 700,000 " 17 " "	

Conditions of Contract, and forms of tender, may be obtained on application to the undersigned, to whom also tenders, sealed, and endorsed "Tender for Ammoniacal Liquor," must be delivered not later than Ten a.m. on Monday, the 28th day of January, 1889.

The Directors do not bind themselves to accept the highest or any tender.

JAS. V. GREEN, Secretary.
Chief Offices: Canons' Marsh,
Bristol, November, 1888.

BRISTOL UNITED GASLIGHT COMPANY.

OXIDE OF IRON.

THE Directors of this Company invite TENDERS for the supply of their requirements of OXIDE OF IRON during the twelve months next ensuing.

Conditions and forms of tender may be obtained on application to the undersigned, to whom also tenders, sealed, and endorsed "Tender for Oxide of Iron," must be delivered not later than Ten a.m. on Monday, the 17th day of December next.

JAS. V. GREEN, Secretary.
Chief Offices: Canons' Marsh,
Bristol, November, 1888.

THE GASLIGHT AND COKE COMPANY.

NOTICE is hereby given, that the TRANSFER BOOKS of this Company, so far as they relate to the DEBENTURE STOCKS and BONDS, will be closed on the Evening of Monday, the 10th of December next, for the Half Year ending the 31st of December, 1888, and that the Interest for that Half Year will be payable on the 1st of January next, to the Proprietors registered as the holders of such Debenture Stocks and Bonds at the time of such closing of the Transfer Books, which will be re-opened for the following Half Year on the Morning of Tuesday, the 11th of December next.

By order,
JOHN ORWELL PHILLIPS,
Secretary and General Manager.
Chief Office: Horseferry Road,
Westminster, S.W., Nov. 10, 1888.

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TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion; but as the Advertisement sheet of the JOURNAL is sent to Press the first thing on Monday Morning, Advertisers will please bear in mind that Orders for Alterations in or Stoppages of PERMANENT Advertisements should be received Not Later than Two o'clock on SATURDAYS.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, DECEMBER 11, 1888.

MR. ALFRED LASS ON GAS COMPANIES' ACCOUNTS.

IN another part of the present issue of the JOURNAL will be found the text of a paper, "On Gas Companies' Accounts," recently read by Mr. Alfred Lass before the Chartered Accountants Students' Society. The author describes his paper as bearing specially upon the reserve, insurance, sinking, and depreciation funds relating to gas undertakings, and on the legislation affecting the same; and it is obviously of advantage to have a record of the views of such an experienced Accountant as Mr. Lass in regard to this class of subjects. Mr. Lass begins by summarizing the history of the introduction of gas lighting and of the early legislation affecting the industry; showing what are the General Acts of Parliament necessary to be studied by those who would understand the conditions under which statutory Gas Companies have to carry on their operations. After this prefatory instruction, the author sets out his subject under eight alphabetically distinguished headings. The bulk of matter is very unequally divided among these classes; for while some headings only require a few paragraphs of explanation, others run into long statements. The history of the form of accounts prescribed by the Act of 1871 is very quickly told; but the discussion of the manner in which Gas Com-

panies may distribute their profits takes Mr. Lass a long way into his paper. His synopsis of the law relating to the payment of dividends and the allocation of gas profits in other ways is very clear and instructive. Upon the question of the right of Gas Companies to establish contingency funds, Mr. Lass is not positive. Such a right may be derived from the Companies Clauses Consolidation Act, 1845; but he says that some authorities hold that this permission is supplanted by the authorization of a reserve fund by the Gas-Works Clauses Act of 1847. The point has never been settled by the Courts; and Mr. Lass admits that Gas Companies have seldom indulged in contingency funds, and to only a small extent. The author goes on to explain the reason for the creation of the optional insurance funds, and also remarks upon the optional and unlimited reserve funds permitted by the latest legislation. He points out a fault in the wording of the model clauses, and declares that the actual state of the law requires amendment to reconcile the general intent of the Act of 1847 with the altered state of things brought about by sliding scale legislation. Mr. Lass discusses the sliding scale, and its actual and prospective effects upon gas consumers and stockholders, and arrives at the prudent reflection that "the auction clauses and sliding scale will not result either in unmixed good or unmixed evil." No man can say anything fairer than this.

After unburdening his mind upon the subject of the sliding scale, Mr. Lass turns his attention to the application of profits of gas making by Local Authorities. He recites the provisions to this effect that are usually found in Special Acts relating to such undertakings—showing that Local Authorities are not bound to keep their accounts in the form prescribed for Gas Companies; that they are authorized to create a sinking fund for the repayment of borrowed moneys; that they may also form limited reserve funds out of profits, and carry any balance of profit to the district or other local fund. Mr. Lass does not mention that this last direction is not usual in the case of Scotch undertakings; nor does he lay quite sufficient stress upon its consequences in the majority of English towns where it is followed. It may be objected that the real object of an accountant's paper should be the facts as they exist, and that comment is not within his province. As he permitted himself to state some of the considerations for and against the sliding scale, however, it would not have been going far out of his way if the author had done the same thing for the similarly "burning question" of municipal gas administration. When he arrives at the division of his paper which deals with repairs, renewals, and depreciation, Mr. Lass pauses, as it were, to draw breath, while directing his readers' attention to the very delicate distinctions and important classifications which come into this branch of the subject. Not Dr. Trench himself could be more solicitous that those whom he addresses should clearly grasp the meanings of the words employed. People in conversation may carelessly transpose the words "repair" and "renew" as though these were synonymous. Not so Mr. Lass; he draws the clear distinction between them, and drives it home. Having duly insisted upon the necessity of clear language, and a just appreciation thereof, Mr. Lass is prepared for grappling with the question of renewals and depreciation, which he does very satisfactorily. He first lays down the data upon which depreciation funds for gas-works may be calculated. Averaging the life of plant, buildings, and apparatus at from 37 to 40 years, he shows that if $1\frac{1}{2}$ per cent. upon the capital cost is taken out of the profits, and allowed to accumulate at compound interest at the rate of 3 per cent. per annum, a fund will be created which will be at all times sufficient for the renewal of the works in perpetuity. After showing, however, that the expense of renewals must come out of revenue, Mr. Lass argues that a special depreciation fund is unnecessary, seeing that the works must be regularly kept up in an efficient condition. He clinches the argument by remarking that the General Acts do not anywhere specially authorize the creation of a depreciation fund, except for works on leasehold lands.

Mr. Lass explains the principle to be followed in allocating the charges for new and enlarged plant as between capital and revenue, and explains the operation of sinking funds for redeeming the cost of works in the hands of Local Authorities. Seeing that he addressed students, it might have been better if Mr. Lass had offered a little more comment upon the difference between the positions of Gas Companies and Municipalities in this regard. All that he says upon this subject is that "the works are, therefore, to be redeemed from debt, as well as repaired and renewed, out of the

"profits derived from the gas consumers." The last section but one of the paper deals with the appointment and position of auditors. Seeing who his audience were, there is much point in Mr. Lass's aspirations after the adoption of the system of official audit "by chartered accountants" for Gas Companies everywhere. It was a sentiment certain to awaken an echo in the breasts of his auditory. In a general way, moreover, the suggestion is not a bad one; but, as the author said, "legislation moves slowly;" and it is to be hoped that the young accountants whom Mr. Lass had in his eye when he spoke will not be compelled to wait for snug auditorial berths until the law is altered in the sense desired. In concluding his paper, the author submits some general reflections upon his subject. He recommends Local Authorities owning gas-works to keep their accounts as strictly as possible in accordance with the form provided by the Act of 1871, and lays stress upon the necessity for solicitude, when making up the accounts of gas undertakings, that charges upon capital and revenue should be fairly apportioned. The ordinary conditions of a trading concern do not apply in such cases; and it is consequently all the more essential that the rights and interests alike of the public and the undertakers should be looked after. Here also Mr. Lass permits himself to make a few remarks upon the vexed question of the subsidizing of district rates out of gas profits; but he is very careful not to offer any opinion regarding the right and wrong of the matter. He points out that the duty of an accountant is clearly to carry out the intentions of the Legislature as expressed in the various Acts of Parliament which he has to consult, without allowing his own prejudices to warp his judgment. This is a piece of counsel that all accountants called in to investigate Gas Companies' accounts in a judicial capacity have not borne in mind. With a final warning respecting the difficulties of the subject of depreciation, the paper concludes. It was rendered more complete by appendices consisting of the forms of accounts scheduled in the Act of 1871, and also an example of the method of analyzing the working results of a Gas Company's operations for a half year. Altogether the paper is a very useful one; and if it does not tell the more experienced of our readers anything new, it contains much useful information to which we direct the attention of some of the perplexed managers and secretaries who are in the habit of writing to us for guidance as to the meaning of some of the references to accounts in the Acts of 1847 and 1871.

THE EMOLUMENTS AND RESPONSIBILITIES OF GAS-WORKS OFFICIALS IN BIRMINGHAM AND ELSEWHERE.

THERE has been a lively discussion by the Birmingham Town Council on the subject of the pay and position of the chief officers of the Corporation Gas Department, arising out of the recent action of the Gas Committee in raising certain salaries without notifying the fact to the Council. It was explained that, in acting as they had done, the Committee had only followed precedent. It appears that when the Corporation acquired the undertakings of the two old Gas Companies, and the water supply, the principle of management adopted by the Gas and Water Committees, and persevered in ever since, was for the Committees to act very much as though they were Boards of Directors. According to this interpretation of their position, the Committees could deal with their officers very much as they thought fit; and so long as the Gas Committee continued to hand over the usual annual subsidy to the Corporation, they did not expect the Council to interfere with their acts of administration in detail. This is a view that appears to have been growing unfashionable in the town; and it has now been finally abandoned, with the consent of both Committees, in favour of the more general course of reporting to the Council proposed increases of salary amounting to £50 or upwards. Following upon the resolution by which this alteration of the principle of administering the Corporation gas and water undertakings was expressed, came a proposal evidently originating in the same circumstances, although more personal in its aim. It was for taking away, as from the end of the year, the advances of salary recently granted by the Gas Committee to Mr. Charles Hunt and Mr. Edwin Smith, the Secretary of the Department. The supporters of this proposal could not argue that the officers in question did not earn their pay; but they objected to the salaries given on the same grounds that are always advanced by orators of the school of that eminent publicist, old Eccles, in "Caste." Happily for the credit of Birmingham, the motion only received five votes against thirty-five. The mover of

the resolution disclaimed any desire to disparage the work of the officers whom he sought to victimize, and referred to the examples of Manchester and Leeds for standards of the pay and position of gas-works officials. This is only what may be expected while these two towns remain quotable for such a purpose. It is necessary, however, that the circumstances both of Manchester and Leeds should be understood. It is true that in both places the Gas Committees are for the present endeavouring to manage their own business "on the cheap;" and a miserable mess they are making of it. The Leeds Corporation are some thousands a year worse off than they were when they had the advantage of Mr. Henry Woodall's advice; and they are able to muddle on as they have done the past few years only because he put them fairly on the road. As for Manchester, we thought everybody knew of the gas supply of this city as a by-word for cost and bad quality, thanks to the wonderful ability of the great unpaid members of the Gas Committee, who have had the works in hand since Mr. West's time. And how was it before him? When Manchester wanted new works, the Corporation Gas Committee went about getting them in the most costly way possible. Having no Engineer in their employ, they invited competitive plans, and engaged Mr. G. Livesey and Mr. William King to select the best for execution. Then they spent vast sums of money in preparing the site for, and building that section of the new station which they least required. What is the recompense received by Mr. Hunt in respect of the new Windsor Street works, in comparison with the money spent for advice alone by the Corporation of Manchester in regard to their Bradford Road works? And which town have the most value for the money? It is such reflections as these that make one disgusted with the narrowness and short-sightedness of some Corporation gas-works administration. Manchester and Leeds, forsooth! If there had not been any proverb declaring the extreme foolishness of the "penny wise," it would have been necessary to make one to fit their case. To return to the case of Birmingham, it may be noticed that, in defending the claims of Mr. Smith to be regarded as something more than an Accountant, Mr. Alderman Pollock described him as General Manager of the gas undertaking. This must surely have been a slip in the warmth of debate, as we are not aware that the Birmingham Gas Department has a General Manager; being managed by a Secretary and two Engineers, who are equally responsible to the Committee.

IMPROVED STREET LIGHTING.

SEVERAL of the London newspapers have been complaining of late of the miserable lighting of the streets of the Metropolis; and the announcement that the Corporation are thinking of dabbling once more in electric lighting only increases the exasperation of the public, who are naturally at a loss to understand why the street lighting authorities do not make better use of the gas they have, instead of waiting for the electricity which is not yet available. This is, in truth, one of the most curious problems of the age in connection with the subject of street lighting. If they put up a good refuge-lamp here and there, the highway authorities think they may leave the rest of their town in semi-darkness. It may be gathered from recent intelligence, however, that here and there local authorities are waking up to a better sense of their responsibilities. Indeed, it would not be too much to say that the reflections which we published a short time since upon the opportunity afforded to murder and outrage by neglect of lighting in the poorer town districts, have also occurred to some of the authorities chargeable with this matter. The Vestry of Newington have ordered all the street lamps in their district to be enlarged to burn 10 cubic feet of gas per hour; and we hear of the doubling of the number of lamps in other parts of the town, besides a general lighting up of dark corners. It is to be hoped that the impulse to this improved public service will not prove transient. The utter wretchedness of much of the usual street lighting is an unfailing topic with the people who seek to supplant gas by electricity; and it is in vain for those who know what gas can do, to speak a word in its favour while the ordinary street lamp remains as an example of how thoroughfares should not be lit. Time was when gas engineers thought that highway authorities had drifted into their common miserly way of using gas by mere force of tradition, and for want of knowledge. Mr. Corbet Woodall, when Engineer of the Phoenix Gas Company, entertained this opinion, and was one of the first to endeavour to break through the force of habit in this matter

by showing how Waterloo Bridge might be lighted by improved gas-lamps. This hopeful view has long been discredited by the general observation that, while a highway authority will cheerfully bear an increased charge for street lighting, provided that the money is to be spent upon inefficient electric lamps, they will not, as a rule, stretch a point to vastly improve the gas lighting which they know they can depend upon. Let us hope that the initiative of the Newington Vestry is the sign of a new departure in this matter.

A PRONOUNCEMENT RESPECTING WATER GAS.

Does anybody know who are the components of the "British Water Gas Syndicate," for whom a Mr. W. L. Wildy, signing himself as engineer, of Leeds, writes in a recent number of *Industries*? If the members of the "Syndicate" are as remarkable in their way as the engineering knowledge exhibited by their representative in his letter, the group must form a curious combination. Our contemporary recently published some remarks, taken from a German source, upon the subject of the dangers of water gas, which Mr. Wildy seems to think reflect upon the projects of his "Syndicate;" and he has accordingly rushed into print in defence. He begins by arguing that it is idle to object to the dangerous character of anything, from football to dynamite, which happens to be cheap and good for some special purpose. The argument is not very strong; because it would be easy to name commodities—such as crude petroleum, and a variety of active poisons—which are not admitted into British trade on account of their dangerous nature, although they might doubtless be useful for some purposes. Mr. Wildy admits that in some communities there is a prejudice, reflected in legislative enactments, against the general distribution of water gas, on account of its containing a high proportion of carbonic oxide; but he triumphantly says that wherever these obstacles existed in the United States they are being swept away, simply because the water gas is cheaper than coal gas, and not only cheaper but better. As to the cheapness, it is of course impossible to lay down any general rule; but Mr. Wildy's peculiar competence to treat of this subject peeps out in his contention that water gas is better than coal gas, because in the first place "its combustion is perfect, under all circumstances, without any smoke." This is, of course, only true of water gas when wholly free from illuminating constituents. Then he says that all the sulphur can be taken out of water gas, which cannot be done for coal gas "without destroying more or less its lighting power." Again, coal gas always flickers and hurts the eyes; while with water gas used to make a light by incandescence, there is no flickering. "Besides, in using water gas there is only half as much heat produced with a similar quantity of light given out, as with common coal gas; and in consequence only half as much carbonic acid introduced into a room." Thus Mr. Wildy thinks that carbonic acid is a direct product of heat. Then for cooking and heating, Mr. Wildy recommends water gas in preference to coal gas, because it does not require any "secondary air." It appears from this strange effusion that Mr. Wildy has attended a few gas engineers' meetings where technical matters have been discussed, and has picked up a smattering acquaintance with such terms as sulphur impurity, carbonic acid, and secondary air, which he uses very much at random. It will tax all his natural and acquired powers to show that, under ordinary English conditions, water gas for illuminating purposes is comparable either in cost or value with common coal gas.

THE HALIFAX GAS-WORKS SCANDAL.—In the House of Commons last Thursday, Mr. Labouchere gave notice that on Monday, he would ask "the President of the Local Government Board whether his attention had been drawn to the *Halifax Times* of the 4th of October, 1888, containing a report of the proceedings of the Halifax Town Council, and to the charges then made in writing against certain gentlemen connected with the Town Council—viz., 'That they had been guilty of fraud and malpractices in connection with the Halifax Gas-Works,' and to the resolution of the Council excluding one of these gentlemen from all Committees of the Council in consequence of such charges; and, whether he will take proceedings to have an official inquiry into the allegations which have been made." Last night, Mr. Ritchie, replying to the question, said that his attention had not been called to the matter. As regards the suggestion that the Local Government Board should make an official inquiry into the allegations, he pointed out that they have no power to inquire into the conduct of members of a town council, or of their officers. Even if there were such powers, he did not think such an inquiry would be expedient. One of the persons implicated was, he remarked, to be tried at the present Leeds Assizes.

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(FOR STOCK AND SHARE LIST, see p. 1037.)

THE Stock Exchange markets have generally ruled dull and heavy during the past week. The amount of business done was on a reduced scale, and lack of support caused some departments to give way. But the prime cause of the depression in prices is still to be found in the condition of the Money Market, which has increased rather than abated during the week. If matters do not take a turn the other way, we may see a 6 per cent. rate before Christmas. The Gas Department has formed no exception to the rule of limited business—more especially in the latter portion of the week. The tendency, however, has on the whole been more favourable; and the few variations in price to be noted are, with one exception, in the upward direction. Taking the Metropolitan Companies first: Gaslight "A" has been moderately dealt in, and at remarkably steady figures; the prices never ranging outside 251½-252½. A few transactions have also been marked in the preference stocks, at good average rates. South Metropolitans of all three issues have been fairly active. The "A" shows out strongest, and looks ripe for a little advance. Commercial old, after having been done (on one day only) at more than average figures, made the improvement we referred to last week, by advancing 2. Nothing was done in the new stock. We understand that the tenders invited by the Company for the small balance of 4½ per cent. debenture stock unappropriated were opened on Friday and allotments made. The average price realized was rather in excess of 125 per cent., which must be satisfactory to the Company. Suburban undertakings have not been dealt in; but a quantity of Crystal Palace stock (formerly belonging to Sir Erasmus Wilson) was disposed of at the Mart on Thursday. The prices realized about 206 for the 10 per cent., 146 for the 7 per cent., and 136 for the 6 per cent. preference. Among the foreigners, Continental Union new have made a further rise of ½. [N.B.—In last week's list, the yield upon investment in these shares was, by an obvious error, given as £5 12s. 10d. It should have been £5 17s. 5d.] Other changes are a rise of 1 in Cagliari, and a fall of ½ in Monte Video. Water, though very quiet, has been interesting for the determined advance made by New River. It now looks like resuming the position from which it has been so long displaced. Kent also, which has been very much kept down for some time, jumped up to 280 on Tuesday. West Middlesex and Southwark ordinary, however, are a little easier.

The daily operations were: Fairly good business in Gas on Monday—mostly in Gaslight "A," South Metropolitan "B," and Imperial Continental. Continental Union new rose ½. Water was quiet and unchanged. Gas was rather less active on Tuesday; but prices held firm. Water was brisker, at good figures; but quotations were still left as before. Business in Gas on Wednesday was more limited; but more Companies were dealt in. Cagliari improved 1. Water was quite neglected; and Southwark ordinary dropped 2½. Thursday brought no increase of business in Gas, and prices were only ordinary. Monte Video fell ½. Hardly anything was done in Water; but buyers of Southwark ordinary took another 5 off their price. Gas remained just as quiet on Friday. Commercial old advanced 2, without business done. Water was more active, and for the most part stronger. New River sellers' price rose 6; the debentures changed hands at top price; and Southwark rallied. West Middlesex, however, fell back 1½. On Saturday, Gas offered nothing to remark; being very quiet and unchanged. In Water, Kent rose 3; and Southwark ordinary recovered its loss of Thursday.

ELECTRIC LIGHTING MEMORANDA.

A SENSATIONAL REPORT AND ITS JUSTIFICATION—WINDING UP OF THE PILSEN-JOEL COMPANY—FIRST MEETING OF CROMPTON AND CO., LIMITED—THE FORTUNES OF THE MAXIM-WESTON COMPANY.

It is an old saying that one must leave home to hear news; but it is nevertheless startling to read in the *American Engineer* the announcement that "London is to be lighted by electricity; and it is said the plant will be the largest in the world. The contract has been captured by the Westinghouse people." Although the American printer of this astounding piece of intelligence has omitted to complete the address of the city in question by the customary affix ("Eng."), in order to distinguish it from the other and nearer Londons which local readers are supposed to have in their minds when the word is mentioned, we venture to assume that he means the capital of these islands. This being understood, the real difficulty of the passage stands revealed. Who has determined that London is to be lighted by electricity, and what contract has been captured by the Westinghouse Company? Upon inquiry into this mystery, however, we have discovered more justification for it than appears at a first glance, when it merely looks as though the American reporter had allowed himself to write of London and its lighting arrangements with about as much knowledge as was displayed with regard to other things English by Martin Chuzzlewit's Yankee acquaintances. It appears that the Metropolitan Electric Light Company—the concern mentioned in the parliamentary notices last week as intending to apply for Provisional Orders for the four quarters of London—have given the contract for fitting up their first central station to the Westinghouse Company. We do not know what may be the value of this order; but it seems to have been regarded as of sufficient importance to be telegraphed across to the Westinghouse Company of Pittsburg, and to be by them communicated to the American technical press,

This is the one grain of fact, which, by the application of that "French measurement" of which electricians are so fond, has been expanded into a contract for lighting all London. It is reported that the English electric lighting firms were much chagrined at the Metropolitan Company thus sending abroad their first order; but they have been pacified by the invitation of tenders for the equipment of a second station. By having one station fitted up with American and the other with English plant and machinery, the Metropolitan Company expect to learn which is the better plan by the time they require to extend their resources. Each station is to supply 10,000 incandescent lamps—rather a large order for a Company not yet in possession of statutory powers.

The Pilsen-Joel Company have held their seventh ordinary general meeting, Sir Rawson W. Rawson in the chair. When the Directors last met the proprietors, there was a proposal on for the sale of the business; but a shareholder stigmatized the arrangement as a "job," and moved the Court to prevent it. He succeeded in his immediate endeavours; but the consequence of the action was that the Directors could not carry on the business of the Company, having no money, and no prospect of raising any. At the last meeting, it was therefore a question as to whether any possible means of escape from liquidation could be found. Nothing of the kind presented itself. The shareholders would not find money to throw after their lost capital; and the Directors did not pretend to believe in the possibility of a prosperous future for the Company. There was no quarrelling or recrimination; everybody feeling that the time for that had gone by. When the ship is on the rocks, it is waste of time to blame those who may be suspected of having contributed to the disaster; the best thing is to save what can be taken off the wreck. So the Pilsen-Joel concern is to be voluntarily wound up at last, after a career rather longer than the majority of its contemporaries of the same order.

The same page of the *Electrical Review* which contains the account of the last public meeting of the Pilsen-Joel Company, gives a report of the first general meeting of Crompton and Company, Limited, the formation of which concern we recently noticed. It being only the statutory meeting, there was not much for the Chairman to say; but as it was, he took the opportunity for declaring that the Directors had made themselves fully acquainted with the business, and were satisfied that they had acquired a valuable property. Trade was flourishing, according to this statement, and orders were coming in faster than the Company could execute them. Experience showed that electric lighting could be made to pay; and consequently companies were starting up in all directions to undertake this work. Mr. Crompton would have been happy to have made the acquaintance of the shareholders; but he had gone to Vienna on business connected with his work there for the Imperial Continental Gas Association. All this sounded very well from the chair; but it is not the first time that things have looked rosy at the inaugural meeting of an electrical company. We, of course, place Crompton and Company, Limited, upon a very different footing to that from which the Pilsen-Joel concern has just tumbled; but it is impossible to help thinking they may not always have on their books customers like the Imperial Continental Gas Association, and jobs like the Vienna Opera House lighting.

The Maxim-Weston Company is another of the electrical ventures the proprietors in which must regard their hopeful new rivals with very jaundiced eyes. They held an extraordinary general meeting on the 3rd inst.—one of an already lengthened series—for the purpose of considering a reconstruction scheme. Mr. John Marks presided; and the character of his speeches may be inferred from the fact that a notification has since been published to the effect that proceedings for libel have been taken against him by his notorious predecessor in the chair—Mr. Hugh Watt. The business of the meeting began very quietly. The Chairman explained that, in consequence of the Directors not having been supported in their efforts to raise fresh capital, they had determined upon recommending that the concern should be wound up voluntarily. This recommendation was accepted; but when the names of the proposed liquidators were read out, the liveliness began. The acting Directors were proposed for this employment; but it speedily appeared that information respecting the late Chairman and his doings was urgently required, and this was supplied by the Chairman in speeches of remarkable candour, for which, it appears, he is to be called to account. The net result of the day's proceedings so far as the Company's future is concerned, is that the liquidators are to transfer the business and effects to a new Company with a capital of £75,000 in 3s. shares. It was stated that there would not be any difficulty in floating this new Company, who are to exchange one share, with 2s. credited as paid up, for every share of the old Company. Upon those terms the Maxim-Weston venture is supposed to be able to make a clear start once more. It cannot be denied that they have a good property, as electrical properties go; and, with good luck and good management, they may be able to weather the storm, albeit the outlook is not promising.

The Queen has been pleased to approve of the Borough of Birmingham and the Burgh of Dundee being raised to the rank of Cities.

The Glenboig Union Fire-Clay Company, Limited, of Glasgow, have been awarded three prize medals for goods shown by them at various exhibitions held this year—viz., a silver medal at the Brussels Exhibition; a gold medal at the Barcelona Exhibition; and a first-class medal at the Cardiff Exhibition.

A COMPARISON BETWEEN OIL AND GAS.

THE necessity that exists for a better knowledge as to the capabilities of coal gas amongst consumers of the same, was markedly illustrated by the lecture delivered at Holly Park, by Mr. Defries, an inventor and manufacturer of oil-lamps (see *ante*, p. 991). The best reply that the gas company supplying the district could make to the remarkable line of argument followed by this gentleman in his endeavours, not only to make out the best possible case for his special manufactures, but also the worst for gas, would be to fit up a few dining-rooms and drawing-rooms in the district with gas-burners of the best and most approved modern kind and thus practically illustrate the fact that gas is capable of yielding four or five times the duty that Mr. Defries credits it with. It is only natural that this gentleman should be very strongly prejudiced in favour of oil, and against gas, and of course he is perfectly at liberty to state his opinions; but when he condescends to endeavour to prejudice coal gas by the adoption of a disingenuous and unjust line of argument it is necessary to point out the fallacy of the same. Passing by the popular clap-trap to the effect that gas has got to the top of the tree as an illuminating agent (which is perfectly true, although not in the sense intended by this advocate of oil), has passed the zenith, and is going down hill, we come to the means by which he arrives to his own satisfaction at the conclusion that oil—burnt in a Defries lamp, of course—is only one-fifth the cost of gas. Or in other words, that "when burnt in the best mineral-oil lamp known, and the one in most general use"—i.e., the Defries—it affords a given light at one-fifth the cost of a similar light from gas. The standard of comparison adopted in the lecture is a light of 43 candles for 5 hours, which it is alleged can be obtained by the consumption of one pint of oil. With oil at (say) 8d. per gallon, the cost of this would be 1d., for which a lighting effect of 215 candle-hours is claimed. The subject of gas lighting is approached with great caution, which may be due to ignorance. A Bray's No. 6 fishtail burner is said to generally use 7 or 8 cubic feet per hour, but is taken as using 6 cubic feet, and yielding a light equivalent to 15 candles. Three such burners would be necessary to yield a light of 45 candles. These are alleged to consume in five hours 90 cubic feet of gas, which with gas at 4s. 6d. per 1000 cubic feet would cost 4 $\frac{3}{4}$ d. or say 5d.

We would first point out two or three obvious defects in this argument, all of which tell against gas and in favour of oil. There is nothing estimated for the cost of a wick, or for the extra trouble in cleaning, trimming, replenishing, &c., required with the oil lamp. Then, whereas a duty of 215 candles is required for the oil, 225 candles is the duty obtained from the gas with which it is compared, or an excess of nearly 5 per cent. Then there is another instance of petty inching on, where a cost of 4 $\frac{1}{2}$ d. is said to be practically 5d. These little matters alone, which certainly would not be overlooked by any one desirous of making a fair and just comparison between oil and gas, would reduce the estimated cost to nearer 4d. than 5d.

In the course of a paper read before the Society of Chemical Industry on "The Present Position and Prospects of the Coal Gas Industry," by Mr. Lewis T. Wright, in May last, the following comparison between the cost of oil and gas lighting was given, the standard being 1000 candle hours:—

Best result obtained with mineral oil at	
8d. per gallon after trying various forms	
of lamps	5·63d.
Gas at 2s. 3d. Schulke burner	2·70d.
Wenham burner	3·90d.
Ordinary flat-flame burner	7·70d.

Compared with this standard, Mr. Defries's results work out to—

Mineral oil at 8d.	4·6d.
Gas at 4s. 6d.	23·0d.

The means adopted in order to arrive at this result are patent to everyone. Mr. Defries takes for the basis of the oil calculation, a careful laboratory experiment with his own lamp, which for the present purpose may be accepted as what it is said by its inventor to be, "the best mineral-oil lamp known." But for gas he takes the ordinary burners as used by consumers, which are known to be incapable of developing anything like the best possible lighting effect from the gas. This course is popular with the makers of electric lamps, and enables them to prove (!) to their own satisfaction, that electricity is cheaper than gas, in spite of the known fact that in practice it is found to be equivalent to gas at about 7s. 6d. per 1000 cubic feet. If a fair, honest comparison was desired, both would be put upon the same footing. Either the gas would be burnt in the best-known gas-burner, in which case it would yield some four times the duty credited to it by Mr. Defries; or else ordinary oil lamps that have been some time in common use would be used for the oil. When the Defries lamp, using oil at 8d. per gallon, is compared with the best gas-burners, it will be seen that it is about on a par in regard to cost with ordinary gas at 4s. 6d. per 1000 cubic feet, and this without making any allowance for the extra trouble and attention which it will hardly be disputed is unnecessary in the case of oil. So much for the claims as to the economy of oil. It can be as readily shown that the claim for its superiority are equally as disingenuous, specious, and illusory in their nature.

It was stated that a much steadier light could be obtained from oil than from gas; and the manner in which this point was set forth would lead the listener to believe that owing to some inherent defect, it was impossible to obtain a perfectly steady light by

means of gas. The real facts of the matter are that a flame, whatever its source—whether gas, oil, or candle—will be steady or otherwise according as it is exposed or protected from draughts of air. Expose an oil-flame to the same circumstances as those which obtain in the case of a naked fishtail gas-burner, and it will flicker and smoke to a much greater extent; the oil-flame being much more sensitive to atmospheric influences than the gas. Protect the gas-flame by means of suitable shades, &c., and the light will be perfectly steady. It is almost superfluous to state that if a perfectly steady gas-flame is required, any respectable gas-fitter, who understands his business, would know how to meet the requirement.

The statement that no form of gas-burner has yet been constructed that will perfectly consume all the carbon or sulphur in gas is simply untrue. Can Mr. Defries or anyone else prove the production of unconsumed sulphur from coal gas? This, however, is a matter of no moment, seeing that the quantity of sulphur present is infinitesimal, about one part in 3000, and therefore of no more consequence than the striking of a match tipped with sulphur. As to the escape of unconsumed carbon, this may occur if the flame is left exposed to draught or is otherwise improperly treated. Under proper conditions of use, a gas flame is, if anything, much less likely to give off soot or smoke than an oil-lamp. It is quite true that flowers will not flourish in small rooms where ordinary gas-burners are used; but we have yet to learn that, where modern improved burners are employed, the same effects are noticeable. In any case it is more a question of ventilation, than of the use of gas. Mr. Defries conjures up an appalling vision of a grand sum total of headaches, dyspepsia, and other human miseries, which he hardly asserts are due to the use of coal gas as an illuminant; but on this point, however, proof is wanting. As compared with gas, he claims that oil will not vitiate the air to any appreciable extent; but let us examine the facts. Oil, like gas, consists of carbon and hydrogen; and goes to form water vapour and carbonic acid in the act of combustion. Assuming proper precautions are observed in selecting suitable apparatus, the conversion into these substances will be practically complete. At any rate, we know it is so in the case of coal gas, having seen chimneys of regenerator burners that have been in use for weeks, without the slightest particle of carbon or dust in them. Taking the pint of oil above alluded to, the weight will be about 1½ lbs. Since hydrogen is so light, it only represents a small percentage by weight, and therefore the bulk of this consists of carbon, so it is evident that the pint of oil when burnt will evolve about 3 lbs. or some 25 cubic feet of carbonic acid; whereas 90 cubic feet of gas will weigh something under 3 lbs., of which about three-fourths will consist of carbon, giving a result of rather more than 6 lbs. of carbonic acid. Even with Mr. Defries's excessive estimate, the vitiating effect of coal gas will only be about double that of oil; but if the consumer, desiring to have as pure an atmosphere as possible, elects to take advantage of modern improvements, he can have the same amount of light, as we have seen, with an expenditure of only one-fourth the quantity of gas. By so doing, he reduces to a corresponding extent the vitiating effect on the atmosphere of the room in which the light is used, or to about one-half of that obtaining in the case of oil, thus proving a claim that has repeatedly been advanced on behalf of gas, and never been refuted—viz., that, light for light, gas vitiates the air to a less extent than any other illuminant.

Weight for weight, it is evident that oil will require a smaller quantity of oxygen than gas for complete combustion, because it contains less hydrogen; and that whereas with the oil, carbonic acid is the principal product, there will with gas be also a considerable proportion of water vapour. Approximately it may be said that oil requires twice its weight, and gas three times its weight of oxygen for complete combustion. Oil gives off about three times its weight of carbonic acid, and gas about twice its weight; the remainder of the oxygen coming off as harmless water vapour. This is sufficient to show that any prejudices as to the use of oil allowing a pure atmosphere to obtain, while the use of gas under precisely similar circumstances would render it impure and unwholesome, have no foundation in fact. The public have now used gas for half a century or more, and if the poisonous properties so eloquently dilated upon by Mr. Defries had any real existence, they would long ago have found them out and discarded that means of illumination in consequence. Whether they use gas, oil, or electricity, there is need for improving the ventilation of ordinary domestic apartments; and this is the direction in which to look for improved health, &c., rather than in the substitution of one illuminant for another.

THE THREE-LIFT HOLDER FOR SYDNEY GAS-WORKS.

DESIGNED AND CONSTRUCTED BY MESSRS. C. & W. WALKER,
ENGINEERS, OF LONDON AND DONNINGTON.

DESCRIPTION OF DRAWING No. 2.

This is the general drawing of the guide-framing, giving the position of the joints in the standards, &c. One bay only is shown, as the remaining 21 bays are exactly the same. The pitch of the lattices, and sizes of the iron used, are given throughout; likewise the exact lengths for the diagonal ties, &c.

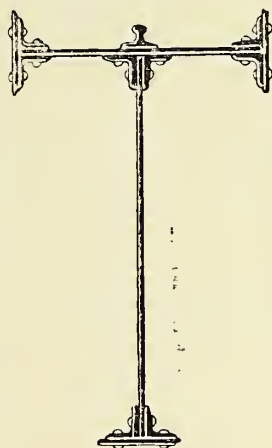
It will be noticed that the standard tapers from 7 ft. to 2 ft. 6½ in. in the back member; and from 4 ft. 6 in. to 1 ft. 11½ in. in the front. The guide-rail forms part and parcel of the standard; and therefore assists in strengthening the standard. The total height of the standard is 122 ft. 0¼ in. above the base. It is made in five

lengths—the bottom being 22 feet long over all; the top, 24 feet; and the intermediate, 25 feet. These are handy lengths for shipping and for erection. If the holder had been erected in England probably the standard would have been in about 30 feet lengths; and thus reduced the number of joints.

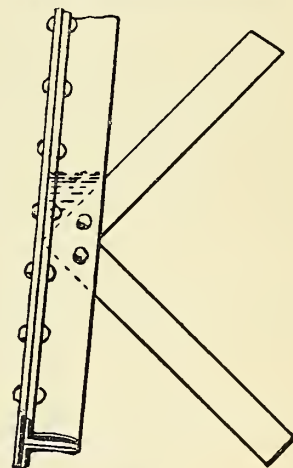
It will be noticed that the same size angle-irons are used for the full height of the standard. This is for convenience. Theoretically they might be reduced somewhat in section as they rise; but it would complicate the work to be done on them. Beyond the taper, the only reduction in weight as the structure rises is in the lattices and tee-iron cross-struts. The former are reduced in three stages, and the latter in two stages; the riveting being the same throughout.

This same drawing No. 2 also shows the detail of the cast-iron base upon which the standard rests. The standard is bolted down firmly to the cast-iron base with twenty 1½-inch bolts passing through the stout wrought-iron plate and angle-irons; so that the casting is made one with the standard. In order to secure a good level bed, the top face of the casting is planed perfectly level; and the whole is then bolted down to the tank pier by the four holding-down bolts previously described. The round holes shown in the base are hand-holes for putting the bolts in by. The base is filled solid with concrete after erection through these holes.

In standards of T-section, it is very common to add a table-plate to the two angle-irons, forming each flange as in sketch "C," instead of two angle-irons only. This is much more costly than the plan adopted, as the table-plates have to be riveted all the way up to the angle-irons, so that there are six lines of rivets extra, extending the whole height of the standard. Again, it makes little recesses for the rain water to settle in at the joints of the lattices (as indicated in sketch "D"), which is objectionable, and



C.



D.

tends to rust away the standard; whereas if only two stout angle-irons are adopted, the way between them is open right through, and no water can lodge. The latter is also easier to paint. Therefore, when the two angle-irons are sufficiently wide for lateral stiffness, it is much better to avoid using table-plates—even leaving economy out of the question. Sometimes the spaces between the angle-irons, &c., are cemented up, to exclude the water.

The objection to tee-iron being used for the flanges is that it lacks lateral stiffness, being narrow on the table. It also puts all the rivets in single shear; thereby weakening the attachment of lattices, &c., and requiring more rivets. More rivets than are necessary for the work are mischievous, as they weaken the structure by cutting away material, beside causing needless expense.

SAFFRON WALDEN CORPORATION WATER-WORKS.—Owing to the hardness (25°) of the water obtained from their works, the Saffron Walden Corporation have decided (under the advice of their Consulting Engineer, Mr. Jabez Church, M. Inst. C.E.) to put up a softening plant, so as to reduce the temporary hardness of the water to 5° or 6°. A Local Government inquiry has already been held; and a loan for this purpose has been granted. The contract for the necessary plant and alteration to the existing works—amounting to £2237—has been let to the National Pure Water Engineering Company, Limited.

CREOSOTING TIMBER.—A zinc creosote process for preserving timber is described in the recently-published volume of "Proceedings of the Institution of Civil Engineers." The experiments from which the data have been obtained are from the observations of Mr. J. P. Caird, an American engineer. After the timber has been prepared in the usual way by steaming and vacuum, dead-oil is run into the cylinder; and so much as may be desired is forced into the wood—half a gallon of oil (or less) to each cubic foot of timber being about the quantity required. The oil is then withdrawn from the cylinder, which is charged with chloride of zinc; and this by pressure is forced into the timber through and beyond the oil. In this way the wood receives the advantage of the dead-oil treatment with the expenditure of one-half, or less, of the usual proportion of oil; and the chloride surrounded by the oil is protected for a lengthened period against moisture. It is stated that this process gives the best result for the money invested.

MODERN DIVINERS EXPOSED.

IN the JOURNAL for Sept. 25, there appeared an article upon the use of the divining rod for finding underground water, in which, after stating some general testimony in support of our proposal to treat the subject in all seriousness, as a matter suited for discussion in a technical publication, we narrated some personal experiences of the manipulation of the rod by Mr. John Stears, of Hull. We then related how, on the occasion of the meeting at Lisburn of the North of Ireland Association of Gas Managers, Mr. Stears astonished the members and their friends by showing, on the indications of a freshly-cut forked hazel twig, which moved in his hands, but apparently without his own volition, the position of the gas and water mains in the high road. Further than this, our testimony did not go. We maintained a particular degree of reserve in commenting upon the exhibition; being careful only to vouch for the actuality of the phenomena brought about through the instrumentality of Mr. Stears, and intimating that further investigation of the mysterious faculty alleged to be possessed by him and by other "diviners" was very desirable. In the same issue of the JOURNAL, and as a footnote to the article referred to, was recorded the contemporary fact of the employment of a diviner named Mullins to discover the best place to sink a well for the supply of the new workhouse at Hastings. Confirmation of Mr. Mullins's indication has not yet come to hand. In the following number of the JOURNAL (Oct. 2), will be found some further communications on the subject; comprising a reprint of a leading article published in the *Morning Post*, and of a batch of correspondence that originally appeared in the columns of the same newspaper. From time to time since then, we have had occasion to mention the subject under various circumstances; for there has seemed to be during the last few months a distinct revival of interest in, and experiments with, the divining-rod, and the matter has been discussed in several prominent newspapers—*Truth* among the number. This recapitulation is necessary to explain the condition of affairs in connection with modern users of the divining-rod up to about a week ago.

One of the correspondents of the *Morning Post* was Mrs. Louise Cotton, a lady who made no secret of her fancy for the so-called "occult" arts of palmistry and astrology, and evidently had a desire to take "rhabdomancy" under her wing. She accordingly issued a public notification of her desire to test the pretensions of such modern diviners as chose to come forward for the purpose; and having secured promises of attendance from four of the class—William Scott Lawrence, described as a stone merchant, living in the neighbourhood of Bristol; John Stears, gas engineer, of Hull; Charles Holt, signalman at Redmile Station (Leicestershire) on the Great Northern Railway; and Alfred Allen, son of a farmer, of Abergele, North Wales—Mrs. Cotton arranged for a demonstration last Saturday week before a small and select body of interested witnesses assembled at the house of Captain Nisbet, "Hollywood," South Kensington. The grounds of Hollywood are admirably suited for the purpose; the garden being about half an acre in extent, and containing somewhere an old well, first dug in 1809, the exact situation of which was only known to Captain Nisbet, who was no believer in the diviners or their art. The programme was that the position of this well should be found, if possible, by the diviners. They one and all accepted the challenge, with the single qualification that, as the rod was supposed to be affected only by running water, they might not be able to hit upon the well itself—the water in which would, of course, be stagnant—but would trace the course of the spring or springs from which the well was fed. This was the order of the day; but what really took place will be found described at length in the report of the representative of *Truth*, which we cannot improve upon, and accordingly reproduce in another column. We endorse from personal observation every line of this statement, which is an unvarnished record of the facts. Not one of the diviners gave the faintest indication of the neighbourhood of the well, although three of them were actually taken over the spot by Captain Nisbet, and all of them passed round about it, in "full cry," many times. They all gave indications of water, after their respective manners, in different parts of the grounds; but they never agreed, except in the vicinity of very obvious hydrants, and from the comments which they offered upon each other's performances, we formed the opinion that they did not put much faith in one another. Mr. Stears found so many indications of water under the grass plots and garden walks, that the ground would have had to be riddled like a rabbit warren to test their truth; but although his twig worked well over a purse, which he said contained a penny and placed on the ground to demonstrate the contrary action of the rod over metal as contrasted with its movement over water, he failed to find a lump of iron purposely trodden into the grass by one of the spectators, although he walked upon it three times. Both Mr. Stears and Mr. Lawrence had indications of water upon revisiting spots which they had previously passed over without any sign; thus leaving it to be inferred that observation of the surroundings may have had something to do with the correction of their earlier divinations. Mr. Stears walked once in silence over the spot between the water-tank and hydrant mentioned in the *Truth* report as the place where Mr. Lawrence became so convulsed; but after seeing Mr. Lawrence perform in this way, Mr. Stears's rod became very sympathetic in the same neighbourhood. The net result of the garden tests, therefore, was disappointment. The diviners declared for the existence of water in many places where Captain Nisbet denied its presence; and they did not discover the well, or even detect the fact that an iron pipe full of water ran straight across the central grass plot, from

one hydrant to another. It was, of course, impossible to say that water did not exist, at any depth, at the spots indicated by the diviners. Indeed, the subsoil of this part of Kensington being gravel, it is more than probable that a well sunk anywhere upon Captain Nisbet's property to the same depth as the actual one—25 feet—would collect water. The diviners did not say anything to this effect, however, nor attempt to explain their failure not only in finding the well, but also in ascertaining the existence of any springs or water courses going to feed it.

When darkness put an end to the experiments in the garden, the company adjourned to the house, where, as the *Truth* reporter tells, Mr. Stears conspicuously broke down over an attempt to find by divination five sovereigns hidden under the cover of a book placed among others on a table. After this incident, Mrs. Cotton read a short paper of a rather rhapsodical cast, in which the genuineness of indications of the rod were taken for granted. Asked afterwards whether she could not have worded her paper differently if she had known that the diviners would fail to satisfy the test conditions accepted by themselves, the lady allowed it to be understood that her faith in the rod was unshaken by the failure of its professors. This was also the state of mind of several of the company, who came with a distinct predisposition in favour of astrology, spiritualism, and similar eccentricities. The matter-of-fact order of spectators, who, like Captain Nisbet himself, began by thinking the whole notion unaccountable and outrageous, but who were yet disposed to give the professors of divination every advantage that they could fairly claim, were left by the experiments with a confirmed belief that the thing is gross humbug. It should be recorded that before the proceedings came to an end on Saturday, a further trial was made of Mr. Stears's powers, with his own consent, the result of which was to still more effectually dispose of his claims in this regard. He stated that he could find any substantial mass of metal; but, remembering his previous failure, he objected to coin. Accordingly a 2 lb. iron weight was procured from Captain Nisbet's kitchen; and when held openly in the hand before Mr. Stears, his rod was strongly affected by it. He expressed himself as being quite satisfied with the object; and all could see that his own powers, whatever they were, had not suffered any deterioration. The weight was then hidden in the drawing-room by one of the company, who also hid 18s. in silver inside a lady's muff lying on an occasional table. Unknown to this gentleman another spectator placed a huge old-fashioned iron doorkey quite openly between the leaves of a book, in such a way that half of its length stuck out. This book and key lay upon a small table standing in a rather dimly lighted part of the room; so that no one would be likely to notice the key unless his attention was directed to it. Mr. Stears then began his search; and although his rod was strongly affected in the neighbourhood of the piano, on account, as he said, of the wires, and also when held over an ottoman obviously provided with metal springs, he failed to detect either the 2 lb. weight, or the heap of silver coin, or the key, although he was repeatedly taken near these objects, and was almost in contact with the last two or three times. This experiment concluded the "business" of the day.

Altogether, we regard last Saturday's doings as extinguishing the reputation of the diviners implicated, and inflicting a deadly blow upon the divining art itself. We do not deny that all the diviners had testimonials from respectable witnesses, who declared that they had succeeded in many instances named; and we do not wish to imply that they are all conscious and deliberate impostors. It is possible for them to believe in themselves to some extent; although, as already remarked, those collected by Mrs. Cotton did not show any great faith in each other. All the same, we hold from Saturday's tests that there is absolutely nothing in the so-called art of divination for water or metals by the rod worthy of the attention of sensible people. One failure in a matter of this kind is more significant than many recorded successes; for one never knows all the circumstances of the successes, nor can discover how far occult art was likely to be aided by more ordinary resources. When the Psychical Society investigated this matter of divination for water, they decided (as recounted by the Honorary Secretary, Mr. Frank Podmore, on Saturday week) that, to be trustworthy, the positive indications of a diviner should be checked by negative indications upon the same authority. For example, it is not sufficient for a diviner to declare that water will be found in a certain spot; he should also be able to indicate a spot where water will not be met with. Otherwise, there is room for the objection that the prediction relating to an underground spring may be mere guesswork, or at best a guess fortified by trained observation and knowledge of the ground. The Committee of the Psychical Society acted upon this principle in their experiment. They employed a diviner, who assured them that water would be found in one part of a certain field, and not in another; but when they had wells sunk in the two places, they found water in both—which, indeed, was to have been expected from geological considerations. The conclusion to be drawn from this experiment of the Psychical Society is precisely the same that follows from Saturday's demonstrations. It will not be shaken even though the Hastings Guardians, who are now sinking for water under the directions of Mullins—a diviner who did not accept Mrs. Louise Cotton's invitation for Saturday—should obtain their desired supply; since in this event there will be nothing to prove the non-existence of water in other parts of the site at their disposal. There exist tens of thousands of people in all grades of the community, however, who cannot or will not weigh evidence

Technical Record.

THE ACCOUNTS OF GAS UNDERTAKINGS.

By ALFRED LASS, F.C.A., Assoc. Inst. C.E.

Last Tuesday evening, Mr. ALFRED LASS, F.C.A., read a paper before the Chartered Accountants' Society in London, taking for his subject "The Accounts of Gas Undertakings, especially in relation to Reserve, Insurance, Sinking, and Depreciation Funds; and the Legislation affecting the same." The paper was as follows:—

The application of coal gas as an illuminant appears to have been discovered in 1792 by William Murdoch, a Scotchman; and the first public display of gas lighting was made in 1802. The first public Company connected with gas lighting was projected in 1807, with the object of obtaining a Royal Charter. The promoter of the Company—F. A. Winsor—desired to raise a capital of one million sterling, and to secure the exclusive privilege of gas lighting in all the British possessions; but being unable to acquire a Charter until an Act of Parliament had been obtained, an application was made in 1809 to incorporate the National Light and Heat Company with a capital of half-a-million sterling, and an exclusive privilege of lighting with gas the whole of London, which application was defeated by Murdoch on the ground of priority in the discovery of the use of gas for lighting purposes. The following year—1810—the Company again applied to Parliament to be incorporated as the London and Westminster Gaslight and Coke Company, with a capital of £200,000, when, after much opposition, they succeeded in obtaining an Act of Incorporation; and two years later—1812—the King granted a Royal Charter, from which period, for nearly 60 years, the Company was called the Chartered Gaslight and Coke Company.

Between 1816 and 1819, applications were made to Parliament by the City of London, the Exeter, Edinburgh, Liverpool, Leeds, Sheffield, and other Gas Companies for statutory powers to supply gas; and from thenceforward to the year 1845 similar applications were almost continuous. During the whole of this period—viz., from 1812 to 1845—all the clauses relating to the authorization of works for making gas and the constitution and management of gas companies were inserted *in extenso* in each Special Act; but in 1845 and 1847 the inconvenience arising from this cumbersome mode of drawing Special Acts was remedied by the passing of the following General Acts, viz.—

"An Act for consolidating in one Act certain provisions usually inserted in Acts with respect to the constitution of companies incorporated for carrying on undertakings of a public nature," commonly called: "The Companies Clauses Consolidation Act, 1845;"

"An Act for consolidating in one Act certain provisions usually inserted in Acts authorizing the taking of lands for undertakings of a public nature," commonly called: "The Lands Clauses Consolidation Act, 1845;"

"An Act for consolidating in one Act certain provisions usually contained in Acts authorizing the making of gas-works for supplying towns with gas," commonly called: "The Gas-Works Clauses Act, 1847;" and

"An Act for consolidating in one Act certain provisions usually contained in Acts for paving, draining, cleansing, lighting, and improving towns," commonly called: "The Towns Improvement Clauses Act, 1847."

These Acts are now incorporated in Special Acts *by reference* only.

General legislation affecting gas supply therefore commenced in 1845 and 1847, since which period the following General Acts, directly or indirectly affecting gas supply, have also been passed, viz.—

Sale of Gas Act	1859
" Amendment Act	1860
Metropolis Gas Act	1860
Lands Clauses Consolidation Acts Amendment Act	1860
Metropolis Gas Amendment Act	1861
Companies Clauses Act	1863
Sale of Gas (Scotland) Act	1864
Companies Clauses Act	1869
Gas and Water Works Facilities Act	1870
Gas-Works Clauses Act	1871
Municipal Corporations (Borough Funds) Act	1872
Gas and Water Works Facilities Act, 1870, Amendment Act	1873
Conspiracy and Protection of Property Act	1875
Public Health Act, 1875 (Gas Supply)	1875
Burghs Gas Supply (Scotland) Act	1876
Lands Clauses (Umpire) Act	1883

The above-mentioned Acts should be carefully read and studied; it being quite impossible within the limits of this paper to set out their effect and scope. Some reference will, however, be made to the Companies Clauses Consolidation Act, 1845, the Gas-Works Clauses Act, 1847, the Metropolis Gas Act, 1860, and the Gas-Works Clauses Act, 1871.

The consideration of the subject of this paper will now be proceeded with in the following order, viz.—

A.—The history of the form of accounts set out in Schedule B to the Gas-Works Clauses Act, 1871; and the application of

in this manner; but if they are so inclined by nature will accept the slenderest bit of positive testimony as outweighing any amount of negative evidence. The divining-rod is only one of the superstitions which are cherished in the present age by people who, though they breathe the atmosphere of our modern civilization, are not of it. Words of comment fail before such a combination of the ancient and modern as a diviner with the rod who is also a signalman of the Great Northern Railway. Moabitish necromancy and the most unromantic of modern callings unite in one person, who, poor man, does not suspect what genealogy belongs to his magician half! Not all the roar and bustle and exactitude of the railway service could prevent the resurrection in Holt's signal-box of the oldest of all known departments of magic. This is a wonderful thing to think of; but it is a line of thought that we cannot enter upon. We have regarded it as a duty to our readers that, having introduced to them the subject of divination in connection with water supply, we should complete the matter by faithfully recounting last Saturday week's experiments.

INSTITUTION OF CIVIL ENGINEERS.—Last Tuesday the ordinary meeting of the Institution was held, under the presidency of Sir George B. Bruce. The first ballot for the session 1888-89 took place, and resulted in the election of 18 members, 87 associate members, and 4 associates. In the first category, we notice the name of Mr. William Davidson, of the Melbourne Water-Works office. Among the associate members elected was Mr. F. S. Cripps, whose articles on "The Guide-Framing of Gasholders" (recently published in the JOURNAL, and now being revised for publication in book form) have been so favourably commented upon at several recent meetings of District Associations of Gas Managers.

THE QUALITY OF THE SOUTH-WEST SUBURBAN WATER COMPANY'S SUPPLY.—Mr. Pickersgill gave notice in the House of Commons, on Thursday last, that on Monday he would ask the President of the Local Government Board, whether complaints had reached him of the bad quality of the water supplied by the South-West Suburban Water Company, who carry on business outside the Metropolis, by virtue of a Private Act of Parliament passed in 1883; and whether there is any power either in the Local Government Board or in any Local Authority to inspect the works of the Company, or in any way to take steps to ensure the purity of the supply, and, if not, whether he will consider the propriety of conferring on extra-metropolitan districts securities similar to those provided for the Metropolis by section 4 of the Metropolis Water Act, 1852, and sections 35 and 36 of the Act of 1871.

LONDON COAL DUES.—In the House of Commons last Tuesday, the President of the Local Government Board was questioned by Mr. Pickersgill as to whether on the expiration of the Metropolitan Coal Dues in July next, there will remain an unappropriated surplus of about £100,000; and, if so, whether the Government will consult the County Council for London before they make any proposals to Parliament as to the disposition of this surplus. Mr. Ritchie, in reply, said he understood that the sum payable in respect of the freeing of the bridges which will fall on the coal and wine dues for the year ending July 5, 1889, was about £350,000. He had no reason to doubt that the coal and wine dues would exceed this sum by £100,000. The Government would be prepared to consider any representations on the subject which might be made to them by the County Council of London.

THE VYRNWY WATER-WORKS.—The impounding of the waters of the artificial Lake Vyrnwy, in Llanwddyn Valley, for the supply of Liverpool, is now in operation. Two of the three valves through the embankment are closed; the remaining valve being open only to the extent of 5 inches for the supply of compensation water along the river bed. Last Tuesday the waters had reached the height of about 30 feet above the bottom of the invert of the discharge tunnels. The effect of this is to cover the village road running from the south-east side of the valley to the north-west side near the old village of Llanwddyn, the houses of which are now nearly all demolished. Some considerable time must, however, elapse before the site of the village is completely submerged by the vast lake, which will eventually be 4 miles in length. Mr. Alderman Bower was able to announce, at the meeting of the Liverpool City Council on Wednesday, that the water was $3\frac{3}{4}$ miles up the lake, which was filling very rapidly.

PRESENTATION TO MR. J. F. BROMLEY.—Last Friday night Mr. J. F. Bromley, the newly appointed Manager of the Batley Corporation Gas-Works, was made the recipient of a valuable marble timepiece and a couple of bronzes to match, from the gas-fitters of the Bolton Corporation, as a mark of their respect and esteem on his leaving Bolton after 30 years' connection with the gas-works—he having began as a fitters' boy, and gradually worked his way up until he held the position of Assistant Manager, as well as Gas Analyst and Superintendent of the Fittings Department. The gathering took place at the Fleece Hotel, Bolton. The company (numbering about 30) that sat down to dinner included Alderman Miles, J.P., the Chairman of the Gas Committee, and who presided at the subsequent proceedings; the vice-chair being occupied by Mr. H. Eccles. In making the presentation on behalf of the men, Alderman Miles referred to the marked ability shown by Mr. Bromley whilst in the service of the Corporation. Mr. Bromley, in acknowledging the gifts, said that whatever he had done under the Corporation, he had always done with the view of studying the interests of those from whom he received his commission, and also of those who were under him.

that Act to those gas companies whose Special Acts incorporate the Gas-Works Clauses Act, 1847.

- B.—The appropriation of the profits of gas undertakings; the formation of the reserve fund; and the powers of gas consumers under the Gas-Works Clauses Act, 1847; the introduction of the auction clauses and sliding scale; the appropriation thereunder of the profits; and the formation of insurance and reserve funds.
- C.—Legislation affecting gas undertakings in the hands of local authorities; the appropriation of the profits; and the formation of sinking and reserve funds.
- D.—Repairs, renewals, and depreciation, showing the principle upon which the calculation for renewals is based.
- E.—Capital and revenue charges; showing the principle to be applied in allocating the same.
- F.—Sinking funds for the redemption of gas-works in the hands of local authorities, or for paying off borrowed capital.
- G.—The appointment and duties of auditors, and the audit of gas accounts by an official auditor, as defined by the Acts of Parliament relating thereto.
- H.—General remarks.
- A.—*The History of the Form of Accounts set out in Schedule B to the Gas-Works Clauses Act, 1871, and the Application of that Act to those Gas Companies whose Special Acts incorporate the Gas-Works Clauses Act, 1847.*

Under the Gas-Works Clauses Act, 1847, each gas company is required to transmit to the Clerk of the Peace yearly an account in abstract of the total receipts and expenditure under the "several distinct heads," with a statement of the balance of such account duly audited and certified; but no form of account is prescribed. It was not until the passing of the Metropolis Gas Act, 1860, that power was given to the Secretary of State to issue a form in which the accounts of the Metropolitan Gas Companies should be kept, and for the year ended Dec. 31, 1862, the accounts of the Metropolitan Gas Companies were presented to both Houses of Parliament in the form prescribed by the Secretary of State, which, in course of time, was enlarged and improved, until shortly before the passing of the Gas-Works Clauses Act, 1871, it became similar to that which is contained in Schedule B to that Act.

By section 35 of the Gas-Works Clauses Act, 1871, the undertakers are to forward to the local authority in each year an annual statement of accounts as near as may be in the form, and containing the particulars specified in Schedule B. The Board of Trade, with the consent of the undertakers, may alter the said forms for the purpose of adapting them to the circumstances of the undertaking, or of better carrying into effect the objects of the section.

Very shortly after the passing of the Gas-Works Clauses Act, 1871, a question arose whether that Act had a retrospective action with regard to those companies whose Special Acts incorporate the Gas-Works Clauses Act, 1847; and in the case of the *Dudley Gas Company v. Warmington*,* the Court decided that the effect of section 3 of the Gas-Works Clauses Act, 1871, together with section 49 of the Gas-Works Clauses Act, 1847, made the provisions of the Gas-Works Clauses Act, 1871, applicable to companies whose Special Acts incorporate the Gas-Works Clauses Act, 1847. Accordingly all gas companies which are subject to the Gas-Works Clauses Act, 1847, are also subject to the Gas-Works Clauses Act, 1871, and are bound (*inter alia*) to keep their accounts in accordance with the form set out in Schedule B to that Act.

- B.—*The Appropriation of the Profits of Gas Undertakings; the Formation of the Reserve Fund and the Powers of Gas Consumers under the Gas-Works Clauses Act, 1847; the Introduction of the Auction Clauses and Sliding Scale; the Appropriation thereunder of the Profits; and the Formation of Insurance and Reserve Funds.*

Companies regulated by the Companies Clauses Consolidation Acts, 1845 and 1863, and the Gas-Works Clauses Act, 1847, are authorized to allot new or additional share capital amongst the shareholders *pro rata* at par, to convert loan capital into share capital, to pay dividends not exceeding the authorized maximum rate, and to appropriate the profits in a certain manner, which appropriation is as follows, viz.:—

- (1) In payment of a dividend at the rate prescribed by the Special Act; and where no rate is so prescribed, 10 per cent.

Note.—Income-tax in addition to the prescribed rate cannot be paid.

- (2) In making up a deficiency in the dividends of any previous year.

Note.—By section 2 of the Metropolis Gas Act, 1860, the payment of back dividends by the Metropolis Gas Companies is limited to six years. Some gas companies have the dividend on portions of their capital limited to the profits of the year. Other gas companies have practically no limitation, and can go back to the date of their Act of Incorporation.

- (3) In the formation of a reserve fund, as follows:—"If the clear profits of the undertaking in any year amount to a larger sum than is sufficient, after making up the deficiency in the dividends of any previous year, to make a dividend at the prescribed rates, the excess beyond the sum necessary for such purpose shall from time to time be invested in Government or other securities; and the dividends and interest arising

from such securities shall also be invested in the same or like securities, in order that the same may accumulate at compound interest until the fund so formed amounts to the prescribed sum; or, if no sum be prescribed, a sum equal to one-tenth of the nominal capital of the undertakers, which sum shall form a reserved fund to answer any deficiency which may at any time happen in the amount of divisible profits, or to meet any extraordinary claim or demand which may at any time arise against the undertakers; and if such fund be at any time reduced, it may thereafter be again restored to the said sum, and so from time to time as often as such reduction shall happen."

- (4) In the reduction of the price of gas.

Gas consumers, therefore, have a direct interest in the proper management and conduct of gas undertakings; and the Legislature has, in section 35 of the Gas-Works Clauses Act, 1847, provided the necessary machinery enabling consumers to apply to the Court of Quarter Sessions for the appointment of an accountant or other proper person to ascertain the actual state and conditions of the concerns of the undertakers, should they consider it necessary so to do. The machinery thus provided has on various occasions been set in motion; but the result has not at all times been satisfactory. One of the most recent cases under this section is that of the *Queen v. The Recorder of Hanley*, relating to the inquiry into the affairs of the British Gaslight Company, which came before the Lord Chief Justice and Justice Denman in the Queen's Bench Division of the High Court of Justice, in July, 1887.* In this case their Lordships found that the Recorder of Hanley had exceeded his jurisdiction in making an order for a reduction in the price of gas, inasmuch as he was obliged to go back over several years to obtain justification for the order. If, said their Lordships, a gas company have not afforded grounds for such an order in the year to which the inquiry is legally directed, the order cannot be made. The inquiry may extend beyond the year, so far as the mere examination of the accounts is concerned; but it is only upon the revenue and position of the company in this particular year that an order can be made.

There is one other point in connection with the appropriation of profits which ought not to be overlooked. Section 122 of the Companies Clauses Consolidation Act, 1845, provides that—"Before apportioning the profits to be divided among the shareholders, the Directors may, if they think fit, set aside thereout such sum as they may think proper to meet contingencies, or for enlarging, repairing, or improving the works connected with the undertaking or any part thereof, and may divide the balance only among the shareholders." It is stated, on good authority, that this clause is inoperative, as the reserve fund of the Gas-Works Clauses Act, 1847, takes the place of the contingency fund of the Act of 1845, and is limited to 10 per cent. on the nominal capital. On the other hand, it is contended that, as the above section has not been repealed by the Gas-Works Clauses Act, 1847, except by implication, it is still operative. If this be so, there is no reason why the profits should not be so reduced by the formation of the contemplated contingent fund as to defeat the object of Parliament, and render it impossible either to create the reserve fund authorized by the Gas-Works Clauses Act, 1847, or to reduce the price of gas. In practice, however, the clause is but seldom acted upon, and then only to a limited extent.

Since 1847, the dividends on new share capital have been limited to $7\frac{1}{2}$ per cent. and 7 per cent.; and in some cases even to a lower rate. Since 1873, the conversion into share capital of borrowed money authorized subsequent to that date has been subjected to a limitation of dividend not exceeding 5 per cent. And since 1877, gas companies have been altogether deprived of the power to allot new share capital amongst the shareholders *pro rata* at par, by the introduction of what are known as the "auction clauses." The Standing Order adopted by both Houses of Parliament in 1877, relating thereto, is as follows, viz.:—"In every Bill by which an existing gas company is authorized to raise additional capital, provision shall be made for the offer of such capital by public auction or tender at the best price which can be obtained, unless the Committee on the Bill shall report that such provisions ought not to be required, with the reasons on which their opinion is founded."

Although shareholders thereupon ceased to have an interest in the issue of additional capital, yet a new and somewhat novel interest was created by the discretionary power given to Committees to insert in all Gas Bills what is known as the "sliding scale," or in the words of the rider attached to the Standing Order—"So to regulate the price of gas to be charged to consumers that any reduction of an authorized standard price shall entitle the company to make a proportionate increase of the authorized dividend, and that any increase above the standard price shall involve a proportionate decrease of the dividend."

The model clauses relating to the sale of shares by auction or tender, the application of the premiums, the sliding scale, the appropriation of the profits and the creation of insurance and reserve funds, can be seen on reference to the Special Gas Acts passed since 1877 authorizing the raising of additional capital, the practical effect of which is as follows:—

- (A) Instead of new capital being allotted to the shareholders *pro rata* at par, it must be sold by auction or tender; and the premiums arising therefrom (after deducting the expenses of, and incident to such issue) are not to be considered as

* See JOURNAL, Vol. XXXV., p. 877; Vol. XXXVII., p. 479.

* See JOURNAL, Vol. L., pp. 82-87.

profit, but are to be expended in extending or improving the works of the company, or in paying off borrowed money, and are not to be considered as capital entitled to dividend.

- (B) Instead of a maximum price, there is a standard price; and instead of the dividends being governed by maximum rates, they are governed by standard rates; the effect of which is that, for every penny of increase or decrease in the standard price, there shall inversely be an increase or decrease of 5s. per cent. in the standard rates.
- (C) Instead of power to create out of the profits of the undertaking a reserve fund equal to one-tenth of the nominal capital of the company to provide for the payment of dividends in case of a deficiency in the amount of the divisible profits, and to meet any extraordinary claim or demand, there is power given to create two funds—viz., an insurance fund and a reserve fund.

The insurance fund (the creation of which is optional) is made up out of the profits of the undertaking in manner directed, and is limited to 1-20th of the paid-up capital of the undertaking, and is to meet any extraordinary claim or demand which may at any time arise from accidents, strikes, or other circumstances, which due care and management could not have prevented; but the reserve fund, instead of being made up out of the profits of the undertaking in the usual way, is made up out of the dividends payable to the shareholders in excess of the standard rates—i.e., assuming the shareholders (in consequence of the price charged for gas being, say, 8d. per 1000 cubic feet below the standard price) to be entitled to an increase of 2 per cent. above the standard rates of dividend, they may, if they think fit, carry to the reserve fund the whole or any portion of such 2 per cent., instead of dividing it amongst themselves. The creation of the reserve fund is therefore also optional, and (in nearly all cases) unlimited; but no reserve fund can be created until after the shareholders have received dividends at the standard rates. Supposing the shareholders, in the exercise of the option thus given, should set apart the whole or some portion of the excess dividends to which they are entitled, then such portion so set aside, together with any reserve or other fund of the company existing at the date of the passing of the company's Special Act, must be invested, and allowed to accumulate at compound interest, forming one fund to be called the reserve fund, which fund is to be applicable to the payment of dividend in any year in which the clear profits of the undertaking shall be insufficient to enable the company in such year to pay dividend at the authorized rates. In some of the Special Acts containing the model clauses, the reserve fund is to provide for any deficiency in the *authorized* rates, and in others to provide for any deficiency in the *standard* rates; but why in some cases it should be called "authorized," and in other cases "standard" does not appear. It should uniformly be either one or the other.

Again, the model clauses are somewhat defective, as they exhaust the whole of the profits of the undertaking without providing for the payment of the excess dividend—as follows:—"If the clear profits of the undertaking of the company in any year amount to a larger sum than is sufficient to pay dividend at the standard rates on the ordinary stock of the company, the excess or such portion of it as is not carried to the insurance fund shall be carried to the credit of the divisible profits of such undertaking for the next following year." This should be amended in the following manner:—"The excess or such portion of it as is not carried to the insurance fund shall, *subject to the payment of the excess dividends if any*, be carried to the credit of the divisible profits of the undertaking for the next following year."

Under section 35 of the Gas-Works Clauses Act, 1847, already referred to, machinery is provided for enabling consumers to apply to a Court of Quarter Sessions for the appointment of an accountant, or other proper person, to ascertain the actual state and conditions of the concerns of the undertakers; and in certain circumstances, a Court of Quarter Sessions has power to order a reduction in the price of gas. But an amended clause, to meet the altered circumstances under the sliding scale appears in a Special Act passed in 1887, a portion of which clause is as follows:—"If it appear to the Court that the profits of the company for the preceding year have exceeded the authorized dividend for that year, having regard to the price charged by the company, and that the whole of the insurance fund has been and then remains invested," the Court "may ascertain and determine to what extent the profits forming such excess would have increased the amount of dividend to the shareholders had the same been divided and paid under the section of this Act, the marginal note of which is 'Dividend dependent upon price charged,' and may make such a reduction in the rate for gas supplied by the company as, in the judgment of the said Court, shall be proper, having regard to the provisions in this Act contained." Having regard to the foregoing observations, it will be seen that some portions of the existing general legislation as well as the model clauses require revising and extending.

The general effect of the auction clauses and sliding scale has perhaps up to the present time been beneficial to both shareholders and consumers. Take, for example, a company which has a standard price of 3s. 6d. per 1000 cubic feet, but is selling gas at 2s. 5d. per 1000 cubic feet; being a reduction in the standard price of 1s. 1d. The selling price of gas being 1s. 1d. per 1000 cubic feet below the standard price entitles the company to pay a dividend at the rate of $3\frac{1}{2}$ per cent. per annum in addition to the standard rate of 10 per cent. or 7 per cent. as the case may be, or at the rate of

5s. per cent. for every penny reduction in price. The consumers, therefore, benefit to the extent of 1s. 1d. per 1000 cubic feet; and the shareholders (if the profits are sufficient) to the extent of $3\frac{1}{2}$ per cent.

Again the auction clauses indirectly benefit both consumers and shareholders, as they are the means of creating as premiums on the sale of shares a considerable capital, which, being non-dividend bearing, reduces the amount to be taken out of the profits to the extent of the dividend thereupon. And although shareholders are not, under the auction clauses, entitled to allotments of shares *pro rata* at par, yet the original holders can to-day obtain in the open market a premium of about £150 for every £100 worth of stock.

Up to the present time the operation of the sliding scale has been on the downward gradient; but supposing it should become necessary for gas companies (in consequence of a continued rise in the coal and labour markets, or a continued fall in the price of residuals) to increase the price of gas so that the sliding scale should move on the upward gradient, it would be interesting to know—(1) what would be the attitude of the gas-consuming public in the face of an increased price of gas? and (2) what would be the attitude of those shareholders who have bought their shares at such a premium as will yield a return of only about 5 per cent., and this return contingent upon the company continuing to sell gas at 2s. 5d. per 1000 cubic feet, and to pay a dividend at the rate of $13\frac{1}{2}$ per cent.?

There are, however, other views of the operation of the sliding scale which must not be lost sight of. It has been said by some authorities that the desire on the part of gas companies to reduce the price of gas and increase the dividends, acts as an incentive to over-economy in the manufacture of gas, especially in that department which relates to the repair and maintenance of works and plant. But probably the operation of the sliding scale has had the effect of stimulating invention and scientific research; and thus of introducing improvements in the methods of distilling coal, and dealing with the products thereof, which have resulted in considerable economy. One thing, however, is certain—that the auction clauses and sliding scale will not result either in *unmixed good* or *unmixed evil*.

C.—*Legislation affecting Gas Undertakings in the Hands of Local Authorities; the appropriation of Profits; and the Formation of Sinking and Reserve Funds.*

Hitherto this paper has dealt exclusively with matters relating to gas companies; but, as local authorities have to some extent acquired the possession of gas undertakings, attention may be profitably directed to the principles which govern such undertakings when in their hands. The power enabling local authorities to construct works and supply gas may be obtained by Provisional Order under the Gas and Water Works Facilities Act, 1870, coupled with section 161 of the Public Health Act, 1875; or those powers may be, and usually are, obtained by Special Act. But such undertakings are not regulated by the Companies Clauses Consolidation Act, 1845, or the Companies Clauses Act, 1863, neither are they subject to all the provisions contained in the Gas-Works Clauses Acts, 1847 and 1871, as will be seen on reference to the following clause, which is usually inserted in such Special Acts—viz., "The provisions of the Gas-Works Clauses Act, 1847 (*except* the provisions with respect to the amount of profit to be received by the undertakers when the gas-works are carried on for their benefit), and of the Gas-Works Clauses Act, 1871, *except* section 35 (accounts, &c.), so far as the same respectively are applicable for the purposes of, and are not varied by, or inconsistent with the Special Act, shall apply to the gas undertaking in the hands of the local authority as if they were authorized by this Act." And, of course, they are not subject to the clauses relating to the sale of shares by auction.

With reference, however, to the accounts of gas undertakings in the hands of local authorities and the appropriation of the profits, the provisions usually inserted in the Special Acts are similar to the following or some of them:—

The local authority shall keep accounts in respect of their gas undertaking separate from all their other accounts, distinguishing therein capital from revenue, and shall apply all money from time to time received by them on account of revenue in manner and in the order following (that is to say):—

(1) In payment of their costs, charges, and expenses of and incidental to the collecting and recovering of gas rents and rates, and of the borrowing of money under this Act.

(2) In payment of the working and establishment expenses and cost of maintenance of their gas undertaking.

(3) In payment of interest on bonds for the time being outstanding.

(4) In payment of the annuities.

(5) In providing the monies required to pay the interest on monies borrowed by them under this Act.

(6) In providing the requisite instalments or sinking fund under this Act; or otherwise making provision for repayment of the monies borrowed under this Act.

(7) In providing a reserve fund, if they think fit, by setting aside such money as they from time to time think fit, and investing the same and the resulting income thereof in securities in which trustees are by law for the time being authorized to invest, and accumulating the same at compound interest, until the fund so formed amounts to (say) £5000, which sum shall be applicable from time to time to answer any deficiency at any time happening to the income of the local authority from their gas undertaking, or to meet any extraordinary claim or demand at any time arising against the local authority in respect of that undertaking, and so that, if that fund is at any time reduced, it may thereafter be again restored to (say) £5000, and so from time to time as often as such reduction happens.

(8) And the local authority shall carry to the district fund any balance remaining in any year, and the annual proceeds of the reserve fund when amounting to (say) £5000.

It will now be seen—

That local authorities possessing gas undertakings are not bound to keep their accounts in the form set out in Schedule B to the Gas-Works Clauses Act, 1871; section 35 of that Act, relating to accounts, &c., being expressly excepted;

That local authorities are authorized to create a sinking fund for repayment of borrowed monies;

That local authorities are authorized to create a reserve fund out of the profits of the undertaking, which is limited, and is applicable to meet any deficiency in the income of the gas undertaking, or any extraordinary claim or demand; and

That local authorities are authorized to carry to the district or other fund any balance of profit.

In some Special Acts relating to gas undertakings in the hands of local authorities, there is provision made for the formation of a depreciation fund at certain fixed rates upon the capital invested.

D.—Repairs, Renewals and Depreciation; showing the Principle upon which the Calculation for Renewals is based.

The subject which is now being approached is an exceedingly important one; and it will be well to understand distinctly the meanings of the words, "repair," "renew," and "depreciate." According to the best authorities they are as follows:—"Repair" means to restore after injury or dilapidation; to amend any injury by an equivalent; to make good for all practical purposes as it was before. "Renew" means to make again absolutely; to restore to the first or original state. We repair that which has been injured we renew that which has become useless or worn out. "Depreciate" means to bring down to a lower price, or to lower the value.

As to Repairs.—Gas-works must at all times be kept in a thorough and efficient state of repair, the cost of which must be charged to the revenue account.

As to Renewals and Depreciation.—The cost of renewals must be charged to the revenue account in one of two ways—viz., Either out of the profits of the year in which the ultimate failure of each portion of the buildings and apparatus occurs, or by setting aside every year out of the profits such a sum as will, if allowed to accumulate at compound interest, provide a fund sufficient to meet renewals as and when they fall due.

Plant and machinery may be repaired; but these repairs will not provide for that imperceptible depreciation or lessening of value which is going on day by day, and which is only made good when the thing depreciated is renewed or restored to its first or original state. Take, for instance, a gasholder. It may be repaired as often as possible, but it cannot be kept in such a state from year to year as, at the expiration of its term of life, to be as good as new. Therefore the gasholder must eventually be renewed by a new one being erected in its place.

In order to show more fully the amount which must be taken out of profits to meet the renewals of buildings, plant, and machinery, let it be assumed that works (exclusive of land), costing £130,000, and capable of producing 200 million cubic feet of gas per annum, are to be of exactly the same size and capacity, and as good in every respect at the end of 100 years as when originally erected, and of equal value. The various portions of the plant, machinery, and apparatus—such as buildings, gasholders, retorts, scrubbers, condensers, mains, &c.—which constitute the works have each a separate length of life; and let it be further assumed that the following table represents the original cost and length of life of each of the respective portions of the plant, together with the cost of renewals during the period of 100 years:—

Portions of Plant, Buildings and Apparatus, Designated by the Letters A to O.	Original Cost.	Life in Years.	Number of Renewals in 100 Years.	Amount of Renewals in 100 Years.
	£			£
A	24,000	100	1	24,000
B	10,000	50	2	20,000
C	8,000	25	4	32,000
D	1,100	3	33½	36,666
E	600	40	2½	1,500
F	3,000	50	2	6,000
G	10,000	40	2½	25,000
H	1,000	25	4	4,000
I	5,000	50	2	10,000
J	800	40	2½	2,000
K	1,500	33½	3	13,500
L	10,000	100	1	10,000
M	10,000	40	2½	25,000
N	2,000	50	2	4,000
O	40,000	40	2½	100,000
	130,000			313,666

Note.—The scrap value, for the purpose of this illustration, has not been taken into consideration.

The renewals in 100 years, therefore, amount to £313,666; or, in other words, the works, which originally cost £130,000, must on an average be renewed 2·41 (or, say, two-and-a-half) times during the period of 100 years. This sum of £313,666 must either be taken out of the profits of the year in which the ultimate failure of each portion of the buildings and apparatus occurs, or it must be provided for by taking out of the profits each year the sum of £1731, or, 1½ per cent. on the sum of £130,000—the original cost of the works—which sum of £1731, if allowed to accumulate at

compound interest at the rate of 3 per cent. per annum, will provide for each renewal during the whole period of 100 years, as and when it falls due.

Thus, whichever mode be adopted, the result will be that the works, which originally cost £130,000, will be, at the end of 100 years, of the same size and capacity, and structurally as good as when first erected, and of equal value. But in large cities and towns where the population is continually increasing, it becomes necessary from time to time, in order to keep pace with the demand for gas, to enlarge the works; and as the works are enlarged, the renewals of the enlarged portions thereof will from time to time have to be provided for. Therefore, if 1½ per cent. upon the total amount expended on the works at the end of each year be yearly taken out of the profits, and allowed to accumulate at compound interest at 3 per cent. per annum, it will at all times (assuming the length of life of each portion of the plant, buildings, and apparatus be taken as above) produce a fund sufficient for the renewal of the works in perpetuity (whatever their size or capacity) once during the average period of life, which for all practical purposes may be taken at from 37 to 40 years.

In all cases where a fund has been allowed to accumulate for the purpose of providing for renewals, that fund, and not the revenue account, must be debited with the cost of such renewals. But as gas companies are not, under the Acts of Parliament regulating their undertakings, authorized to create such a fund (which would certainly have the effect of equalizing the profits), it follows that they must debit the revenue account with the renewals as and when such renewals become necessary. This in some years may have the effect of reducing the profits below the sum required to pay the maximum or standard rate of dividend; and in that case the reserve fund can be resorted to for the purpose of making up the deficiency.

Looking at the many varying and disturbing elements constantly in operation, such as the pulling down of old plant to make room for larger, or the substitution of new scientific appliances in the place of the old, it will be well even for local authorities to debit the revenue account with the renewals as and when such renewals become necessary, rather than create a fund, which, unless worked with the greatest care, must give rise to questions of such a complex nature as will lead to endless confusion and difficulty. In practice, however, renewals are made with some degree of care, foresight, and regularity.

It has now been clearly and conclusively demonstrated that, in providing for renewals out of revenue, a proper provision has been made for depreciation, even for that imperceptible depreciation or lessening in value which is going on day-by-day, and which can only be made good when the thing depreciated is renewed or restored to its first or original state. It therefore follows—whether (a) the works are renewed by charging the revenue with the renewals as and when such renewals become necessary, or (b) by charging the revenue with an annual sum to be set aside and allowed to accumulate at compound interest—that, if the revenue be charged with depreciation in addition to repairs and renewals, such charge for depreciation will not only be wholly unnecessary, but will entail a burden upon gas consumers which ought not to be borne. It may be stated that the General Acts do not anywhere specially authorize the creation of a depreciation fund, except for works on leasehold lands.

E.—Capital and Revenue Charges; showing the Principle to be applied in Allocating the Same.

During the process of continual enlargement (so that works which to-day are capable of producing 100 million cubic feet of gas per year become, in the course of a few years, capable of producing 200 million cubic feet of gas per year), there are introduced many disturbing elements, which render it necessary to properly allocate the expenditure as between capital and revenue.

The following examples will show the principle to be applied:—

(1) Enlargements and extensions. These must be charged to the fixed plant (or capital) account.

(2) Old plant, which originally cost (say) £4000, is pulled down; and the old materials are sold for (say) £200, and enlarged plant is erected at a cost of (say) £10,000.

(a) Debit the sale and credit fixed plant account with the £200.

(b) Debit the revenue account with £3800, the difference between £200 (the value of the old materials) and the original cost of the old plant, and credit fixed plant account therewith.

(c) Debit the fixed plant account with the total cost of the enlarged plant, £10,000.

(3) An old gasholder which originally cost (say) £5000 is pulled down; and the old materials are sold for (say) £250. The tank is converted into a tar-tank at a cost of (say) £200; and a new tank and gasholder are erected at a cost of (say) £20,000.

(a) Debit the sale and credit fixed plant account with the £250.

(b) Debit the revenue account with £4750—the difference between £250 (the value of the old materials) and the original cost of the old gasholder, and credit fixed plant account therewith.

(c) Debit fixed plant account with £200, the cost of converting the old tank into a tar-tank.

(d) Debit the fixed plant account with the total cost of the new tank and gasholder, £20,000; and

Generally adopt the same principle with reference to the mains, services, and meters.

If the above principle be strictly observed, the fixed plant account and the revenue account will each have borne its proper and legitimate burden.

F.—Sinking Funds for the redemption of Gas-Works in the Hands of Local Authorities, or for Paying off Borrowed Capital.

Sinking funds relate only to works and undertakings in the hands of local authorities; and the purposes for which the same are authorized are for paying off moneys borrowed for the erection of such works, or for the purchase of the undertakings, and for extensions and other purposes of the works and undertakings to which capital is applicable.

The clause setting out the mode of repayment in the case of the purchase of a gas undertaking by a local authority is similar to the following—viz., “The local authority shall at the expiration of a period of one year from the transfer, out of the revenue of their gas undertaking, discharge or make provision by means of equal yearly or half-yearly instalments of principal, or of principal and interest, or by means of a sinking fund, or partly in one way and partly in the other, for paying off all moneys borrowed for the purchase of the undertaking, within such period as the local authority may think fit, not exceeding 50 [or 60] years from the transfer; and the local authority shall, at the expiration of one year after the borrowing of any other moneys, in like manner, discharge or make provision for paying off all such other moneys borrowed by the local authority within such period as such local authority may think fit, but not exceeding a period of 50 [or 60] years from the time when such moneys are respectively borrowed.”

The intention of the Legislature is exceedingly clear—viz., that, within a given period, the original purchase-money shall be paid off or provided for by equal annual instalments of principal and interest, or by the creation of a sinking fund out of the profits of the undertaking; thus leaving the works, at the end of the first period of 50 or 60 years (so far as the original purchase-money is concerned), entirely free from debt and unencumbered; and this process must, of course, be repeated with each subsequent loan, so that, at the expiration of the specified period from the date of borrowing, the works may be entirely free therefrom. The works are, therefore, to be redeemed from debt, as well as repaired and renewed, out of the profits derived from the gas consumers.

G.—Appointment and Duties of Auditors and the Audit of Accounts by an Official Auditor, as defined by the Acts of Parliament relating thereto.

Section 101 of the Companies Clauses Consolidation Act, 1845, provides that, except where by the Special Act auditors shall be directed to be appointed otherwise than by the company, the company shall elect the same in like manner as is provided for the election of directors; and section 102 of the same Act states: “Where no other qualification shall be prescribed by the Special Act, every auditor shall have at least one share in the undertaking.” And section 107 states: “That it shall be the duty of such auditors to receive from the directors the half-yearly or other periodical accounts and balance-sheet required to be presented to the shareholders, and to examine the same.” And section 108 empowers the auditors to employ such accountants and other persons as they may think proper, at the expense of the company, and that they may either make a special report on the said accounts or simply confirm the same.

The recognized qualification of auditors under the Companies Clauses Consolidation Act, 1845, is that they must be shareholders, each holding one share at least; and the Legislature has made provision for the possible incapacity of the auditors to perform the duties imposed upon them, by giving them the power to employ accountants to help them in the proper discharge of such duties. This legislation, looking at the importance of the subject, is exceedingly weak and defective; but so far as the Metropolitan Gas Companies are concerned, this was partially remedied during the year 1869, by the introduction of clauses in various Acts relating to the Metropolitan Gas Companies passed in or about that year, authorizing the Board of Trade to appoint an Official Auditor, so that, from the year 1869 to the present time, the accounts of the Metropolitan Gas Companies have, in addition to the audit by the Companies' Auditors, been audited by an Official Auditor appointed by the Board of Trade, in whom are vested the following powers—viz., “The auditor shall during every half year, as and when he thinks fit, inspect the accounts of the company, and audit the same; and if he find the same correct, he shall certify the same, but if he find the accounts incorrect in principle or in detail, he shall require the company to correct the same in such manner as he thinks right, and he may, if he think fit, grant a conditional certificate, so as to authorize the payment of a dividend, subject to correction if need be, and, except in the case of a conditional certificate, a dividend shall not in any case be declared until the accounts are certified by the auditor.” Provision is also made for arbitration should any of the parties interested think themselves aggrieved by any act of the auditor. If the principle of official audit were extended to all gas companies by the appointment of chartered accountants for certain defined districts, it would be a step in the right direction; but legislation moves slowly.

H.—General Remarks.

An attentive and careful study of the form of accounts under the 1871 Act will reveal its simplicity and adaptability. Of course,

certain parts of the form must be somewhat modified to adapt it to the requirements of gas undertakings in the hands of local authorities; but it will be to their advantage to adopt it as far as the same is applicable, as it will enable them (when the necessary calculations are made) to compare the working of their undertakings with the working of other gas undertakings.

Of course when the calculations are made, it requires “technical knowledge” to enable an opinion to be formed as to whether further economies in the manufacture of gas can be effected and in what department, which knowledge must be obtained by experience outside that which ordinary accountancy gives.

In a technical paper such as this, it is unnecessary to enter into the general principles and practice of accountancy. There are both books and papers of great value treating upon these subjects, which are readily accessible; but perhaps it would not be out of place to state that, in making up the accounts of gas undertakings, it should be borne in mind that neither gas companies nor local authorities carrying on gas undertakings are subject to competition or to the ordinary rules of demand and supply, but that within certain defined limits, they have a *quasi* monopoly. In these circumstances, it is very necessary that every allocation as between capital and revenue should be thoughtfully and carefully studied, so as to make such charges only against the capital and revenue accounts as are proper and legitimate, and that the various Acts of Parliament relating to the reserve, insurance, and sinking funds should be carefully read, so as to appropriate the profits in such a manner that the rights and interests of the gas-consuming public are preserved and protected, as well as the rights and interests of the undertakers.

With reference, however, to the clauses in the various Acts of Parliament authorizing local authorities to carry to the district or other fund any balance of profits remaining in any year, opinions may differ as to the expediency or otherwise of taking moneys out of the pockets of gas consumers, and applying them in reduction of those rates which should be borne by the whole of the ratepaying community, consisting of consumers and non-consumers of gas. But the duty of accountants is clear—viz., to carry out as far as possible the intention of the Legislature as expressed in the various Acts of Parliament, and not to allow prejudice to override judgment. The latest legislation bearing upon this point will be found in the Edinburgh and Leith Corporations' Gas Act, passed last session, which provides practically for a supply of gas at such a price as will, after paying the expenses of manufacture, &c., leave as near as may be such a margin of profit only as will provide for the payment of interest on borrowed money and the payment of the sums to be set apart for the reserve and sinking funds; but it must not be forgotten that the “rates” as well as the “undertaking” are pledged as security for the repayment of the purchase-money and other loans which may be raised for the purposes of the undertaking.

[In order to give an idea as to the magnitude of the industry to which the paper referred, some statistics relating to the authorized gas undertakings in the United Kingdom, extracted from the Board of Trade Returns, were supplied.]

In conclusion, looking at the various industries carried on in a country like this—such as gas-works, water-works, railways, tramways, mills, breweries, and factories of all descriptions—and the different processes of manufacture, it is evident that no fixed rate of depreciation can be established for universal application. In these circumstances, accountants must depend upon engineers and others who are technically qualified, for the accuracy of the data upon which the calculations for depreciation are made.

It is important, however, for those who have to deal with the accounts of large manufacturing undertakings, to acquire as much knowledge as to the various rates of depreciation as they possibly can, in order to place themselves in the best possible position to determine (within certain limits) whether or not the capital expended on the buildings, plant, and machinery is fairly represented by the value thereof. There are other things in addition to buildings, plant, and machinery, which are subject to depreciation such as tools, chains, ropes, belting, portable forges, and engines, carts, horses, moulding boxes, patterns, &c., which cannot well be included in an average rate of depreciation, and must therefore be dealt with on a different basis. The whole question relating to depreciation is an exceedingly important one, and demands the closest care and attention.

At the conclusion of the reading of the paper,

Mr. W. EDMONDS, who presided, moved a hearty vote of thanks to Mr. LASS for his kindness in preparing so interesting a paper.

Mr. MURRAY, in seconding the motion, said that from various parts of the paper he gathered that Mr. LASS considered that depreciation was provided for in renewals; but he did not know if he understood rightly. He thought it was generally regarded that repairs and renewals should be charged on revenue. The two charges were somewhat distinct from each other; for in the case of railway and gas companies, there was no need for charges for depreciation, except when the works were built upon leasehold land. With some corporations having gas undertakings under their control, the principle of depreciation was adopted. In certain cases, for instance, a large amount was deducted from the fixed plant account, and charged to revenue year after year; and then additions were made to the fixed plant account for renewals, &c., without any distinction being made between the two. In such an instance, he thought that the mode of keeping the accounts would undoubtedly lead to irregularities, and that the accounts would

not show the exact position of the undertaking as they ought to do. In the case of the Manchester Corporation accounts, which had been kept in this way for the last 30 years, it was contended that the sum which had been deducted from profits—and so taken from the ratepayers—should have been carried over to the city fund; and he thought it was undoubtedly the case that a very large amount had been kept from the ratepayers in this way. In Salford, the adjoining borough, the accounts were also kept in this manner. The revenue account was charged with what was called depreciation; but that depreciation so-called was not written off fixed plant, but carried to the credit of an account against which all renewals were charged in the way suggested by Mr. Lass. So that in this case it was really not proper to call it a depreciation fund. He regarded it as a renewal account, and said that, from the attention he had given to the question, he preferred this mode of dealing with the charge to revenue account by corporations. It equalized profits, as the amount required for renewals, of course, might be much more in one year than in another. He did not like the words "depreciation fund," as he looked upon depreciation as a writing down—a fund to provide for the reduced value of property, and that, therefore, it should be deducted from the property account. In the case of companies, it would be better if the amount of depreciation were carried to the credit of capital account.

The motion having been carried,

Mr. LASS said it had afforded him very great pleasure to prepare the paper; and if those present would read it, they might probably gain a little instruction from it. He concluded by moving a vote of thanks to the Chairman.

SOUTH AFRICAN LIGHTING ASSOCIATION, LIMITED.—The Directors of this Association (whose prospectus appeared in our columns a fortnight ago) met last Friday; and letters of allotment were sent out the following day to applicants for shares.

MR. W. CARR'S TRIAL.—It is not likely that the case of the *Halifax Corporation v. Carr* will come on at the Leeds Assizes before the end of next week. Mr. Tindal Atkinson, Q.C., and Mr. Banks have been retained for the Corporation. Mr. Waddy, Q.C., and Mr. Kershaw will be Counsel for Mr. Carr.

THE USE OF CANDLES IN GAS TESTING.—At last Friday's meeting of the Metropolitan Board of Works, the Clerk reported the receipt of a letter from the South Metropolitan Gas Company, expressing their opinion that the parliamentary standard candle used for testing gas is of a very uncertain and unreliable character, and that it is desirable to obtain parliamentary sanction for the adoption of a new and reliable standard; and asking the Board to receive a deputation from the Company on the subject.

TUSCAN GAS COMPANY.—As will be seen from an advertisement elsewhere to-day, the Directors of the Tuscan Gas Company, Limited, are prepared to receive applications for the balance of £33,000, part of an authorized issue of £60,000 of 5 per cent. debentures of £100 each. The bonds are redeemable, by annual drawings, at £105; a sum being set aside each year to redeem the whole issue within the period of the Company's concessions. The debentures are issued to complete the purchase of the existing gas-works in North Italy, and which are established profitable undertakings. The dividend paid by the Company on its ordinary share capital for the past five years has been $7\frac{1}{2}$ per cent. per annum, free of income-tax; besides providing a redemption fund. The Company already light ten towns in North Italy, all of which are paying and progressive undertakings.

PRESENTATION TO MR. R. H. TOWNSLEY.—The good-feeling existing between Mr. R. H. Townsley, Engineer of the York Street Gas-Works of the Leeds Corporation, and the *employés* was pleasingly manifested, says a correspondent, on the occasion of his marriage with Miss Minnie Newell, of Headingley. As soon as the approaching nuptials "got wind" among the staff, they determined upon giving Mr. Townsley some substantial proof of their esteem; and accordingly the bride and bridegroom were invited to meet the *employés*, on Monday evening of last week, in the reading-room connected with the works, which was prettily decorated with flags, &c. Mr. J. L. Rust, the foreman of the works, presided, and tendered to Mr. Townsley, on behalf of the men, their hearty congratulations; and afterwards presented him with a very handsome marble timepiece, chamber service, and toilet set, together with the following address:—"We the *employés* desire to offer you our most hearty congratulation upon your marriage, and beg your acceptance of the accompanying gift as a token of our respect and good wishes for your own and your bride's future happiness and prosperity. Trusting that you may long be spared to enjoy the esteem of the subscribers," &c. Mr. Townsley said he did not know how to thank his fellow-workmen sufficiently for their handsome present. Intrinsically, it must be of great value; but he did not regard it in that way. He looked at it as showing the goodwill evinced by them towards himself and wife, and so he should ever value it; and no matter how long he lived, he should always look back with pride upon that evening's proceedings. He had only been with them a few months, and that short period greatly enhanced the value of the present, because if he had been with them a long time, they could not have shown their kindness in a more substantial way. The health of Mr. and Mrs. Townsley was then drunk with musical honours; and Mr. Townsley briefly responded. The rest of the evening was happily spent by those present—some of the men adding to the pleasure by songs and recitations.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

GASHOLDER CONSTRUCTION AND THE GUIDE-FRAMING QUESTION.

SIR,—It seems that gasholder construction is about emerging from the reign of the "Golden Rule of Thumb" ("golden" because of its costliness, I suppose). Your Correspondent "Theory and Practice" has put the matter upon a scientific basis in a concise and comprehensive form, and in a manner easily useable, so that in future if we are still to have gasholders with a superabundance of material in them, as is generally the case when working with the "golden rule," let us at least distribute it in something like proportion to what it has to do.

The guide-framing may be said to have shaken off the tyranny of the old rule when it was recognized that it would be better to convert the whole circle of columns into one structure by diagonal bracing, than leave each column to use its own individual strength, aided only by the support of one or two tiers of girders. Now we have got a good scientific guide-framing; and no sooner has this arrived at something like perfection, than it is proposed to do away with it.

The idea of erecting gasholders without guide-framing above the tank is an old favourite of mine; and seven years ago I tried very hard to devise a method for doing it, but did not arrive at anything practical. I have had several attacks of the "fever" since; but with no better results. My efforts ran in the direction of a kind of parallel motion after the style of the old-fashioned parallel ruler; it being clear that if you can keep a gasholder horizontal, the bottom rollers keep it in position, provided the holder be strong enough to retain its proper shape. Although I did not arrive at any practical means of guiding the holder (which I consider Mr. Gadd has done since), I have thought of a way of framing the holder so as to resist distortion; and to lay this before your readers is the object of my letter.

In guiding a holder from the bottom curb, as in Mr. Gadd's invention, we resolve the overturning force of the horizontal wind pressure into a vertical pressure at the windward and leeward side. In an ordinary single lift, with its height (say) a quarter of its diameter, we should be applying the force at the long end of the lever, and thus have only one-quarter the work to do; and this seems the right thing. With inclined guides this vertical force would have to be resolved into one normal to the guide; and this would become greater as the angle with the vertical decreases. It would, in fact, be the vertical force, multiplied by the cosec. of that angle, which at 45° is 1.414, and at $30^\circ = 2$; so that still there is a saving in wear and tear and friction in the rollers. Supposing the holder to be rigid, that part of the wind pressure which tends to slide the holder horizontally from its place is taken by the bottom rollers at right angles or half-way between the windward and leeward tangential rollers. It is, of course, at once clear that, with the inclined guides, one of these rollers will have a tendency to run up the guide and the other to run down; and so we get a new element of distorting stress in the holder, which would now be inclined to tilt sideways in the wind, and indeed will tilt as far as the elasticity of the structure will let it.

The first difficulty in dealing with a holder—speaking only of single and inner lifts now—is the want of rigidity in the whole structure. The top curb may be considered rigid; but the bottom curb is anything but that, and the vertical posts are of very little use except to carry the top when the holder is down, unless they are strongly gusseted to the curbs. Even then their lateral or bending strength alone is available to resist distortion; for, as your correspondent has said, the sheeting cannot be taken into consideration to any great extent, as acting as diagonal ties, on account of its curved form. Two things have to be done in order to make a holder keep its shape—(1) The bottom curb must be kept a true circle; and (2) it must be kept in its true position vertically under the top curb. My first idea, therefore, was to make the bottom curb into a tension-wheel by fixing light rods to it, which are brought to a ring in the centre and tightened up. This would keep the curb a true circle; and its position under the top curb might be maintained by means of diagonal ties between the vertical posts. But the same result will be obtained by taking the rods upwards, and fixing the ring in the centre to the main strut or king-post that supports the crown. In fact, starting *de novo* with the trussing of a holder, supposing it to be devoid of framing, except curbs and vertical posts, make both curbs into tension-wheels and bring the "spokes" to one ring in the centre; making the ring wide enough to allow the centre lines of the "spokes" (top and bottom) all to converge at one point in the centre of the holder at a height exactly midway between top and bottom curb. We thus have a complete diagonally braced rectangle for the section of our holder. The top and bottom curbs, being constrained to keep their circle, act as the horizontal members; the vertical posts are the vertical members; and the two opposite top and bottom "spokes" are diagonal braces. The vertical posts, which would have no "racking" strain, could be light ones, and held from bending sideways under the thrust, by light, straight rods running horizontally from one to the other all round at one or more points of their height, and here and there a little diagonal bracing. In this way a very light and practically rigid holder will be secured; and rigidity is, to my mind, a *sine qua non*, if holders are to be guided from the bottom curb only as in Mr. Gadd's plan. Distortion would be fatal, as it would inevitably lead to jamming, as Mr. H. E. Jones pointed out in last week's JOURNAL. The zigzag guide, I fear, has an extra source of danger, as, at the point of change, opposite rollers might be inclined to take the wrong path.

That the above plan of trussing is feasible is easily seen every day in the bicycles and tricycles on our roads; and without theorizing at all, we may draw an inference from the fact that racing bicycles are made with (say) a 4 ft. 6 in. wheel, the spokes of which do not weigh 1 lb.; and they have to stand not only the weight of the rider, but the enormously greater stress put upon them in propelling the machine.

If it is desired to truss the roof of the holder, the king-post can be brought down to the centre-ring—the top spokes being made stronger to take the extra load; and, if desired, the ring can be placed higher up, which would slightly modify the strength of the rods or "spokes."

The rest of the trussing can be put as usual. On the Continent, they are very fond of constructing the roofs of holders, as well as those of the houses in which holders are usually placed, out of Γ iron only, like an ordinary dome, without any posts or ties; the rafters being in compression, and the purlins and curb in tension.

There is a drawback in my proposed arrangement of spokes—viz., it cannot be used in annular tanks; and if used with a revolving holder, such as Mr. Gadd's, the inlet and outlet pipes would have to be carried to the centre of the holder and inside the ring, which would have to be made large enough to take them in. But in telescopic holders, with the guide-framing carried up only part of the way, it is easily applicable. It also allows a fair amount of "dumping" in the tank; for, as before stated, the ring need not be absolutely in the middle of the height—it may be higher. In tanks with flat bottoms, the lower curbs of the outer lifts could be kept true circles by the same means, only the spokes would have to be horizontal. But here is a difficulty in keeping the upper and lower curbs (grip and cup) in their true vertical positions. One way of doing it would be by using very wide \sqsubset irons for vertical posts, well gusseted at top and bottom, as there is no room in small holders to put diagonals all the way from the top of one stay to the bottom of the next, though, in very large holders, where there are comparatively many stays and the arc between them is a correspondingly small portion of the circle, it might be possible to use bracing in this way; and if it is attempted, one or more horizontal (stiff) rings might be arranged, which would serve the double purpose of strengthening the vertical stays sideways (they could then be made lighter), and at the same time keeping the diagonal bracing out of the way of the inner lifts.

By means of making the curbs into tension-wheels, as above described, we should have gasholders framed complete with all the members subjected only to longitudinal stresses, no bending; and the holder would be a structure in which all the stresses could be determined, and it would be independent of the sheeting which would only have to be strong enough to stand the gas pressure and the working up.

Birmingham, Nov. 30, 1888.

HYPOTHENUSE.

CLECKHEATON LOCAL BOARD GAS SUPPLY.—At the meeting of the Cleckheaton Local Board yesterday week, the Clerk submitted an estimate of the cost of the new gasholders required at the works. The main items were: Land, £2499 17s. 6d.; gasholders, &c., £7795 9s.; contingencies, 10 per cent., £775 11s. It was proposed to borrow £12,000 for the works; and after the estimates had been met, there would thus be a balance of £925 2s. 6d. The Clerk, in reply to Mr. Hirst, said that this £12,000 would include everything connected with the erection of the holders. It was then resolved to apply to the Local Government Board for power to borrow the above-named sum. The Clerk next submitted a statement of the gas revenue, which showed that the Board would be able to reduce the price of gas from 3s. to 2s. 8d. per 1000 cubic feet net; and it was thereupon resolved to reduce the price to this figure.

PROPOSED PURCHASE OF THE OTLEY GAS-WORKS BY THE LOCAL BOARD.—At the meeting of the Otley Local Board yesterday week, a recommendation was made by the General Purposes Committee that a letter be forwarded to the Directors of the Gas Company asking if they were willing to sell their works to the Board. The Chairman (Mr. T. A. Duncan), referring to this matter, said it had been suggested to the Board by the statutory notice which had been given of the Company's intention to apply for a Provisional Order in the ensuing session of Parliament. He had not seen the terms of the application; but it was possible that the Company might be applying for powers which might or might not conflict with the powers of the Local Board. This would be most undesirable; and to avoid it, and at the same time in the interest of the town generally, the Board had deemed it expedient to ask the Company if they were willing to sell their undertaking. Upon the answer would depend the future action of the Board—whether they would take steps in regard to the application, or arrange for negotiating a purchase.

THE TESTING OF GAS-METERS IN DUBLIN.—The testing of gas-meters in the houses of consumers in Dublin has just been commenced, under the direction of Mr. T. J. Cotton, the Gas Inspector to the Corporation. This arrangement, which is expected to prove a great convenience to the inhabitants, has (says the *Freeman's Journal*) been chiefly promoted by Alderman Dillon and Mr. Mayne, M.P. The Corporation, under the Sales of Gas Act of 1859, have authority to test gas-meters as well as the quality of the gas supplied to the city. Since that Act was passed, however, the practice has been for the consumer who believes that his meter is inaccurate to send it to the office of the Gas Committee in East Hanover Street to be tested. This involved the trouble and expense of disconnecting the meter from the service-pipe, conveying it to and from Hanover Street, and then replacing it. In 1884 the Board of Trade made an order that standard meters should be provided for the purpose of enabling the testing of meters in the premises of the consumers to take place. But there was considerable delay in the preparation (under the Board) of a model meter, verified copies of which were to be kept by all local authorities under the Act for the purpose of domestic testing. The difficulties, however, have now been overcome; and the Gas Committee have at the Hanover Street office, under the charge of Mr. Cotton, one of these verified standard meters.

RIPON CORPORATION GAS AND WATER SUPPLY.—The monthly meeting of the Ripon City Council was held on Monday last week, when the subject of turning on the new water supply at the gravitation works on Lumley Moor was discussed. Mr. Collinson maintained that this was being done against the wishes of the Engineer; but the Mayor stated that Mr. Carter's desire was to wait until the pure water well was completed, if the Committee had not expressed a wish to have the water turned on. Alderman Hargrave said if they had to wait for the Engineer, it might be a year or two before the water was turned on. The Town Clerk, in answer to Mr. Smith, said there was a balance in hand on the gravitation water-works capital account of £1300; but he did not know how far this sum would cover outstanding accounts. Alderman Baynes (ex-Mayor) intimated that the ex-Mayor had consented to turn on the new water supply; and it was also stated that a silver key was to be presented to her on the occasion. Mr. Collinson subsequently called attention to the price of gas, and said he was prepared to give notice of a motion that the price be reduced to 2s. 6d. per 1000 feet. The Mayor stated that returns were being prepared as to the gas-works expenditure; and when completed, the Gas Committee would consider the matter. Alderman Hargrave stated that great loss occurred through leakage from the gasholder; and the Gas Manager (Mr. F. Shepherd) said that certain parts of the holder were in bad repair.

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

FRIDAY, DEC. 7.

(Before Mr. Justice North.)

In re THE CAGLIARI GAS AND WATER COMPANY.

This was an application for the removal of the name of Mr. Frederick Wigan, a Director of the Company, from the register of members; or, in other words, for the cancellation of the registration of certain shares which stood in his name.

Mr. COZENS HARDY, Q.C., in applying for the order, said the matter was brought before the Court under rather peculiar circumstances; and the application was not opposed. The Company was in a very flourishing condition. The shares were at a large premium; and the concessions under which they were working in Italy were very valuable. As long ago as 1868, they resolved to set aside £150 a year in respect of their terminable concessions, by way of sinking fund; and they had, by formal resolution, decided upon the investment of that money in the purchase of shares in the Company, and that the dividends payable thereon should be added from time to time to the Company's reserve fund. This course had accordingly been continuously followed; but was now found to be open to various objections. In the first place, it was *ultra vires* for the Company to make investments in the purchase of their own shares. Striking out Mr. Wigan's name as the owner of the shares would have no effect whatever on the Company, except to make the assets so much more than the liabilities; and the Directors were now perfectly prepared to make their investments in authorized securities. In pursuance of the resolutions mentioned, the shares had been allotted, in the first instance, to Mr. Barrow, who had executed a declaration of trust, in Mr. Wigan's name. There were 377 shares now registered.

His LORDSHIP asked what evidence was adduced of the solvency of the Company.

Mr. HARDY said evidence of the fact was afforded by the high premium of the shares in the market, and that the Company had paid continuous dividends of 7 per cent. The debts due by the Company only amounted to £772.

His LORDSHIP remarked that a further affidavit must be produced, showing the position of the Company with regard to debts and liabilities.

Mr. HARDY suggested that it would not be necessary for more to be shown than that the Company's debts did not exceed the amount which would now be dealt with.

His LORDSHIP said he would be satisfied with that. If the state of matters exhibited by the last balance-sheet were existing at the present time, it would not be necessary to require consent on the part of the creditors to the amount of £772.

Mr. HARDY said he supposed the Court only desired to be assured that the debts were substantially covered.

His LORDSHIP replied that that must be done before he could release from liability a person who was admittedly holder of a considerable number of shares on which, though credited as fully paid up, nothing had been paid, and which were not shown by evidence to be held in pursuance of any contract.

Mr. HARDY said the Secretary of the Company would make an affidavit that the debts due by them did not exceed the £772 of ordinary current debts.

His LORDSHIP observed that he could not point out how the affidavit should be framed. He only wanted to be assured that he would not be prejudicing anybody by releasing a person who at present was under liability in respect of the shares. The matter might be mentioned again to the Court at any time.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

MONDAY, DEC. 3.

(Before Mr. Justice Hawkins and a Common Jury.)

STRUBE v. SOUTHWARK AND VAUXHALL WATER-WORKS COMPANY.

This was an action to recover damages in respect of personal injuries sustained by the plaintiff on May 10, 1886, through the alleged negligence of the defendants' workmen in leaving an open space in the public highway in Edward Street, Penton Place, Kennington Park Road.

Mr. COCK, Q.C., and Mr. FILLAN appeared for the plaintiff; Mr. M'CALL and Mr. GRIFFITHS for the defendants.

Mr. COCK, in opening the case, said the only question for the jury was whether or not the defendants were responsible for the injuries which the plaintiff had sustained, as, in the event of their so holding, the amount of damages had been agreed upon. The plaintiff, who was a master tailor, suffered from sciatica; and, consequently, had to use a stick when walking. On the night in question, his stick caught in a guard-box, which was not provided with a cover, with the result that the plaintiff fell down and fractured his shoulder. One question for consideration was whether the Company did in fact put the guard-box over the supply-pipe; and if so, whether it was a proper and suitable box. Secondly, whether the defendants were responsible. He submitted that, as they were entitled to put the box down, they were responsible. After referring to the various sections of the Water-Works Clauses Acts bearing on the point, the learned Counsel said it was plain that the only duty of the owner of premises was to put in the communication-pipe. In the present case, the Company stated that they did not in fact put in the box. However, whether they did or not, it was clear they provided it; and it was their property according to the decision of the Court in the case of the *East London Water-Works v. Vestry of St. Matthew's, Bethnal Green*.* In that case the Vestry thought the guard-boxes were dangerous, and removed them from the pavement; but the Court held that, as the Water Company had a right to put them down, the Local Authority had no power to interfere with them.

Mr. Strube, the plaintiff, gave evidence supporting the statement of Counsel as to the cause of the accident.

Mr. S. M'Murdie, architect and surveyor, deposed to the guard-box in question being situated 2 feet from the kerb. The pavement was 6 feet in width. There was no cover to this particular box; but many of the boxes had covers.

Mrs. H. Hodgson stated that between 1877 and 1886 she resided in Edward Street, and remembered the box in question being put down opposite her house. The work was done by the Company's men.

Cross-examined: Her reason for saying that the work was done by the Company was because she saw the Company's Inspector there.

His LORDSHIP asked whether there was any dispute as to who did the work.

Mr. M'CALL said the box was supplied by the defendants; but it was not placed in position by their workmen, nor was it the property of the Company. He submitted there was no case to go to the jury.

His LORDSHIP: Supposing I rule that there is no case to go to the jury,

* See JOURNAL, Vol. XLVI., p. 1071 Vol. XLVIII., p. 243.

are you content (if it should turn out hereafter that there was some evidence) to have judgment entered against you, and to take the consequences?

Mr. McCall: Certainly.

Upon the understanding that, should the Divisional Court hold there was evidence to go to the jury, the verdict was to be entered for the plaintiff for £40, his Lordship directed a nonsuit to be entered; the defendants also consenting to a stay of execution until after the judgment of the Divisional Court. With a view of saving expense, his Lordship further advised the parties to see whether some arrangement could not be come to, by which the case could be taken direct to the Court of Appeal; thus saving the costs of a hearing before the Divisional Court.

MANCHESTER ASSIZES—NISI PRIUS COURT.

TUESDAY, NOV. 27.

(Before Mr. Justice WILLS and a Jury.)

HINDLE, NORTON, AND CO., v. DOUGIL.—A GAS-ENGINE CASE.

The plaintiffs in this case are engine makers, of Oldham; and the action was brought for the recovery of £63 1s. 6d. for goods sold and delivered to the defendant.

Mr. ADDISON, Q.C., M.P., and Mr. EASTWOOD appeared for the plaintiffs; Mr. C. A. RUSSELL for the defendant.

Mr. ADDISON, in opening the case, said the plaintiffs were the owners of the "Dougil" gas-engine. In order to push the sale of it, they appointed the defendant Dougil to be their agent at Leeds. Although the name was the same, he had no connection with the patent; it was merely an accidental similarity. The terms were that he should have 15 per cent. upon the net price of cash transactions. Defendant bought the two engines which were in dispute—one in November, 1887—the price being £45, or reckoning the discount, £38. This was an engine of $\frac{1}{2}$ -horse power. The other engine was one of $\frac{1}{2}$ -man power, which was sent to him in July, 1887. Subsequently, he made complaints as to this engine; but the information of the plaintiffs was that he admitted he had tried to get more work out of it than it was capable of. However, the plaintiffs consented to take it back in April of this year; but defendant did not send it. In June there was some disagreement between the parties, in consequence of which defendant sent the two engines back; but the plaintiffs did not receive them. The price of one was £45, and of the other £12; and plaintiffs said they were entitled to have the full price for them from the defendant. The engines were now lying at a railway station in Oldham, at the defendant's risk. Defendant claimed to return them on the ground that they were not merchantable articles. He further said one was worth £6; and the other £1, and had paid the amount into Court. It was also contended that there was an implied warranty that the engines would be noiseless and steady in working; that they could be worked with uniformity of motion, however intermittent the work was; that they would be fitted with governors to regulate the supply of gas; and that they could be started with exceptional ease, and as soon as any other gas-engine that was in the market. This warranty, defendant said, had not been fulfilled, because the engines were defective—defective in manufacture, and not proportioned to the work they were warranted to do. Plaintiffs, however, never warranted them to do any special work, except by describing them as $\frac{1}{2}$ -horse and $\frac{1}{2}$ -man engines respectively. The engines were tested for a week before being sent out; and they worked satisfactorily. What defendant did with the engines he did not know; but he used them or had them used for a long time, and then sent them back. Plaintiffs had seen them, and said that after being cleaned they would still work well. There could be no doubt but that defendant knew what he was buying; and he did not suggest that there was any special warranty.

Mr. E. Norton, one of the plaintiffs, in examination, averred that both the engines in question fulfilled the conditions of the firm's prospectus; being tested before they were sent out, and found satisfactory. They were noiseless and steady in working, made of the best iron, and of good workmanship. He had seen the engines since they were returned, and found them to be all right, except that they were a little dirty.

WEDNESDAY, NOV. 28.

On the case being resumed this morning,

Mr. Norton was cross-examined by Mr. RUSSELL. He admitted that defendant had told him that if he would make the $\frac{1}{2}$ -man engine work properly, he would keep it. He did not make it work properly. He did not know that the piston jammed after working for an hour or two. Upon this point being further pressed,

His Lordship remarked that it was rather a matter for reasoning than for cross-examination. He explained to the Jury that what Mr. Russell suggested was that the piston got hot by the explosions inside the cylinder; and the piston, being surrounded by the cylinder, would not cool as fast as the cylinder—the result being that the cylinder shrank on the heated piston, and became bound.

Cross-examination continued: Neither of the pistons was fitted with rings; and the lubrication of the piston was by hand. The $\frac{1}{2}$ -horse engine was sent to a Mr. Pedley, who made complaints about it.

Re-examined, witness said that they had no complaints of any engines that were supplied for cash; but they had had three complaints respecting engines which were put out on hire by the defendant. Rings were not required on an engine of so small a power as the $\frac{1}{2}$ -man one.

Mr. J. Dougil, the patentee of the engine, deposed to having tested the engines by a friction brake before they were sent out. They behaved perfectly well. When a Dougil engine was started, there was a small space between the piston and the cylinder; but it was filled up by expansion when the engine had been working five or six minutes. Witness went to Mr. Pedley at Leeds, to whom the $\frac{1}{2}$ -horse engine was sold. He found it fitted up with an unsuitable exhaust-pipe. Pedley complained that he could not get up the pressure; and he found it to be due to the exhaust-pipe, and to the slide rods having been lengthened two turns of the screw. Nothing was said to him on that occasion about the piston. Rings were not put on the pistons of other makes of gas-engines.

Cross-examined: He did not take the piston out several times, nor did he file it.

Re-examined: He found that the piston wanted cleaning. It ought to have been cleaned every week; and this was stated on the instructions sent out with the engine.

Mr. Hindle agreed with the last witness as to the cause of the engine not working properly.

Mr. J. Bickerton said he had examined the $\frac{1}{2}$ -horse power engine, and found it to be of good workmanship. He thought the piston was of proper construction, and that rings could be dispensed with. One of the plaintiffs' $\frac{1}{2}$ -horse engines had worked satisfactorily at his place for about twelve months.

Further evidence of a like nature having been given,

Witnesses for the defence were called.

Mr. A. Dougil, examined by Mr. RUSSELL, stated that the $\frac{1}{2}$ -man engine referred to did not work satisfactorily. Mr. Norton tried to make it work; but it stopped before he got out of the show-room. Plaintiffs offered to

take this engine back; but witness wanted to give them every chance to make it right, as he had gone to some expense in advertising the engines, and wanted to reconp himself. In June, however, he sent it back. He did not see the $\frac{1}{2}$ -horse engine after he had sent it to Mr. Pedley, from whom he received a great many complaints respecting it. He sold six of plaintiffs' engines in Leeds. One of these—a $\frac{1}{2}$ -horse—was fairly satisfactory; and two others had been returned.

Cross-examined: The engines in question were returned after disputes with the plaintiffs.

Mr. Marks, the defendant's foreman, said the engine supplied to Mr. Pedley would not work in consequence of the piston jamming. It had never to do more than $\frac{1}{2}$ -horse power, in fact a 2-man Bisschop engine was now doing the work the $\frac{1}{2}$ -horse Dougil machine should have done. The $\frac{1}{2}$ -man Dougil engine would not work at all.

Cross-examined: Witness had seen a number of different makes of gas-engines, but never one, except the Dougil engine, where the pistons were without rings.

Mr. Pedley, of Leeds, said the $\frac{1}{2}$ -horse engine he obtained from the defendant would not do its work at all. Mr. Dougil, the patentee, visited his place to look at the engine. He took the piston out, and began to file it, because it was too large. The piston did not want cleaning. After Mr. Dougil's visit the engine worked no better than before, and he eventually returned it.

Mr. T. Ashbury, M.Inst. C.E., stated that he saw the two engines in dispute in Oldham the day before. The $\frac{1}{2}$ -man was simply a toy engine. He tried the piston of the $\frac{1}{2}$ -horse engine, and worked it by hand. This indicated that there was great looseness of the piston inside the cylinder. The piston had been filed. It was not fit for a gas-engine, because a gas-engine piston should be as tight or tighter than a steam-engine piston. He did not know of any other gas-engine of the same size which had no adjustment for expansion. It was not a workable engine; and it was not worth more than its scrap value. The scrap value was not more than £6—the amount paid into Court.

Mr. H. Bickerton said he had seen several Dougil engines, and condemned the principle on which they were made. It was a non-compression engine; there were no rings in the piston; and the slightest bit of dirt would stop it. It would not work to its nominal power for any length of time.

His Lordship, in summing up, said the question before the jury was whether the engines were really merchantable and saleable articles. He regretted very much indeed that the case was not left to the decision of one thoroughly competent man; for not only had he and the jury to decide questions to which they were not accustomed, but they derived very little assistance from those who ought to give it them. It was a perfect scandal that in such a matter as this, and upon such a question as to whether the "Bisschop" engine ordinarily had rings on or not they should actually have people contradicting one another.

The jury found for the plaintiffs, and judgment was entered for £54 9s., including the money paid into Court. Costs were also allowed.

His Lordship said he would certify, if necessary, that the case was a proper one to come before him.

WESTMINSTER COUNTY COURT.—TUESDAY, DEC. 4.

(Before Mr. FRANCIS BAYLEY, Judge.)

THE GASLIGHT AND COKE COMPANY v. LEACH.

This case which was adjourned on the 16th ult. for the production of further evidence (*ante*, p. 943) came before His Honour to-day. The facts of the case are briefly as follows:—The defendant Mr. G. E. Leach, was for many years a partner in the firm carrying on business in Charterhouse Square, E.C., under the style of G. E. Leach and Co. It was not disputed that the gas was not consumed; but Mr. Leach denied his liability, on the ground that he was not now a partner, having severed his connection with the firm in 1879. When the dissolution of partnership was effected, he wrote to the Company informing them of the fact, and also told the collector that his relations with the firm had terminated. He then removed to Fenchurch Buildings, where the Company laid on the gas for him, and continued to supply him for several years—not a word being said with reference to any previous account; and it was not until quite recently that the present claim was made.

On behalf the Company, it was stated that a letter had not been received from Mr. Leach; and therefore the Company held him liable. If Mr. Leach could produce any document showing that the Company had released him from the contract, then there would, of course, be an end of the matter.

For the defence, a copy of the *London Gazette* was produced to prove the dissolution of partnership on April 29, 1879, which was some months prior to the time for which the claim was made.

On the Company's books being produced in support of the claim, His Honour said he did not think it necessary to go into the books. His opinion was that, although the defendant had not produced any document from the Company releasing him from the contract, he had proved he was not a partner at the time for which the claim was made. The verdict would therefore be for defendant with costs, as well as the costs of the former hearing.

KEIGHLEY CORPORATION GAS SUPPLY.—At the meeting of the Keighley Town Council last Tuesday, it was resolved to empower the Gas Committee, if they thought desirable, to apply to the Local Government Board for a Provisional Order to amend the Keighley Gas Acts, authorizing the Council to raise floating capital.

DEATH OF MR. T. CRAVEN, OF KEIGHLEY.—The sudden death, last Tuesday morning, of Mr. Tom Craven, of Keighley, removes one who took a prominent part in the fight in Parliament, in 1868, between the Bradford Corporation and the then Keighley Local Board on the question of the water supply of the town. Mr. Craven was at that time Chairman of the Water Committee; and he displayed great earnestness in seeing the Committee's scheme carried to a satisfactory completion. The deceased was in his 52nd year.

A PROPOSAL TO PURCHASE THE ST. ANNE'S GAS-WORKS.—At the last meeting of the St. Anne's Local Board, a motion was brought forward by Mr. W. H. Hargreaves to the effect that the local gas-works should be purchased by the Board. He said that every town ought to control its own gas and water supply; for then great inconveniences were avoided. The speaker referred at length to the advantages that would accrue to the ratepayers if they owned the works. As there was no seconder, Mr. Pye said there was something far more important for the good of St. Anne's than the purchase of the gas-works, and that was a sewage scheme. They would sooner or later have to face this question; and it was one that was most urgently needed. Mr. Porritt inquired if the subject Mr. Pye was discoursing upon was relevant to the subject of the motion, to which the Chairman replied that Mr. Pye was rather out of order, but no doubt was taking time by the forelock. The motion was lost.

Miscellaneous News.

BIRMINGHAM CORPORATION GAS SUPPLY.

THE SALARIES QUESTION.

At the Meeting of the Birmingham Town Council last Tuesday—the Mayor (Alderman Barrow) presiding—the question of increasing the salaries of the Corporation officials by Committees, particularly in relation to the Gas Department, was fully discussed.

The Mayor said he desired to call attention to the following notices of motion which had been given, and to suggest that they should be considered together—the latter as an amendment on the former. The first motion was by Mr. Lowe: "That it be an instruction to all such Committees as have been in the habit of increasing the salaries of officials in their employment without obtaining the sanction of the Council that they shall henceforth report to the Council any proposed increase of salary which shall amount to £50 or upwards; and that any previous resolution of the Council which is inconsistent with this present instruction be, and is hereby, to that extent rescinded." The second was by Alderman Dr. Barratt: "That it be an instruction to the several Committees of the Council to report any application or proposal for the advance of the salaries of any of the officers in their respective departments in all cases where the salary of such officer amounts to the sum of £100 or upwards per annum, anything contained in any previous resolution or authority of the Council to the contrary notwithstanding."

The suggestion was adopted.

Mr. Lowe, in proposing the resolution standing in his name, said that at the previous meeting of the Council the resolution he then moved did not go far enough to meet the exigencies of the case. As an amended resolution was then ruled out of order, the discussion came to a somewhat untimely end, and was unceremoniously dismissed. Although they were not altogether agreed as to the nature of the change which should take place, they were, he thought, unanimously of opinion that some alteration should be made, so that for the future it would be impossible for a Committee to act as the Gas Committee had in raising the salaries of their high officials without first obtaining the consent of the Council. A very strong feeling on this subject existed amongst the electors. During the recent contests, it had been his privilege to attend a good many meetings; and he never knew any item of municipal administration which was more strongly condemned than the recent action of the Gas Committee. With the exception of that body, it had been the almost invariable custom of Committees to report to the Council any proposed advances of salary; and that course was a most desirable and proper one to pursue. With this idea in view, he had made his resolution read "any proposed increase of salary which shall amount to £50 and upwards." He had fixed the sum at £50, because he did not believe in the wisdom of compelling Committees to go to the Council for every paltry increase in weekly wages or small salaries, as that would only impede and hamper the work of Committees. For this very reason he could not agree with the notice of motion given by Dr. Barratt.

Mr. BARCLAY also considered that Dr. Barratt's proposal, if passed, would unnecessarily hamper Committees. It might be said that, under Mr. Lowe's resolution, Committees could give frequent increases below the £50, and so avoid the necessity of appealing to the Council; but for his own part he did not think any Committee would act in such an unfair spirit.

Dr. BARRATT then moved his amendment, which, he remarked, he brought forward partly on the ground just stated by the last speaker. To his mind, it would be wise to go back to the old days, when all increases were brought before the Council; and his amendment would bring that result about so far as salaries over £100 a year were concerned. He objected to the £50 limit, as smaller increases could be more frequently given without any application to the Council.

Alderman BAKER, in seconding the amendment, said the change, if made, ought to be thorough and complete.

Mr. BRINSLEY supported Mr. Lowe's motion, remarking that so long as Committees had officers like Mr. Edwin Smith, the Secretary of the Gas Department, they need have no fear of the Council sanctioning reasonable increases in the salaries of their officials.

Mr. THOMASON said he was anxious to define rather more clearly what was really wanted; and he should, therefore, move, as a further amendment—"That henceforth no Committee shall increase the salary of any official until the proposal has been reported to the Council, and approved of by them."

This amendment was not seconded.

Mr. A. C. OSLER suggested that Alderman Barratt should accept a limit of £200 instead of £100. One of the great difficulties in the way of accepting the resolution was that Committees might be unwilling, in view of it, to get the very best men they could for the management of these large undertakings; and, in his opinion, the very best men were always the cheapest. He thought the community would be quite willing to give adequate salaries if there was not a kind of feeling, certainly very widespread at the present time, that with regard to salaries they were being hoodwinked and kept in the dark. If they took the constituencies into their confidence in the fullest manner, this unhealthy feeling would be removed; and the Council would be able to do ample justice to their servants. He moved as an amendment that the limit be £200 instead of £100. Mr. Lowe's resolution, he thought, would increase the feeling of which he had spoken.

Mr. H. C. FULFORD seconded this amendment. He said all the Committees, except the Gas Committee, the Water Committee, and the School of Art Committee were in the habit of reporting increases to the Council.

Mr. DAVIS: Yes; after they have made them.

Mr. LAWLEY PARKER supported Mr. Lowe's resolution.

Alderman Sir THOMAS MARTINEAU observed that the Water Committee, one of those against which he supposed some resolution of the kind was aimed, most cordially accepted the principle of Mr. Lowe's resolution; and, speaking personally, he would, as Chairman of that Committee, just as soon come before the Council with a recommendation for an advance as with a report of one, and asking for approval. There must be a generous confidence shown in Committees to whom the Council relegated the management of large commercial undertakings if the work was to be properly done; but any substantial increase of salaries should come before the Council.

Mr. MICHAEL DAVIS objected to Mr. Lowe's resolution, because under it any Committee could advance an official's salary by steps of £49 19s., until it came to £2000 a year, without consulting the Council. It might be said that present Committees would do no such thing, but gentlemen might come after them who would not be so tenacious of principle.

Alderman POLLACK, Chairman of the Gas Committee, said that his Committee had discussed the matter, and cordially accepted Mr. Lowe's resolution. The Gas Committee were not to blame for not coming to the Council, because the rule of the Committee had been, since it was started, not to report increases of salaries; and he was surprised that such a great

economist as Mr. Michael Davis should have only just discovered that he objected to their action. To those who thought the Gas Committee had acted extravagantly, he should like to say that for several years previous to last year hardly any salaries in the Gas Department had been increased. During the four years in which he was Chairman of the Committee before he was elected Mayor, the increases of salaries only amounted to £300; and in the two years previous to that term, there were only three increases of salary. The Committee had acted probably with a closer fist than if they had come to the Council, because they felt the responsibility which rested upon them. They had not the slightest objection to report to the Council any proposals for increase of salary; and he thought it much better that they should be reported before being granted than afterwards.

Dr. BARRATT said that he would, with the consent of his seconder, adopt the modification of his amendment proposed by Mr. Osler, that increases should be reported in the cases of all salaries over £200.

Alderman COOK supported the amendment.

Alderman LLOYD also agreed that if they were to do anything effective they must adopt Alderman Barratt's amendment, as cases which would be effected by Mr. Lowe's proposition were of very rare occurrence.

Mr. GRANGER also supported the amendment, which he thought took a medium course, and established a principle for the guidance of all the Committees. It should be remembered that the Council was a representative body, and should furnish the burgesses with full information as to its proceedings. It was far better that important increases of salary should be reported rather than be made known by private rumour. A report by a Committee would enable the burgesses to know the merits of some of the men who received the large salaries; and he thought it would be more agreeable to the latter that the salaries should be dealt with in an open and public manner.

Mr. WALSH, referring to the remark that the resolution moved by Mr. Lowe only pointed to certain Committees, said that, while this was so, it did not exonerate the Committees who had been in the habit of reporting increases of salary from continuing to do so.

Mr. ELI BLOOR remarked that when Committees came up with recommendations for increasing salaries, the increase was frequently supported on the ground of the economical management of the department by the official concerned. He thought that in such cases the report should show wherein the economy consisted, as he had found in some instances, from subsequent inquiry, that the alleged economy had been effected either by discharging a number of men and getting the same work done by the remainder, or by reducing wages, or employing boys to do men's work. He knew two or three departments in which this kind of thing had been or was being done.

Mr. H. J. MANTON said he was at a loss to understand how the Council had so suddenly become filled with an excess of virtue in respect to this question of salaries. He believed that both the Committees against which Mr. Lowe's motion was principally aimed were quite prepared to defend their past action.

Mr. LOWE, in reply, referring to the suggestion of Mr. Osler that the instruction of the Council might be evaded by a Committee giving advances of salary by instalments, or, as Mr. Davis hinted, by voting £49 19s. instead of £50, said he did not believe that any member of the Council, let alone one of its Committees, could for a moment be guilty of such dishonourable and unworthy conduct. It was a most shallow and sophistical argument.

Mr. OSLER asked to be allowed to say that he was far from imputing to any of his colleagues that they would do anything dishonourable.

Mr. DAVIS made a similar disclaimer.

Dr. Barratt's amendment was then put to the vote, and lost by 35 votes against 17, and the original resolution was carried.

Mr. WALTER subsequently moved—"That, in the opinion of this Council, the action of the Gas Committee in raising the salaries of Mr. Edwin Smith, Secretary of the Gas Department, and Mr. Charles Hunt, Engineer of the Windsor Street Gas-Works, £250 per year each, was not only an act of discourtesy to the Council, they not having reported the same, but also unnecessary and uncalled for; and considering that the necessities of life are at least 20 per cent. less than they were five years ago, and competition much keener in all trades, this Council instructs the Gas Committee that such increases of salaries named shall cease on the 31st of December next." He remarked that he felt considerable diffidence in moving such a resolution, because it might seem that he wished to assume a dictatorial spirit towards men who had done splendid work for the town. As to Mr. Edwin Smith's work, he considered it was purely accountant's work (cries of "No"). He was not responsible for making the gas, but merely for the accounts; and he (the speaker) thought his salary ought to be guided by what a fair accountant could get in the town. He had made inquiries and found that £800 a year would pay Mr. Smith well for his services. At Leeds, where the gas was 1s. 10d. per 1000 cubic feet, the salaries paid for such work were £350 to one, and £250 to three other officials respectively. In Manchester, four officials were paid, in the aggregate, £1600; while in Birmingham £1200 was paid to one officer. He believed the Council desired to deal with the ratepayers' money as they would deal with their own; but in this matter they were hovering on the lines of extravagance. He was not so foolish as to expect the resolution to be passed; but as he was on the side of justice and truth, he hoped he would gain some support.

Mr. TOWLER, in seconding the resolution, said he had nothing to say, against the officials personally; but in considering the high salaries of the chief officials, he could not overlook the fact that a large number of men were discharged by the late Gas Committee without any remuneration whatever, and many of them were either in the workhouse or walking about the streets penniless. He could give the names of men who had been 20, 30, and 40 years in the service of the Corporation, some of whom were discharged without compensation or with an allowance which was very small after their 30 or 40 years' "slavery." The impression created among the people was that the high officials were well looked after, and the poor workers neglected. Private employers paid higher wages to bricklayers than were paid by the Corporation. If there was a superabundance of money in the hands of the Gas Committee, why not spend some of it in lighting the courts.

Mr. GRANGER spoke in favour of the resolution. It was urged, he said, that Mr. Hunt had saved a Consulting Engineer's commission in the erection of the new Windsor Street works; but those who knew the district said that this had been the very cause of excessive expenditure. It was also stated that these advances had been promised by Mr. Chamberlain; but he did not believe that he had in any way bound his successors. The fact was that there ought to be one Engineer instead of two; for, while it was urged that the present system kept up a useful rivalry, it was obvious, on the other hand, that the same rivalry made it to the interest of each to conceal the causes of bad gas.

Mr. JARVIS felt that the case was one in which the voice and opinions of the electors ought to be considered. The maximum salary of the Manager should be £1000. He would not suggest a reduction; but a readjustment of the two salaries in question to £1000 and £950.

Mr. LOUGHTON believed Mr. Chamberlain had, in fact, promised the officers of the Gas Department that their position should be as good as that of other officers throughout the country. The statement that Mr. Smith was merely an accountant was incorrect, as every one acquainted with the work of the Gas Committee was aware.

Alderman POLLACK concurred in the concluding statement of the last speaker. One would imagine, he continued, that the sole business of the Gas Committee was to deal with salaries. The duty of the Gas Committee was to do its business successfully and remuneratively, to employ such men as would ably assist them in doing so, and to pay those men such salaries as their responsible duties deserved. Mr. Hunt was engaged some thirteen or fourteen years ago; and surely an advance from £800 to £1200 in that time was not excessively rapid. The fault had been, as it seemed to him, that the Committee had not made it gradually. Contrary to what Mr. Granger had said, the Windsor Street works were effecting great economies. Manifestly the question could not be decided by the opinion of Mr. Granger, especially when the Committee were in possession of many facts and reasons which were not known to that gentleman. Mr. Walter was entirely mistaken as to the nature of Mr. Edwin Smith's duties. They were not exactly those of an accountant. The department had an accountant strictly so called. Mr. Smith was the General Manager of the department; and one of his duties was to detect any shortcomings on the part of the Engineers. Mr. Walter appeared to forget that the Gas Committee transacted an enormous amount of business. Their turnover was nearly £500,000. They had not only to deal with the gas accounts, but with several other important matters. There was, for instance, the question of residuals. Two years ago they had a large stock of coke; and they were advised to reduce the price by 1s. or 1s. 6d. a ton. If they reduced it 1s. per ton, it would have been a reduction in the revenue of £7500; but by the vigorous action of Mr. Bishop, in conjunction with Mr. Edwin Smith, they had now no coke left, and it was probable the sale of the coke this year would very largely increase the revenue. There were also a great number of contracts to deal with. If the contract for tar were not properly watched, there would be a difference of perhaps £2000 to £3000 a year; and every penny a ton in the price of the coal meant £1500 a year to the Committee. It was due to Mr. Smith that they were able to buy their coal so economically. Mr. Edwin Smith gave most invaluable advice in respect to all the matters which came under the control of the Committee, who appreciated the value of his work.

Alderman JOHNSON thought that the resolution if passed would be illegal. He did not know the details of Mr. Smith's engagement; but it was an engagement which could not be terminated at a month's notice. By passing the resolution, they could not cancel his engagement by any such notice as Mr. Walter proposed. Mr. Walter urged in support of his resolution the discourtesy of the Gas Committee in not reporting their advances of salary. The Committee, unfortunately, had departed from the spirit and letter of the resolution that they should always report; but were they going to victimize Mr. Edwin Smith because the Gas Committee did not perform their part of the standing order passed when the Gas Committee was constituted? The Committee were empowered by the Council to make a contract with Mr. Smith; and therefore it would become in every sense the contract of the Council. If they passed the resolution, it would have a serious effect on the permanent staff. It would discourage them in their work, because it would be a proclamation to every member of the permanent staff of the Corporation that his salary was at the mercy of a vote taken at any time in the Council. He asked the Council, therefore, to reject the resolution on the ground that it was most mischievous in its character.

The motion was defeated by 35 votes to 5.

IMPORTANT SALES OF SHARES.

By order of the Royal College of Surgeons, Messrs. Thurgood and Martin sold at the Auction Mart, Tokenhouse Yard, last Thursday, £24,780 of stock and 375 fully-paid £6 7 per cent. shares (all *cum div.*) in the *Crystal Palace District Gas Company*. The well-known prosperous and promising character of this undertaking drew together a good number of purchasers, who evinced much eagerness to become possessed of the various lots as offered. Having dilated on the prudent management and the steady growth of the Company's district, the Auctioneer put up for sale, in lots of £250 and £100, a quantity of 10 per cent. ordinary stock, which sold as follows:—£4750, at £205 per cent.; £800, at £207; and £775, at £207 10s. A large parcel of 7 per cent. stock was next offered (divided into similar lots), of which £250 sold at £148 per cent.; £100, at £147 10s.; £2000, at £147; £4800, at £146 10s.; £6235, at £146; and £200, at £145 10s. The final lots of stock sold consisted of £4870 of 6 per cent. (divided as before); and they were disposed of at the following prices:—£2500, at £137 10s.; £400, at £135 10s.; £1970, at £135. The £6 new ordinary shares (earning dividends at the rate of 7 per cent. per annum) produced—300 shares, £8 17s. 6d. each; and 75 shares, £9.

Messrs. Studdards and Stansfield, of Bradford, sold by auction last Tuesday, a number of miscellaneous shares, in which were included shares in various Gas Companies. Three lots of £100 original 10 per cent. stock in the *Shipley Gas Company* were disposed of at £240 each. Fifteen fully-paid £10 shares in the *Redcar Gas Company* fetched £14 per share. Six £10 fully-paid "A" shares in the *Eccleshill Gas Company* realized £18 10s. Fifteen of the *Drighlington Gas Company's* £10 shares (£8 paid) sold for £8 per share. A lot consisting of £120 "B" stock in the same Company was disposed of at £122 10s.

THE LIGHTING OF LIMEHOUSE.—At the last meeting of the Limehouse District Board of Works, Mr. E. Smith called attention to the lighting of the district. He said the Board were paying more for public lighting than they should; and he hoped the Gas Company would see their way to reduce their charges. With this in view, he moved that the question of lighting the district be referred to the Works Committee. The Clerk stated that the charge for lighting was £39s. per lamp annually, including the painting of the columns, lighting the gas, and repair of broken glass. Mr. Hopson seconded the motion, which was carried.

THE PROPOSED ELECTRIC LIGHTING OF COWPEN.—Last Wednesday an informal meeting of a Committee composed of all the members of the Cowpen Local Board was held to consider the advisability of lighting the town with electricity. The Chairman (Mr. Robinson) said he had called the meeting for the purpose of hearing an explanation from Mr. Nicholson, of Messrs. Jennings and Nicholson, electrical engineers, of London. After the explanation and conference, a memorandum of agreement was drawn up and initialled by the Chairman on behalf of the Board, and Mr. Nicholson on behalf of his firm, for lighting the township by electricity. On Friday, at a special meeting of the Local Board, it was unanimously decided that the tender of Messrs. Jennings and Nicholson, to light Cowpen township with 18 arc lights for £575 per annum, with option to purchase the plant during the five years' term, be accepted. The township has been in darkness since August; so that considerable satisfaction is expressed with the decision of the Board.

THE GAS COAL CONTRACTS OF THE BURY CORPORATION.

On Thursday last, at the Meeting of the Bury Town Council—the Mayor (Mr. Alderman Smethurst) presiding—the Gas Committee presented minutes, from which it appeared that at their meeting tenders for coal were opened and initialled, and ordered to be tabulated and laid before the next meeting; and the Chairman (Mr. Alderman Burrow) read to the Committee some correspondence that had taken place between himself, the Manager, and Mr. Ellis Lever.

Mr. BENTLEY called attention to the minute referring to the correspondence, and moved that it be read. He said he need not remind the Council that the name of Mr. Ellis Lever had been pretty prominent in connection with gas-works and municipal corporations. He did not know what the object referred to was; but he thought it desirable, as long as his name was in the minutes, that the letters should be read.

Alderman BURROW had no objection to this being done, if it was the wish of the Council. He did not think it advisable that all the correspondence, which the members of the Council did not know the tenor of, should be made public; although the Council might have the right to know of it. Mr. Bentley should have given him notice of his motion. But fortunately he had the letters with him; otherwise he would have had to ask the Council to wait whilst he sent for them.

Mr. MOZLEY moved that every member have an opportunity of seeing the correspondence at the gas offices.

Some conversation took place as to whether the Chairman of the Committee should read the correspondence, when

Mr. ALCOCK said it would be simply a waste of time. If any person who had an interest in the question had the liberty of perusing the correspondence, it would meet the case.

The minutes were then confirmed, on the understanding that Mr. Alcock's suggestion should be carried out.

The *Bury Times*, referring to the matter, thinks the Council made a mistake in not having the letters read. "We do not," says the local paper, "suppose that anything like what has occurred at Salford or Halifax is about to be disclosed in connection with Bury. Still, as Mr. Lever is something like a stormy petrel in connection with gas-works, and as Alderman Burrow said he had the letters with him, and had no objection to read them if the Council wished him to do so, it was a pity the Council should not have accepted his offer. Had the letters been read, or even a summary of them given, it might have been the best for all parties. There are people ready enough to think there may be something to conceal. It is clear the letters should not have been named in the minutes—or they should have had their purport disclosed—if only to prevent statements going abroad which may be altogether untrue and unfair."

SALFORD CORPORATION GAS SUPPLY.

THE ALLEGED FRAUDS IN THE GAS DEPARTMENT.

At the Monthly Meeting of the Salford Town Council last Wednesday—the Mayor (Mr. Alderman A. L. Dickens) presiding—the correspondence which had taken place with Mr. Ellis Lever with reference to certain alleged frauds in the Gas Department was submitted.

The Mayor said that some letters had passed between the Council and Mr. Ellis Lever with regard to that gentleman's offer to show the ratepayers how they had been defrauded; and the upshot of it all was that Mr. Lever had declined to accept the terms of the Corporation. The Mayor then read the correspondence. The first letter, dated Nov. 22, was from the Town Clerk to Mr. Lever, and was as follows:—

I beg to forward you copy of resolution passed by my Council yesterday. You must understand that in case your two nominees should not appoint his Worship the Mayor the third gentleman to meet you, the meeting must be held outside the Town Hall; but, of course, in case his Worship is the third member, the meeting may be held here.

The resolution enclosed was in the following words:—

Resolved, that the proposal of Mr. Ellis Lever to nominate two members of the Council, who, being so nominated, shall themselves appoint a third, to whom he will disclose the frauds alleged to be going on in the supply of coal for the Gas Department, be accepted, and that the members so selected shall receive such evidence and report the result to the Council.

To this letter and enclosure, Messrs. Dendy and Paterson, Mr. Lever's Solicitors, on Nov. 28, wrote—

On his return from Wales yesterday, Mr. Lever handed us your letter of the 22nd inst. enclosing a document purporting to be a resolution passed by the Council on the previous day. In the discussion which took place, the Council appeared to ignore the fact that the offer made by our client on the 26th of September had been formally withdrawn by us in his behalf, for the reasons stated in our letter addressed to the Mayor on the 8th inst., which you published. Even if the offer had not been withdrawn, the resolution you send, and the letter accompanying it, contain conditions to which we could not advise our client to assent. When you tell him, although not authorized by the resolution to do so, that, unless the Mayor is the third person nominated, Mr. Lever and his nominees should not be permitted within the Town Hall, the only construction which our client can place upon a deliberate affront of that nature, following the obstacles put in his way on former occasions, is that his presence and assistance are not desired.

Alderman KEEFNEY asked if he might understand that the Committee could have met either in the Gas Offices or anywhere else, at Mr. Lever's request, if he had accepted the proposal.

The Mayor replied in the affirmative.

Mr. RYECROFT observed that having since his election to the Council, taken a somewhat prominent part in the gas affairs of the Corporation, he must express his regret at what appeared to be the utter collapse of the negotiations between Mr. Ellis Lever and the Corporation in reference to the communication of certain information which Mr. Lever publicly announced he was able to furnish. He was afraid the Council was largely to blame for this result. If the Council, as it undoubtedly should have done, had promptly and without reservation accepted Mr. Lever's offer, he would have had no alternative but to carry out the promise he made; but the manner in which the Council, in its unwisdom, approached the matter was not calculated to inspire Mr. Lever with confidence. He trusted, however, that Mr. Lever would not let the public suffer in consequence of the infirmity of those who were sent to safeguard their interests; but that he would reconsider the position, and let the information be available for exposing any past or present malpractices in the Gas Department. That the burgesses of Salford were greatly indebted to Mr. Lever could not be denied; and it did seem strange that he should have been treated with such scant courtesy. He refused altogether to be drawn away by side-issues. The sole questions they, as a Corporation, had to consider were: Had they been defrauded? (and of that there was no manner of doubt), and By whom? To say that A. was no better than B., or, as a prominent statesman put it, "You're another," did not, in his opinion, advance the matter at all.

The Mayor said Mr. Lever would probably have plenty to do for some little time to answer the letter which had been published in the *City News*. If that letter was answered satisfactorily, it would answer the purposes of the Council.

* This is the letter which appeared in the JOURNAL for the 27th ult. (p. 941).

Mr. B. ROBINSON thought the matter ought not to be allowed to rest where it was; because a serious imputation had been cast upon the Council as well as upon the Gas Committee.

The Mayor: You can put it on the *agenda* paper for the next Council meeting.

THE ALLEGED OVERCHARGES FOR GAS IN ABERDEEN.

The Sub-Committee appointed by the Aberdeen Town Council, in July last, to consider the subject of the alleged overcharges for gas (to which a number of references has been made of late by our Edinburgh correspondent), have now issued their report. The Committee state that they resolved, in the first instance, to obtain a report from Dr. William Wallace on the quality of the coals used at the Corporation Gas-Works, the gas produced, and the pressure on the distributing mains.* They had carefully considered Dr. Wallace's report, from which it would be observed that he took no exception either to the quality of the coals or the results obtained. They had also examined the pressure-register kept at the gas-works, and found that the pressure agreed with that recommended by Dr. Wallace. With regard to the suggestion that gas of 25-candle power should be manufactured, as the most economical for general use, and the most likely to give satisfaction to all parties, the Committee recommend that this matter should be kept in view, and taken into consideration before the contracts are entered into for next year's supply of coals. The report goes on to say that the Committee also instructed the Gas Treasurer to prepare a statement showing the amount of the gas accounts of consumers resident, for three consecutive years, in each of the following streets:—Causewayend, Market Street, Ferryhill Place, Watson Street, and Frederick Street—the statement to embrace the period from May, 1885, to May, 1888, and to distinguish the number increased or decreased. This statement was duly prepared; and it showed that the increase of gas consumed for the year 1886-7 over the year 1885-6 amounted to 5.08 per cent., while the increase of money paid amounted to 5.3 per cent. For the year 1887-8 the increase of gas consumed over the preceding year amounted to 2.33 per cent. only; while the sum paid for gas for the same period decreased 2.01 per cent.—the price of gas having been reduced. The Committee further find, from the last statement of accounts submitted in connection with the gas undertaking, that the average annual increase of gas consumed since 1872 to the present time has been 10,700,000 cubic feet; whereas the increase of the past year over the preceding year has been only 8,379,000 cubic feet. The gas-rental has decreased from £56,076 in 1887 to £55,604 in 1888. The Committee also received from Mr. Adam Pratt a list of complaints obtained by him in response to public advertisement. The number of gas consumers in Aberdeen is nearly 25,000; and the complaints on Mr. Pratt's list amounted to only 134. Of these cases, an analysis shows the following result:—Number entered twice, 4; number where larger pipes or meters were supplied owing to greater quantity of gas being required, or where pipes were cleaned out or larger burners used, 7; number where gas-stoves were introduced, 2; number where escapes were found ranging from $\frac{1}{2}$ foot to 6 feet per hour, 4; number where no corresponding accounts exist with which comparison can be made, 16; number not found in the Council's books, 4; number decreased in place of increased as alleged, 13. This disposes of 50 of the complaints; and of the 84 remaining cases, it is explained that 5 show an increase on the half year of from 2d. to 1s.; 35, from 1s. to 5s.; 23, from 5s. to 10s.; 15, from 10s. to 20s.; 6, from 20s. to 36s. It is pointed out that, while it is the duty of the Town Council to supply gas of the statutory quality, and keep up the necessary pressure on the street mains, it is the duty of the consumer to use only such quantity of gas as he requires, and that the Council cannot impose any restriction as to the amount which the consumer is to burn. The Committee, in conclusion, take the opportunity of stating that there is not the slightest foundation for the allegation, which, on more than one occasion, has been made in public, to the effect that atmospheric air was being forced through the mains by which the gas supply is distributed to the city.

THE PROPOSED ELECTRIC LIGHTING OF DUBLIN.

At a Special Meeting of the City Council of Dublin last Wednesday—Mr. Alderman KERNAN (*locum tenens* for the Lord Mayor) presiding—the question of the electric lighting of the city was discussed on the estimate of the Finance and Leases Committee coming up for confirmation.

The HIGH SHERIFF (Mr. J. Winstanley), in moving the adoption of the estimate of the Finance and Leases Committee, said that the figures were rather alarming, being £6795, as against £3651—an increase of £3144. The adoption of the electric light would alone cause about £2300 of this additional expense.

Mr. HEALY remarked that in the estimate he could only see a sum of about £1000 accounted for under the head of electric light.

Mr. SHANKS pointed out that there was an estimate for £804 to meet expenses in connection with a loan for £6000 for electric lighting purposes. He was not aware the Council had sanctioned such a loan.

The TOWN CLERK replied that the Council had authorized the obtaining of a Licence, and the necessary expenses in connection with it.

Mr. DAWSON moved a reduction of the amount of the estimate by £1404 made up as follows:—£804 15s. expenses in connection with the electric lighting loan; £500 for maintenance; and £99 less cost of collection.

Alderman O'CONNOR seconded the amendment.

Mr. GILL said he believed the Corporation were going into a thing which would entail an enormous expense on the community. People might say: "Oh, you are a gas shareholder and have no right to speak on this matter." Notwithstanding that he was a shareholder in the Gas Company, he considered himself, as a member of the Council, bound to protest against the enormous expense that was going to be put on the city. The Corporation were rushing into an enterprise the end of which no one saw, and which would saddle the citizens with probably £25,000 of expense. He believed the Gas Company were also going in for electric lighting; but they had some reason of their own. It was not for any profit they would make through it, because he believed both the Gas Company and the Corporation would incur heavy loss. He might point out that in parts of America, where electricity was successful, it competed with gas at from 12s. to 15s. per 1000 cubic feet, instead of 3s.

Mr. DOYLE said it struck him as an anomaly that Mr. Gill, who was a large shareholder of the Gas Company, should oppose this motion, when the Gas Company themselves were about to apply for a Provisional Order for the purpose of enabling them to furnish electric light. His reason for voting for the experiment was that he thought the monopoly of lighting should not be altogether in the hands of the Gas Company.

The HIGH SHERIFF intimated that he would assent to the reduction of the estimate by £1400. It would stop the loan for a year.

Mr. DOHERTY observed that, if they desired to keep up with the times, they were bound to give electricity a trial. Belfast was splendidly lighted with gas; but they had control of the gas-works themselves. If the Dublin

Corporation could not light the city by electricity, they must buy up the Gas Company's property.

Mr. HEALY thought it was singular that this scheme should be attacked at the last moment, and by those gentlemen who were interested in the Gas Company. The increase on the rates of the city by the scheme would not, he asserted, be $\frac{1}{2}$ d. in the pound.

Mr. ROBINSON said that the High Sheriff, who was a Director of the Gas Company, had "let the cat out of the bag" by saying that if they did not vote £6000, they stopped the enterprise for a year. Under these circumstances, he considered that the Corporation, having unanimously agreed to go for a Licence, it would be a monstrous thing to tie up the hands of the Committee now.

Mr. SHANKS said he should support the amendment, as he believed the Committee had exceeded their powers.

The CHAIRMAN said it was not a fact that the scheme was attacked by the shareholders of the Gas Company. He was not opposing electricity for he would like to see the streets of Dublin well lighted, which they were not at present. The lamps were too far apart; and the Corporation were not willing to give money to the Gas Company to light the streets properly.

On a division being taken on the amendment, the voting was equal.

The CHAIRMAN, believing that it was the wisest course for the Council not to press for the money, said he would give his casting vote for the amendment.

Mr. ROBERTSON moved as a further amendment—"That the estimate be reduced by £402 7s. 6d. (instead of £804 15s.) to meet the expenses of a loan for the electric lighting."

Alderman BYRNE, in seconding the amendment, said the Committee could not get the work done for them by a small contractor if the money was not forthcoming for a year. Only a large contractor, who would charge more, could wait out of his money for a year.

After a prolonged discussion, a division was taken; and the numbers being again equal, the Chairman gave his casting vote against the amendment; and Mr. Dawson's amendment, reducing the Committee's estimate to £5400, was adopted.

THE ELECTRIC LIGHTING OF BARNET.

FURTHER DISSATISFACTION WITH THE LIGHTING—THE THIRD COLLAPSE.

At each meeting of the Barnet Local Board of late, the members have been troubled with complaints from the inhabitants as to the lighting of the district by the electric lamps, and last Tuesday's meeting was no exception to the rule. A Mr. Yolland attended and complained that for three nights one of the lights in Park Road had not been alight. The Chairman (Mr. C. Stevens) apologetically stated that the Board "are spending a great deal of time on the subject of the lighting of the town." This, however, did not satisfy the complainant; and he asked that an oil light should be placed in the gas-lamp, to which the Chairman replied: "We must not do that; but we are seriously considering the matter." On being informed that the Board were about to discuss the whole question of the lighting of the district, Mr. Yolland withdrew. A letter was then read from the Board of Trade informing the Board that it would be necessary for Mr. Joel to acquire statutory powers for lighting the district of the Board with electricity; and the Clerk was instructed to inform the Board of Trade; that, under his contract with the Board, Mr. Joel had to do so at his own expense, if it was required. The Board subsequently went into Committee for the consideration of the subject of electric lighting; and, after lengthened discussion *in camera*, instructed the Clerk to give notice to Mr. Joel to remedy the defects in the lighting within fourteen days.

Last Saturday night witnessed the third breakdown of the electric light at Barnet since its introduction. On this occasion the electric light was brilliant from dusk to about 7.30, when it suddenly went out. The occurrence was particularly unfortunate, as the streets were very busy at the time; and numbers of persons resident in the town and in the surrounding villages were engaged in shopping. A thick fog prevailed; and for some time pedestrians were literally groping their way. In the main thoroughfares the inconvenience was not so great, as the lights in the various shop windows served to illuminate the streets to some extent; and particularly so as the lights in question were more numerous than usual on account of shows and window dressings which are common at this season of the year. Even in the most favoured parts of the town, however, it is stated that the inconvenience was considerable; and trade was practically at a standstill for a short time. It was alleged that a wire had been maliciously cut, and the circuit so broken; and, further, that a workman, recently discharged by the contractor, was suspected of the outrage. A more probable explanation, however, is to be found in a letter which the Contractor recently addressed to the Local Board, informing them that he was about to make a change from temporary to permanent engines and plant, and asking to be excused if, in the transition state, any hitch should occur. Whatever the cause may have been, the light was not again available for nearly two hours; and the public, particularly the tradesmen, gave free expression to their annoyance at its failure.

BOLTON CORPORATION GAS SUPPLY.—At the monthly meeting of the Bolton Town Council on Wednesday last, Alderman Miles, Chairman of the Gas Committee, drew attention to the following paragraph in the Committee's minutes:—"Question of supplying gas upon system of monthly collection referred for further consideration. Office Superintendent to obtain information as to the practice of other towns; prepare a scheme for carrying out proposed system; and submit such information and scheme to Works Sub-Committee. The Office Superintendent also to submit report showing the number of deposits and the total amount now in the hands of the Corporation as security for gas supply, and the average yearly interest paid in respect of such deposits." He said that they had 8000 service-pipes laid into houses in and around the district, which had been cut off for one purpose and another, and at present were totally unproductive. It was the desire of the Committee to bring as many of these into use as possible, and under the best system they could organize. They were now getting particulars as to the practice in other towns; and he thought the information might enable the Committee to come to a wise decision on the point. With regard to the deposit system, he had a strong opinion; but if he gave expression to it, it must be understood he did not pledge the Committee or any member of it in any direction whatever. His opinion was that the Committee would do well to abolish the deposit system, except to those people who might be described as "here to-day and gone to-morrow." At the recent meeting of the Manchester Institution of Gas Engineers, Mr. Newbigging wrote in very strong terms against the deposit system; and he entirely agreed with him, believing that the provision had prevented them in Bolton getting a number of consumers they might otherwise have had. In the short discussion which followed, Mr. Broughton said the proposed monthly collection was a most important change, and likely to lead to a great deal of friction, as they could not treat one householder on one basis, and another on a different one. Finally, the minutes were confirmed.

* Abstracts of Dr. Wallace's and the Gas Treasurer's reports were given in the JOURNAL for Aug. 14 last (p. 302).

THE INAUGURATION OF ELECTRIC AND GAS LIGHTING IN IPSWICH.

Public lighting by electricity from a central station was—says the *East Anglian Times* of last Tuesday—quietly inaugurated in Ipswich on Saturday night, when the offices of this paper were brilliantly illuminated from the station in Carr Street, not far from the spot where, 66 years ago, public gas lighting was first commenced in the town. The coincidence is singular; the premises in Carr Street, taken as a central electric lighting station, being but a few yards from the site of Messrs. Ransomes' old premises, where the gas lighting of Ipswich was started. The house is still marked by a gas-lamp—the very first to be lighted. A little party assembled on the occasion, 66 years ago; and one of the elder Ransomes had struck a light to ignite the first public gas-jet in Ipswich, when Mr. Richard Ransome dashed forward and declared that the new light should not be started in such a way. Wiping up a one-pound note he set fire to it; and thus was public gas lighting inaugurated in Ipswich. Mr. Dykes Alexander was the first Chairman of the Company, which comprised eighteen other Alexanders, six Cobbolds, twelve Ransomes, eight Browns, three Maws, Mr. Arthur Biddell, Mr. D. P. Goddard, Mr. W. Haldeman, M.P., and Sir W. Fowle Middleton, who, imitating his famous predecessor, the author of the New River, took a large interest in the new light. The famous Engineer, Sir William Cubitt, then an undistinguished young man, was the first Engineer and Clerk to the Company, at a salary of £100. It may be interesting to mention that the rental during the first nine months from private consumers only amounted to £514 7s. 8d.; and that the Company earned 5 per cent. from the first. The Committee in their first report "flattered themselves" that the undertaking "would prove satisfactory to the proprietors." That it has done so is beyond doubt; that it will continue to do so both for light and heat is the general belief. The inauguration of electric lighting on Saturday in Ipswich was not marked by the sensational destruction of a one-pound note. It was quietly done in the back yard of the premises taken as a lighting station by Messrs. Lawrence, Paris, and Scott, Limited. The old house where gas was started will soon be replaced by a brand new building; and after 66 years the gas-lamps of Ipswich are menaced by a brand new light. This also is a young giant, born near the self-same spot which gave birth to gas lighting. The *modus operandi* consisted of a big portable engine, put into the central station by Messrs. Ransomes, who are to the front in electric lighting, as they were in gas. This engine drove a dynamo, fixed by Messrs. Lawrence, Paris, and Scott, and which ran so smoothly that it was difficult to see any motion existed. The electric current was then experimentally conveyed to the *East Anglian* offices, where about half-past ten o'clock all the lights were set going. The *East Anglian* makes its own electricity. We are bound to admit that the light supplied by the new Company was whiter and steadier than ours—steadier because there was no machinery to be turned, only light to be produced. The engine power at the lighting station in Carr Street will, it is expected, soon prove inadequate for the anticipated consumers of the light, by which time a cable will be laid to the Orwell Works; and with the engine power at that famous establishment all Ipswich might readily be lighted.

GASEOUS FUEL AND ITS USES.

At the Meeting of the Halifax Literary and Philosophical Society last Tuesday evening, Mr. B. H. Thwaite, C.E., F.C.S., delivered a lecture on the above subject. He commenced by referring to the incalculably evil effects of smoke production on health, and the extraordinary waste resulting therefrom; and stated that no remedy, except the use of gaseous fuel, would be effectual in removing the evil. Alluding to the extraordinary development of the application of natural gas in Pennsylvania, the lecturer pointed out that, from geological premises, he was of opinion that some 1500 feet beneath the salt-beds of Cheshire and other salt districts in this country, natural gas might be found; and, had we had the enterprising spirit of the Americans, not only the salt-fields but the coal-fields of this country would have been prospected and drilled ere this. The scientific processes involved in the generation of gaseous fuel from coal and oil were described, and Mr. Thwaite showed a scheme for supplying gaseous fuel to London from the South Wales, Staffordshire, and South Yorkshire coal-fields. The mains would be four in number from Staffordshire, for a length of 120 miles. The South Wales branch main would consist of two pipes, 100 miles in length; and the South Yorkshire branch, one pipe of 70 miles in length. Branch pipe-lines would supply all the principal towns between Barnsley, Stafford, and London. The coal would be converted into gas at the coal-fields, and delivered to the mains under great pressure; and could be distributed in the towns in the daytime for heating purposes by the ordinary mains, and could also be used at night with special burners for illumination. The saving in fuel by this distribution system would, he asserted, be colossal. There would be no cartage nor railway carriage. The gas would flow from its source to the position of use. There would be no middlemen. The saving in London alone would realize an immense figure; and the smoke question would be settled once for all, with a benefit to the inhabitants of this country that would surpass the effect of all the great achievements of sanitary and economic science. Mr. Thwaite pointed out that natural gas is conveyed 60 miles from the wells in Pennsylvania to distributing locations, and that within the last few years the length of distributing pipes has increased from *nul* to 2300 miles. The lecturer gave a description of a scheme for conveying gaseous fuel to the large towns in Lancashire from the Wigan coal-field; and in the West Riding of Yorkshire, from the Barnsley coal-field.

LINCOLN CORPORATION GAS ANNUITIES.—At the last meeting of the Lincoln Town Council, it was determined, in pursuance of the powers contained in the Lincoln Corporation Gas Purchase Act, 1885, "to pay off and redeem all the annuities secured by gas certificates under that Act, at the price of 25 years' purchase of such annuities."

THE NORTHERN COAL TRADE.—The coal trade of the north-east of England has shown ease, on the whole, during the last few days. The steam coal trade has been affected by the closing of some of the Baltic ports, and the shipments having been less; and the price has been a little lower. From 8s. 6d. to 9s., less discount, may now be put as the price of best steam coals, and second is correspondingly lower. Small coal is almost a drug in the market, and sells at very low prices. For gas coal, there is a very full demand; and the chief collieries find it difficult to obtain all that is needed to supply the orders that have accumulated. The price of gas coals varies very greatly; but about 7s. 6d. is the quotation for best qualities and for odd cargoes. Many of the collieries are behindhand in their deliveries on contract; and it is probable that advantage will be taken of the next few weeks, when the miners usually work fuller time before the holidays, to make up arrears. But the high rates of freight asked for the conveyance of coals to the Metropolis tell against larger deliveries, though the rates of freight are slightly easier than a few weeks ago. This, however, may be changed by a storm at any time. The manufacturing coal trade shows firmness.

DIVINING FOR WATER AND METALS.

In another part of to-day's issue, we give an account of a meeting called last Saturday week for the purpose of testing the claims made on behalf of certain so-called "water diviners"—about which we had something to say a month or two ago in our leading columns. Our lively contemporary *Truth* also had a representative at the meeting; and the account he sent in of the proceedings is prefaced by the following editorial remarks:—"As the use of the 'divining-rod' for discovering subterranean water and metals has been very much pushed lately by parties interested in the business; and as I have more than once expressed my disbelief in the process without reserve, I was much gratified the other day at the receipt of an invitation from Mrs. Louise Cotton to witness experiments with this said rod by several gentlemen of established reputation in the art or mystery of divination by that means. Captain Nisbet, an Elder Brother of the Trinity House, said the invitation, had kindly lent his house and grounds ('Hollywood,' South Kensington) for the occasion; the grounds being specially adapted for the purpose by the presence of an old well and spring, long covered over, the exact site of which was known only to the Captain, who was 'quite sceptical as to the powers of the rod.' Being, unfortunately, prevented from attending the proceedings myself, I deputed a fairly intelligent member of my staff to represent me. I think I cannot do better than print his report in full, for the benefit of all who take an interest in this form of black art, believers and unbelievers alike." Here is *Truth's* report:—

On arriving at Captain Nisbet's, I found the four professed "diviners" who had been announced to attend already on view, divining-rods and all, in the drawing-room; and a move was shortly afterwards made to the garden—Mrs. Louise Cotton (if I may be forgiven the expression) "bossing the show." The four diviners present were: Mr. W. Scott Lawrence, of Bishopston, Bristol, described to me as "stone merchant"; Mr. John Stears, of Hnll, described as "gas engineer, &c.," Mr. Charles Holt, of Redmill, Bottesford, Leicestershire, signalman on the Great Northern Railway; and Mr. Alfred Allen, of Abergelle, North Wales, who was introduced as a "farmer's son."

It was arranged that one of the diviners should commence operations while the other three remained indoors, out of sight of the garden. The first innings was accorded by acclamation to Mr. Lawrence, as the senior professor present. Mr. Lawrence's name may be in the recollection of some of the readers of *Truth*. He it was who was retained not many months ago by the Tiverton Town Council to advise as to the locality in which wells should be sunk for the borough water supply. *Truth* took the liberty of commenting freely on the extraordinary hoops-pocus gone through on that occasion; and Mr. Lawrence took the liberty of replying with equal freedom in a letter, which I think was published, rebuking the scepticism which ridicules things passing its comprehension. I may say at once that Mr. Lawrence is not only the *Doyen* of the divining profession, but that he was by far the most interesting figure present on Saturday. He owned to 79 years of age, but did not look it; being ruddy and clear complexioned, hale, hearty, and strong on his legs. In general figure—at any rate with his hat on, and a fringe of white hair curling luxuriously underneath it—he might have passed for a country cousin of Sir John Bennett.

Before I describe what Mr. Lawrence did, it should be understood that Capt. Nisbet's is an old-fashioned, rambling house, the presence of which in the year 1888 within a mile of South Kensington station is quite as near an approach to a miracle as anything else which I saw on Saturday. The garden might be half-an-acre in extent, chiefly consisting of a large lawn, with a winding gravel path all round it. At the further end were one or two greenhouses and outbuildings. Somewhere on the premises, we were told, was an old well, from which the house was still supplied. The precise spot, however, we were assured, was known only to Captain Nisbet, and to no one else present; and I may say here that Captain Nisbet's *bona fides* on this point was, in my opinion, beyond question. He was announced as a sceptic; and I left him still professing scepticism when I came away.

Now for Mr. Lawrence. He rather disappointed us at starting by announcing that he could not undertake to find the well itself, but only the spring which supplied the well—the divining-rod being only susceptible to *running* water. However, as the spring must run into the well, this was not really so much like hedging as it looked at first sight. With this preface, the wizard took his rod in both hands, and commenced to pace the garden with measured tread and an air of intense preoccupation. The rod was a tolerably stout hazel twig shaped like the letter Y. Mr. Lawrence grasped one arm of the fork tightly in each hand, palms uppermost. The straight stem was pointed away from him, and the arms of the fork bent outwards. The intelligent reader can soon ascertain for himself that a forked twig held in this fashion acts like a spring. The apex has a constant tendency to spin round—greater or less, of course, according to the degree of tension at which the thing is held; and a more or less considerable effort is consequently required to keep the stem pointing horizontally. Mr. Lawrence appeared to steady it by pressing his elbows tightly against his sides.

Well, he started from the corner of the garden nearest the house, and walking diagonally across the lawn, struck the path on the left-hand side about half-way down. (I must apologise for these details; but they are necessary for the correct appreciation of the result.) From this point Mr. Lawrence followed the path down to the bottom of the garden, and right round to the corresponding point on the opposite side; the spectators attending with breathless interest. The circuit of the lawn was not quite completed; for, having reached the point opposite where he had first struck the path, Mr. Lawrence turned on to the grass again, and made for the path in front of the house, which he had missed at first starting. The kitchen and offices were evidently in this direction; and at the corner was a screen apparently shutting off a yard. Passing this spot, the path ran past some rockwork—on both sides, if I remember rightly. Suddenly, as the rockwork was reached, the rod flew up in Mr. Lawrence's hands. He stopped and fell back a pace. The rod was now up in the air jibbing and gyrating, and apparently trying to throw Mr. Lawrence down. The old gentleman, however, stuck to it manfully. His hat fell off; but still he wrestled and writhed, spluttering with his lips at the same time, till at last the rod snapped in two. Mr. Lawrence staggered backward, with his eyes closed, into the arms of one of the spectators; and an enthusiastic cheer went up from the assemblage. Having come round, which he did in a moment or two, the wizard crossed the magic spot without his wand, and then proceeded to approach it from the other side, in order to fix the locality exactly. This time, however, instead of the divining-rod, he produced a piece of steel spring, which he held between his hands, much in the same fashion as the rod, compressing it into the shape of a bow with the convex side away from him. As he approached the same spot, the steel spring behaved in precisely the same fashion as the wooden rod; and after a similar struggle with it, Mr. Lawrence desisted. He next took soundings, as it were, across the lawn with similar results; and he finally announced that there was running water under this part of the garden, in a line drawn about parallel to the house, through the spot where the first manifestation occurred.

I describe all this minutely, partly for the sake of the inference (of which presently), partly to avoid going in detail into the performances of the other artists, which were generally similar, but tame and insignificant after Mr. Lawrence's exhibition, for the simple reason that in the other cases the agitation began and ended with the rod, and did not communicate itself to the operator. I may here remark that, in a conversation which I had with Mr. Lawrence, he attributed his "convulsion" (as one critic aptly termed it) to the infirmity of age, and his growing inability to cope with the potent agencies actuating the rod. He has only been taken this way, it seems, in recent years.

Of the other performers, Mr. John Stears was by far the most capable, if a diviner is to be judged, as I suppose he should, by the quantity of water he can discover in a given space. Mr. Stears was a somewhat fallow-faced and very talkative gentleman, with a sandy beard; and I should guess his age at about 45. He used a much less substantial rod than Mr. Lawrence, and held it point downwards. He had not gone a yard from the spot where we started the Bristol gentleman, before his rod was on the jump. He did not follow the path; but wandering more or less aimlessly down the garden, he spotted the subterranean fluid in at least half a dozen places, several of which had been traversed by his predecessor without so much as a tremor. By this time a large number of the visitors had armed themselves with divining-rods or steel springs, and were wandering about the premises trying their luck. A Mrs. Balfour (announced as a "lady diviner") had, if I remember rightly, also taken a hand, and had confirmed Mr. Lawrence's discovery of water in the neighbourhood of the house. It was now getting dusk, and the two remaining professionals, concluding, I suppose, that they had been forgotten, appeared on the scene unsolicited and commenced divining on their own account. I took a turn with each of them. Mr. Holt was an unobtrusive young man, who went to work very rapidly in a stooping position, with the point of his rod close to the ground. On Mr. Stears asking him presently whether he could not work as well upright, he said that he had never tried. He *did* try, however, then and there, and seemed to find the result equally satisfactory. The last artist, Mr. Allen, was a youth of stolid countenance and the general demeanour of the comic countryman. He held his rod between his fingers, with his hands hanging down before him. When he got a bite, the rod just squirmed between his fingers; but he said that sometimes the motion was strong enough "to take the skin off you." The only time Mr. Allen showed any sign of excitement was when he came presently to see Mr. Lawrence "convulsed," at which he burst into a loud bucolic guffaw. I conclude from this that the modern haruspex has less command of the risible faculty than his classical prototype.

But now a few words about a different experiment—to my mind the only one of any practical value. The divining-rod, it may be as well to state, is capable (in the hands, of course, of a performer possessing the requisite gift) of indicating the whereabouts of metals and certain minerals, as well as water. Mr. Lawrence has no gift for metals; but Mr. Stears is as good at one as the other. The most remarkable feature, indeed, in his performance was that when his rod scented metal, the point spun round towards him, while to indicate water it revolved in the opposite direction. He demonstrated this conclusively by holding it towards various pieces of metal-work. Occasionally the presence of metal under Captain Nisbet's lawn was indicated in this manner. On Mr. Stears attributing this to metal pipes, some one asked what would happen if there chanced to be running water in the metal pipe; but on this point Mr. Stears appeared uncertain. Well, it was arranged that this gift of Mr. Stears's should be tested by some more convenient method than digging up Captain Nisbet's lawn to look for the metal, and an experiment was arranged by a select committee consisting of Mr. Frank Podmore, Hon. Sec. of the Psychical Research Society, Mr. W. Webber, and myself. We went indoors, and deposited five sovereigns (Mr. Stears having expressed a preference for gold) inside a bulky volume, which was laid on a small billiard table. Four other books were also laid on the table; and Mr. Stears was then called in to try and find metal. He went round the table with the rod, talking a good deal, and got a decided indication of metal long before he came to the gold. He drifted on; and it is right to state that on the first round the rod pointed for metal over, or very nearly over, the book which contained the sovereigns. It did the same thing, however, in several other places; and Mr. Stears remarked that he felt he was getting a little tired. Mr. Podmore then told him that there was metal under one of the books, and asked him to make a choice between them. He again went round, getting decided indications at the corners and sides where somebody had remarked that the brass mounts of the pockets would be (the table, I should state, had a cloth over it). He now passed without a sign over the five sovereigns, which were at the top, and finally got a decided manifestation from the rod over the book at the bottom, for which he plumped accordingly. A more ignominious fiasco I never saw. Apparently Mr. John Stears was somewhat of the same opinion; for, on being shown the five sovereigns in the book at the other end, he disappeared without further remark. I omitted to mention, by-the-by, that while Mr. Stears was passing the rod to-and-fro over the table, and showing that there was metal in some places and none in others, a clergyman present observed that it was desirable to mark the place indicated. For this purpose he placed a small purse on a spot where Stears was showing us that there was no metal. The rod immediately shied. "Ah!" said Stears, "that shows the money in the purse." When he was gone our clerical friend produced the purse—a brown leather article with an elastic band round it—and informed us that he had carefully emptied it before laying it on the table, so that there was not a particle of metal about it.

I am compelled to pass very briefly over the rest of the proceedings, including Mrs. Cotton's interesting paper on divining-rods, the motive power of which she was inclined to regard as either electricity, animal magnetism, or "astral fluid." Neither have I space for the subsequent discourse of the professors—for Mr. Lawrence's account of the surprising things he has done during the 50 years or more that he has been in active practice as a diviner; nor for Mr. Stears's story of how he fixed the locality of all the gas-pipes in Portadown, the position of some of which was unknown even to the Gas Company, and how he had been invited to go through South America prospecting for metals—in the interests, I presume, of "Bull" operators at home. I must pass to the net result of the practical experiments.

And, first, for Mr. Lawrence. This gentleman, as I have said, discovered running water in one corner of the garden, and in his case alone, among the whole party, had we indubitable evidence of the soundness of the divination. To the left of the spot where Mr. Lawrence was first "seized" stood, on an abutment of the house, an unmistakable water-tank. To the right of the same spot, in the rockwork already described, was a hydrant for the purpose of watering the garden. From the tank to the hydrant there ran a water-pipe; and within a yard or so of the spot where it might be presumed that this pipe passed under the gravel path, Mr. Lawrence became convulsed. What the peculiar gift was which enabled Mr. Lawrence to divine the presence of this particular running water, I leave to the intelligence of every reader with a head upon his

shoulders. In point of fact the thing was so transparent that, immediately after Mr. Lawrence's demonstration, some sceptic went and laid a piece of sacking over the hydrant. Next, Mr. Lawrence located the same spring in a line running from the hydrant parallel to the house. Over this line he had himself gone at starting without discovering anything. On the other hand, I had it from Captain Nisbet that the pipe supplying the hydrant ran in a straight line diagonally across the lawn to the greenhouse at the opposite corner of the garden. This line, Mr. Lawrence crossed twice in his perambulation; yet he never found water until he had spent five minutes reconnoitering the premises, and had the hydrant right under his nose. I may say further that, so far as I was able to observe, not one of the other "diviners" gave the slightest indication of the line of this pipe—not even Mr. Stears, who had a double chance with it, inasmuch as it was a metal pipe with water inside it. Yet observe that Mr. Stears and the others (always excepting the circumspect Lawrence, who is clearly a very old hand at this business), while they passed over the only known running water on the premises, professed to find water in half-a-dozen places where there was not the slightest means of testing the divination. Even in these places there was no agreement whatever among them, except when they met face to face, or when they had had every opportunity of observing one another. Lastly, as to the well. The well was situated, so Captain Nisbet informed me, about half-way between the middle of the lawn and the path on the left-hand side. Considering that water was pointed out in at least a dozen places under that garden (Stears, indeed, seemed inclined to think that the subsoil must be riddled with drains, which, however, Captain Nisbet denied), it is difficult to say of any particular spot that water was not indicated there. To the best of my belief, however, not one of the four diviners pointed out the site of the well. I will go further than that, and say that not one of them pointed to any line of running water which is at all likely to be that of the spring feeding the well. Certainly neither Holt nor Allen did; certainly Lawrence did not, though he made the circuit of the garden and passed within a yard or two of the well itself. Concerning Mr. Lawrence's marvellous performances elsewhere during the last half-century I will at present express no opinion, nor about those of any of the other diviners, though I have an opinion on the subject, and a very strong one. But so far as the experiments of last Saturday went, I say, without hesitation, that a more contemptible display of transparent humbug was never palmed off upon the credulous dupes of "occult science."

THE PROPOSED MODIFICATION OF THE THIRLMERE WATER-WORKS SCHEME.

THE LATE CHAIRMAN OF THE WATER COMMITTEE ON THE PROPOSAL.
Mr. J. Grave, late Chairman of the Water-Works Committee of the Manchester Corporation, in a letter to the local papers last Tuesday, "enters the lists" against the Act which the Manchester Corporation are about to promote, to give them power to make certain deviations in the line and levels of the aqueduct from Lake Thirlmere to Prestwich, and references to which appeared in the JOURNAL last week (pp. 987, 993). He says that a more dangerous and suicidal measure could not be conceived than one which at once practically reduces the quantity of water to be taken from Thirlmere from 50 million to about 10 or 12 million gallons, leaving unappropriated about 40 million gallons per day, which might be claimed, as unnecessary for Manchester, by other communities. The first pipe, he states, will cost about £1,700,000; and the remaining pipes would only entail an additional expenditure of about £340,000 for each. It is as well, the writer continues, to look at the consequences which would follow this new Act if only one pipe is laid. They will be forced to keep the old price when (even with an additional 10 million gallons of supply) it could have been reduced by one-half the present charge to Manchester, and still have had an additional extra revenue of thousands, besides paying interest. He also calls attention to the extra cost which would be entailed in opening the ground to lay additional pipes should they be required in the future, when, at a very small cost, more pipes could now be laid. Mr. Grave expresses satisfaction at finding that the Lake Association are objecting to the Corporation making a road only on one side of the lake, in place of the one that goes all round the lake, at the proper level ordered by the old Act of Parliament. "Let the public adhere to the old Act, and the Corporation cannot get out of it; and why should they?" The roads are all on their own land, and will, the writer asserts, make the whole of the 11,000 acres which they now hold much more valuable and accessible. These roads will cost £35,000 (the surveyor's estimate). But £20,000 will be required in any event, to heighten the main road above Thirlmere to Dunmail Raise; leaving only £15,000 to complete. The proposed Act, in Mr. Grave's opinion, is a "serious mistake, and should be abandoned." It will endanger the old powers that cost so much to get, as well as break faith with those in the district who assisted Manchester so manfully in the late contest in Parliament; and if the Act passes, he should "feel personally dishonoured." Glasgow, he continues, is bringing in 60 million gallons of water in addition to its present supply. The proposed Act may limit the extra supply of water to Manchester to 10 or 12 million gallons; and the result will be that Glasgow will get all the Manchester bleaching trade, although handicapped by railway carriage and sea freight. Concluding, Mr. Grave says that he shall wait with some curiosity for the result of the meeting of the Council and the confirmation by the ratepayers of the intended Act. He repeats that he considers the Act quite unnecessary, and one which will involve, even if unopposed, an expenditure of more than £4000.

MEETING OF RATEPAYERS.

A Meeting of owners and ratepayers of Manchester, convened by a requisition presented to the Mayor, was held last Wednesday, in the Town Hall, for the purpose of consenting or otherwise to the promotion by the Council in the next session of Parliament of the Bill referred to above. The Mayor (Mr. Alderman Batty) presided; and there were a large number of members of the Corporation and other citizens present.

The Mayor moved—"That this meeting consents to the promotion by the Council of the City of Manchester in the next session of Parliament of a Bill, the short title of which is intended to be 'The Manchester Corporation Act, 1889,' . . . such Bill to be promoted out of the public funds or rates in the hands of the Corporation, or hereafter to accrue to them on water-works account, or out of moneys to be raised under the authority of the intended Act, or otherwise out of such public funds or rates as the Corporation may determine." He remarked that the alterations which it was proposed to make in the plans for the construction of the Thirlmere works would not in the least injure the scenery; but make it better than would have been the case if the original plan had been adhered to.

Alderman Sir JOHN HARWOOD, in seconding the resolution, adverted to some of the points of objection raised in Mr. Grave's letter. Mr. Grave, he said, regretted that the Committee were not in favour of bringing the 50 million gallons of water per day from Thirlmere which the Act of Parliament empowered them to do. The answer to that objection was not far

to seek. In going to Parliament for a Bill for the promotion of any public work, Parliament insisted on knowing the maximum amount of work that was contemplated. It would not do to ask for a small Bill, and then desire something greater. The next complaint was that if the Council only brought in 10 million gallons, they would be obliged to maintain the present price of water. He thought they might be thankful that it was not intended to bring from Thirlmere the 50 million gallons; for if they did bring so much, they could not continue the present price of water. According to Mr. Grave's calculation, the 10 million gallons would cost £1,700,000. This showed that Mr. Grave's memory must seriously have failed; for that was simply the cost of the water. Mr. Grave utterly ignored the cost of the watershed—11,000 acres—the cost of the wayleaves, and interest on money—amounting to at least £2,400,000. Mr. Grave went on to say that each subsequent pipe would cost the city £340,000; and there again he was afraid that Mr. Grave was very much mistaken. The scheme for the sanction of which the Corporation in the first instance applied to Parliament was a scheme for all time; but when they came to develop it, they found that, by modifying the provisions of the Act, by raising the embankment of the lake 20 feet instead of 50, they could save a great amount of expense, and provide for all the requirements for a long time to come. Considering also the storage they had at Longdendale, and the fact that the Woodhead works had cost £3,500,000, no sensible man would dream of bringing 50 million gallons of water from Thirlmere, especially when it was remembered that the water at Woodhead stood third in quality of any water in the kingdom. It would be a most suicidal policy. They might estimate that the cost of laying the pipes, &c., would be £340,000 per 10 million gallons of water. Why, then, should the Corporation incur an extra cost of £340,000 per 10 million gallons for the 40 million gallons they did not at present require? The capital charge—viz., four times £340,000—would be £1,360,000; the annual charge in respect of interest at 3½ per cent. would be £47,600; and the annual charge in respect of sinking fund, on a 70 years' basis, would be £4707—making a total annual charge of £52,307, which was equal to a rate of 5½d. in the pound. The sum of £52,307, accumulated annually for 20 years at 3½ per cent., would amount to £1,479,225; and that represented the saving to the city by not making the four additional pipes until 20 years had expired. No sensible man would bring water into a city, which was not wanted; and it would be monstrous to suppose that an intelligent community like Manchester would have gone to Thirlmere, in face of the opposition they met with and the sentimental feeling raised against them, except as an absolute necessity. But for that necessity there would be no justification for disturbing one of the most beautiful and invigorating districts in the United Kingdom. He pointed out that, by raising the lake to the full height, it would submerge and render valueless the whole of the flat land now utilized for farming purposes, and from which a rental of about £2000 a year was received. This might be saved—certainly to the extent of £1000 a year—for at least 20 years, by only raising the lake 20 feet; and a rental of £1000 a year for that period at 3½ per cent. compound interest would amount to £28,279. He had received a memorial from the Lake District Defence Society and the Commons Preservation Society on the proposals contained in the Bill the Corporation were promoting; and it was most satisfactory. It was the desire of the Committee that sudden alterations affecting the beauty of the district should not be made, but that they should carry out the work step by step.

The resolution was put and carried unanimously; and a vote of thanks to the Mayor concluded the proceedings.

THE BRISTOL GAS AND WATER UNDERTAKINGS.—Mr. H. J. Williams has given notice of his intention, at the next meeting of the Bristol Town Council, to move the following resolution:—"That a Committee be appointed to consider and report as to the advisability of the Corporation acquiring the undertakings of the Bristol Gas Company and the Bristol Water-Works Company; and if it appears to such Committee advisable that such undertakings, or either of them, should be so acquired, to endeavour to ascertain upon what terms such acquisition can be effected."

THE PUBLIC LIGHTING OF FELIXSTOWE.—On the evening of the 29th ult., the streets of the rapidly-increasing town of Felixstowe were for the first time successfully lighted with gas. There are 58 ordinary lamps; and two of Messrs. Sugg's "Victoria" lanterns. Each lamp is fitted with one of Borradaile's metallic governors, consuming 5 cubic feet per hour. The Gas Company light, extinguish, clean, and keep in repair all the lamps, at £2 2s. each; the lamps burning 1000 hours during the six winter months, commencing with October. For every extra hour after 1000, ½d. is charged. The whole of the columns, lanterns, and fittings were supplied by Messrs. R. and J. Dempster, of Manchester.

THE WATER SUPPLY OF QUEENSBURY, NEAR BRADFORD.—Last Saturday week the new water supply for Queensbury, obtained from the Bradford Corporation, was for the first time turned on for public use. Owing to the elevated situation of Queensbury, considerable difficulties have stood in the way of providing an adequate supply for the district; but some time ago the Local Board concluded negotiations for this purpose with the Bradford Corporation, whose reservoir at Thornton Moor stands on a sufficiently high level to supply the whole district (except a portion of Mountain) without resort to pumping. The Halifax Corporation possessed rights extending over about two-thirds of Queensbury; but, owing to the low level of their supply, they decided to waive them in favour of the Bradford Corporation. A Local Government Board inquiry was held in due course; and the Board received sanction to borrow the necessary money for carrying out the works. Altogether it is computed that 7½ miles of pipes have been laid; the connection between the Bradford pipes and those of the district being made near Black Diko Mills. As already indicated, the supply is derived from the Thornton Moor reservoir of the Bradford Corporation, which is situated 1241 feet above the level of the sea. The Local Board, however, intend to construct a storage reservoir of their own at Mountain, on a level about 30 feet lower, and capable of containing 2,000,000 gallons. The number of houses, farms, &c., supplied by the new service, excluding the portion of Mountain before referred to, from which no applications have been received, is 1477; and with the quantity of water required by the mills, the daily consumption is estimated at about 110,000 gallons. The cost of the whole scheme is expected to be about £6500—£3350 for the service-pipes, &c., and £2811 for the reservoir. Mr. John Drake, the Engineer to the Local Board, prepared the plans, and has superintended the construction of the works. The testing of the mains has proved very satisfactory; and the water is now regularly on for general use. At the meeting of the Queensbury Local Board held last Wednesday, it was resolved that consumers of water in excess of 2,500,000 gallons per quarter be charged 9½d. per 1000 gallons (being a reduction of ½d. per 1000 gallons) for all water consumed above the said quantity. A letter was read from the Surveyor of the Thornton Local Board inquiring if the Board would supply water at Laundeside and West-choles, in the district of Thornton; but it was pointed out that they could not do so without the consent of the Bradford Corporation.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

The proposal by the Edinburgh and Leith Gas Commissioners to reduce the price of gas for public lighting virtually from 3s. 3d. to 2s. 6d. per 1000 cubic feet was this week before both the Town Councils of Edinburgh and Leith. In Edinburgh, where the step has been taken with a view to giving more light in the streets, there will be a slight increase of charge. There are, Bailie Steel stated, 9180 lamps in the city, of which 6708 are fitted with No. 1 burners; 2155, with No. 2 burners; and 317 are Bray lamps. It is proposed to supply all the ordinary lamps with No. 2 burners. In Leith, Bailie Garland informed the Council that, by the reduction, they would save £200, which would be the first instalment of the benefits of the gas purchase. This, I venture to think, was an injudicious remark. As he went on to show, there are 1766 No. 1 burners in use, and only 184 No. 2 burners; and, only the other day, Bailie Archibald stated at a Gas Commissioners' meeting that Leith was worse lighted than Edinburgh. The necessary improvement of the lighting will thus probably absorb the £200 of saving contemplated by Bailie Garland.

Dundee has by Royal Warrant been raised to the dignity of a city; and its Chief Magistrate will henceforth bear the title of Lord Provost. The Gas Commissioners, at their meeting on Wednesday, congratulated Lord Provost Hunter on his new honour. There was very little business before them. It was reported that an annuity of £11 10s. had been bought in for £345. The Commissioners approved of the transaction, which was surely effected at a high price; being at the rate of 30 years' purchase. It was also reported that the visitors to the works had received "renewed explanations from the Manager, which were entirely satisfactory." This, no doubt, refers to the matter of using air in the process of purifying. The explanations have not been made public, which, in one sense is to be regretted, because the person, or combination of persons, whom I mentioned last week as giving trouble to the Commissioners in connection with this matter, are resolved not to let the subject out of mind. This week, an anonymous letter-writer, styling himself "Light," says:—"The gas is much better now than it was when I wrote you first about it. There is not so much air in it now; the light is much clearer; and the air in the house is much more pure when the gas is burning than it was before. 'Scrutinizer' says there are coals that only produce 7000 feet per ton. That is true, but they are not real gas coals, but a mixture. They produce as much soot as gas. The Commissioners charge us 3s. 8d. per 1000 feet, that is £1 18s. of the ton of coals for gas, besides what they get for all the other refuse. I think they might let it down to 3s. 6d. per 1000 feet." I cannot help thinking that whoever is responsible for this outcry—it is not worth the name of "agitation"—has a grievance against the officials of the Gas Commissioners; and from recent circumstances, as well as from frequent expressions in the letters with reference to the quality of the coal used, I should not be surprised to find that the grievance has reference to the coal contracts. This, of course, is only a surmise. It is evident, however, to everyone who peruses the letters, that they are written by persons who are familiar with much that goes on within the gas-works; but that, on the other hand there is much in gas-making with which the writers are not conversant. One cannot but sympathize with the Commissioners and with Mr. McCrae, in being bothered by a persistent cry of a catchpenny order like this, got up so as to affect, and presented only in such a way as to affect, the ignorant. Were the authors certain of their conclusions, they would take steps to bring them before a class more competent to judge of them than is the general newspaper reader, as well as to back up their views with something which would show a reason for their existence. They do not do this, probably because they know how futile it would be to attempt it; but it is a pity that the Commissioners, when they had once admitted the subject worthy of their consideration, did not put up one of their number to give such explanations as would have been understood by the public. The explanations which were so convincing in the case of the visitors, surely would not have been thrown away upon the public, if repeated to them.

I am afraid the Aberdeen Sub-Committee, whose report is given in another column, have misunderstood the charge which was preferred against them, or, perhaps, to put it milder, they have only dealt with a portion of it. What was complained of was that, although the price of gas had been reduced, individual gas bills had risen; and the Committee were asked to explain how such a state of affairs could arise. This matter they have disposed of; and they have done it satisfactorily, as I expected they would. They have shown that there could have been no general policy such as was averred, because the consumption of gas and the relative charge year by year has shown a proper co-relation. But that is all they have done; whereas there was, although not perhaps a direct accusation, an innuendo that, in what they did, they were acting dishonourably. Perhaps, with the characteristic long-headedness of Aberdonians, they have concluded that, there being no foundation in fact for the allegations, there could be no question of their honour; and, strictly speaking, that would be a correct assumption. The Committee, however, would have done themselves no harm had they gone further, and left no ground for even a whisper of doubt as to the thoroughness of their acting. For instance, the quality of the coal used was called in question; and to settle this matter, a report on the subject was procured from the late Dr. Wallace, of Glasgow. But Dr. Wallace's report was impugned on the ground that he did not visit Aberdeen and personally inspect the coal at the gas-works. This was but a covert way of stating that although, on paper, the coal was all right, in reality that might not be found to be the case. Now the Committee could have met that by a clause in their report stating that they had examined the invoices for coal, and had found that it was all in terms of the contract. Such a statement would have settled the matter in the minds of all reasonable persons.

At the meeting of the Aberdeen Town Council on Monday, the Gas Committee recommended that eight of the existing purifiers should be enlarged. The purifiers are old and incapable of passing the winter output satisfactorily. It is proposed to make them similar to several which the Committee already possess, at a cost of £1500, of which £1000 is provided for in the estimated revenue of the current year.

At the meeting of the Stirling Water Commissioners on Tuesday, it was reported that the recent extension of the water system to Bannockburn had cost £1550.

The great scarcity of water experienced at Kinghorn during the past two seasons, and an unfavourable analysis by Dr. J. Falconer King, of Edinburgh, in June last, as well as pressure from the Board of Supervision, led the Kinghorn Town Council recently to consider the question of an additional water supply for the burgh; and they have now resolved to adopt the scheme prepared by Mr. D. Meuzies, C.E., of Edinburgh. This is the third supply of water introduced to the town within the past twenty years. The total cost of the undertaking will be considerably over £2000; and operations are expected to commence shortly.

The refusal of the Carron Iron Company to pay the domestic water-

rate which has been imposed by the Falkirk and District Water Trust, until the pipes are laid (which I noticed in my "Notes" last week) was before a meeting of the Trust on Monday; and it was agreed to request the Law Agents of the Carron Company to consent to the question at issue being submitted to the First Division of the Court of Session by a special case mutually stated. Meantime instruction was given to obtain the opinion of Counsel on the subject.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.
Ex-Bailie Crawford, a leading member of the Glasgow Corporation Gas Committee, had occasion last night to address his constituents of the Tenth Municipal Ward, as he was unable to do so when the Ward meeting was held prior to the annual election at the beginning of last month. From the prominent position which he has acquired in connection with the administration of the local Gas Act, it was but natural that he should have something to say on gas affairs. He said, in the course of his remarks, that he had been reproached for reducing the illuminating power of the gas. This reduction of the illuminating power had, however, relieved the Gas Trust from the tyranny of a ring of coalmasters who were possessed of the coal necessary for the production of the higher quality of gas; and the relief had resulted in a saving of £30,000 a year to the citizens of Glasgow. As to the Gas Stove Department, he remarked that the Gas Committee had now 12,000 stoves and burners of various kinds for cooking and heating purposes in the hands of gas consumers in the city and neighbourhood. In the month of July, 1885—the year before the introduction of the system of letting out stoves—the gas consumption was roughly 77 million cubic feet; whereas in July, 1888, it was 103 million cubic feet. This was at a time of the year when there was little gas used for illuminating purposes. He estimated that they had made a profit of at least £20,000 from the introduction of these gas-stoves. In answer to questions put to him after the close of his speech, he denied that the gas now supplied gave less light than that formerly in use, and said that £30,000 which the Gas Trust had saved by breaking the coalmasters' ring was devoted to reducing the price of gas, and to clearing off the debt and mortgages on the gas-works.

At the ordinary monthly meeting of the Glasgow Town Council on Thursday, complaint was made by Mr. Primrose of the insufficiency of the supply of gas in the south-western district of the area of supply; and he asked the Convener of the Gas Committee if nothing could be done to improve the pressure for that locality. There were, he said, many and widespread complaints; and he could speak from personal observation as to the necessity for improvement. Mr. Ure, Convener of the Sub-Committee on Works, said that the matter referred to had been before the Gas Committee on more than one occasion. They were quite aware that there was a difficulty in keeping up a full pressure in that particular district just now; and they had under consideration the propriety of laying down a new main there; indeed, it would have been laid before this time but for the operations, or prospective operations, of the Clyde Navigation Trustees, who were going to make a new road there; and if the Committee had moved in this matter before, they would have required to lay the main twice. They had now notice that this change would take place within the next three months; and as soon as it was possible to do so, the Committee would have the additional main laid.

Since despatching my "Notes" a week ago, I have learned that the motion brought before the Glasgow Corporation Gas Committee on the 29th ult., asking authority to pay the sum of £3000 from last year's gas surplus to the Corporation for their general purposes, was carried by seven votes against four. The matter did not come up for confirmation at last Thursday's meeting of the Town Council; so that it must be "hung up" for a month.

Business on the Glasgow Stock Exchange was reported on Monday as having been done in the shares of the Partick, Hillhead, and Maryhill Gas Company at 80s. per share. On the following day, the same price was again asked by holders; but buyers would not rise above 75s. per share, with the result that no business was done. Yesterday the same condition of things showed itself.

There is now scarcely such a brisk demand as there was for sulphate of ammonia in the Glasgow market. The spot rate is reported to be £12 15s. per ton; but £13 has been realized for January to March deliveries.

The Glasgow pig-iron warrant market has generally been dull this week. On Tuesday, however, a large amount of business was done in Scotch warrants, the price of which touched 42s. 1½d. per ton. Yesterday the market closed with the price at 41s. 9d. per ton cash.

Less activity has shown itself in the coal trade this week; but in most cases prices remain firm.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Dec. 8.

Sulphate of Ammonia.—Why, one may ask, has the market fallen so suddenly this week? and there is no answering echo to the question. It is generally understood that the letting out of large quantities of sulphate, held for a further rise, has been at the bottom of the collapse; and that the heavy make coming on behind these large prompt parcels has completely destroyed the tone of the market. In this way, £12 2s. 6d. f.o.b. Hull and Liverpool, has been touched; and there the decline remains checked meanwhile. Nitrate will not help sulphate at the present moment; for the very large November shipments (110,000 tons) are even beyond the highest estimates. The value on spot has declined to 11s. It is generally considered that the sudden drop in sulphate is uncalled for—especially as the usual margin between it and nitrate is not maintained; and it may from the present position be assumed that there will be an irregular market for the rest of the month.

LONDON, Dec. 8.

Tar Products.—The week has been marked by a little better demand for crude tar products; tar oils and pitch being in good request at improving prices. Benzole is dull; and the same feature characterizes most of the better products. The unhealthy competition for tar continues; and in some instances prices are being paid which are bound to bring a loss unless the values of products largely increase. Present prices are: Tar, according to position, 18s. to 23s. per ton. Benzole, 90 per cent., 3s. per gallon; 50 per cent., 2s. 5d. Toluol, 1s. 6d. per gallon. Solvent naphtha, 1s. 3d. per gallon. Crude naphtha, 90 per cent., 1s. 2d. per gallon. Light oil, 3d. per gallon. Creosote, 2½d. per gallon. Pitch, 18s. to 21s. per ton. Carbolic acid (crude), 3s. 10d. per gallon. Cresylic acid, 10½d. per gallon. Tar salts, 15s. per ton. Anthracene, 30 per cent., "A" quality, 1s. 4½d. per unit; "B" quality, 1s. 2½d.

Ammonia Products.—Sulphate has been fitful and difficult of sale; and prices at the various large outlets have varied in an unusual manner. But the week closes with the price of sulphate nearly 10s. below that of the previous week. Prices are: Gas liquor (5° Twaddell), 8s. per ton, with a rise or fall of 1s. 6d. per degree. Sulphate of ammonia, £12 5s. per ton, less discount. Liquor ammonia, 2d. per lb. Carbonate of ammonia,

3½d. per lb. Muriate of ammonia, brown, £18 per ton; white, £25. Sal-ammoniac, £30 per ton.

[From the Chemical Trade Journal, Dec. 8.]

Tar Products.—The benzol market remains without sensible change; and last week's prices may be said to be ruling to-day. There is a very fair demand for aniline oil and salt; and in time this may not be without influence on the benzol market. We hear that a few of the leading producers are about to put their heads together, in order duly to consider the situation, which in its uncertainty must be, to say the least, unsatisfactory both to the sellers and users. Of solvent naphtha, creosote, and crude carbolic acid, there is little fresh to say, except it be to note that all these products are moving off freely. Anthracene is still firm at old rates; while pitch is slowly moving upwards. It is rumoured that 22s. 6d. is being asked in London; 20s., in Liverpool; and a price intermediate between these two, f.o.b. the Humber ports.

Sulphate of Ammonia.—Sulphate of ammonia has met with a decided check; and £12 3s. 9d. has, we hear, been accepted for shipment at Hull, early delivery, though the price remains at £12 5s. at Leith and London. Nitrate values seem to have had something to do with this fall, which should go no further if makers are but circumspect, as for a few weeks, at any rate, there will be but a moderate quantity required. In some quarters the demand for liquid ammonia has increased, and sal-ammoniac has risen £2 per ton in sympathy with the increased price of acid and salt.

THE PRICE OF WATER AT ELLAND.—The Elland Local Board having obtained a reduction in the price of water supplied to them by the Halifax Corporation, it is suggested that the benefit of this reduction should be at once given to the consumers in the district. One of the local papers points out that there are two courses open to the Board in dealing with this matter—they may retain the present prices, and devote the extra profit to the relief of the rates; or they may give the consumers the benefit direct. Consumers—manufacturers especially—claim that the right thing, and that which will most conduce to the good of the town, is to at once reduce the price. By this means, it is urged, consumption will be stimulated, and manufacturers and others who use large quantities of water will have better opportunities of carrying on their industries; while new enterprises might also be encouraged in the town. Of course, what the Board have to consider is whether the water has paid for itself at the old rate. If so, then probably the concession will be granted; but if not they will be compelled to keep the water charges as they are.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 1019.)

Issue.	Share	When Dividend.	Dividend of 1888.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.					£ s. d.
GAS COMPANIES.								
590,000	10	12 Oct.	10½	Alliance & Dublin 10 p. c.	10	18½—19	..	5 10 6
100,000	10		7½	Do. 7 p. c.	10	12½—13½	..	5 11 1
300,000	100	2 July	5	Australian (Sydney) 5½ p. c. Deb.	100	110—112	..	4 9 3
100,000	20	29 Nov.	10	Bahia, Limited	20	24—25*	..	8 0 0
200,000	5	14 Nov.	7½	Bombay, Limited	5	7—7½	..	5 0 0
40,000	5		7½	Do. New	4	5—5½	..	5 9 1
380,000	Stock.	29 Aug.	11½	Brentford Consolidated	100	223—228	..	5 3 1
125,000			8½	Do. New	100	164—168	..	5 4 2
220,000	20	18 Sept.	10½	Brighton & Hove, Original	20	43—45	..	4 13 4
320,000	20	28 Sept.	11½	British	20	43—45	..	5 0 0
50,000	10	13 Sept.	11	Bromley, Ordinary 10 p. c.	10	19—21	..	5 4 9
39,000	10		8	Do. 7 p. c.	10	13—14	..	5 14 3
328,750	10	14 Nov.	8	Buenos Ayres (New) Limited	10	13½—14½	..	5 10 4
200,000	100	2 July	6	Do. 6 p. c. Deb.	100	110—112	..	5 7 1
150,000	20	10 Aug.	7	Cagliari, Limited	20	26—28	..	5 0 0
550,000	Stock.	12 Oct.	13½	Commercial, Old Stock	100	257—262	..	5 4 11
130,000			10½	Do. New do.	100	209—214	..	5 0 5
121,234		28 June	4½	Do. 4½ p. c. Deb. do.	100	123—128	..	3 10 3
557,320	20	14 June	13½	Continental Union, Limited	20	44—46	..	5 13 0
242,680	20		13½	Do. New '69 & '72	14	30½—31½	..	5 15 6
200,000	20		10½	Do. 7 p. c. Pref.	20	37—39	..	5 2 7
75,000	Stock.	28 Sept.	10	Crystal Palace District	100	205—215	..	4 13 0
234,060	10	27 July	13	European, Limited	10	25½—26½	..	4 18 1
120,000	10		13	Do. New.	7½	18—19	..	5 2 7
354,060	10		13	Do. do.	5	12—13	..	5 0 0
5,468,000	Stock.	29 Aug.	13	Gaslight & Coke, A, Ordinary	100	250—254	..	5 2 4
100,000			4	Do. B, 4 p. c. max.	100	100—105	..	3 16 3
665,000			10	Do. C, D, & E, 10 p. c. Pf.	100	257—262	..	3 16 4
30,000			5	Do. F, 5 p. c. Pf.	100	125—130	..	3 16 11
60,000			7½	Do. G, 7½ p. c. do.	100	182—187	..	4 0 2
1,300,000			7	Do. H, 7 p. c. max.	100	167—172	..	4 1 4
463,000			10	Do. J, 10 p. c. Pf.	100	255—260	..	3 16 11
1,061,150		14 June	4	Do. 4 p. c. Deb. Stk.	100	118—121	..	3 6 1
294,850			4½	Do. 4½ p. c. do.	100	122—127	..	3 10 10
650,000			6	Do. 6 p. c. do.	100	172—177	..	3 7 10
3,600,000	Stock.	14 Nov.	10	Imperial Continental	100	205—208	..	4 16 1
75,000	5	14 June	6	Malta & Mediterranean, Ltd	5	5—5½	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	113—115	..	4 6 11
541,920	20	29 Nov.	6	Monte Video, Limited	20	19—20*	..	6 0 0
150,000	5	29 Nov.	10	Oriental, Limited	5	8½—9½	..	5 8 1
60,000	5	28 Sept.	7	Ottoman, Limited	5	6—7	..	5 0 0
166,870	10	27 July	4	Pará, Limited	10	5½—6½	..	6 3 1
People's Gas of Chicago—								
420,000	100	2 Nov.	6	1st Mtg. Bds.	100	104—107	..	5 12 1
500,000	100	1 Dec.	6	2nd Do.	100	92—97*	..	6 3 9
100,000	10	12 Oct.	10	San Paulo, Limited	10	15½—16½	..	6 1 2
500,000	Stock.	29 Aug.	15½	South Metropolitan, A Stock	100	297—302	..	5 2 7
1,350,000			12	Do. B do.	100	233—237	..	5 1 3
141,500			13	Do. C do.	100	245—255	..	5 1 11
550,000		28 June	5	Do. 5 p. c. Deb. Stk.	100	135—140	..	3 11 5
60,000	5	29 Aug.	11	Tottenham & Edm'ton, Orig.	5	11—13	..	4 4 0
* Ex div								
WATER COMPANIES.								
717,467	Stock.	28 June	9	Chelsea, Ordinary	100	260—265	..	3 7 11
1,720,560	Stock.	12 Oct.	7	East London, Ordinary	100	200—203	..	3 9 0
700,000	50	14 June	9	Grand Junction.	50	123—127	..	3 13 2
708,000	Stock.	10 Aug.	10½	Kent	100	275—280	..	3 15 0
1,043,800	100	28 June	9	Lambeth, 10 p. c. max.	100	255—260	..	8 9 3
406,200	100		7½	Do. 7½ p. c. max.	100	200—205	..	3 13 2
200,000	Stock.	28 Sept.	4	Do. 4 p. c. Deb. Stk.	100	117—120	..	3 6 8
500,000	100	27 July	12½	New River, New Shares	100	350—360	..	3 7 4
1,000,000	Stock.	14 June	4	Do. 4 p. c. Deb. Stk.	100	123—127	..	3 8 0
902,300	Stock.	14 June	6	S'thwk & V'xhall, 10 p. c. max.	100	170—175	..	3 8 6
125,000	100		6	Do. 7½ p. c. do.	100	160—165	..	3 12 9
1,155,066	Stock.	14 June	10	West Middlesex	100	266—270	..	3 14 1

† Next dividend will be at this rate.

THE COSTS OF REMOVING THE HUNTER TRIAL TO LONDON.—It is stated that the costs of the rule for a *certiorari*, and the extra costs incurred by the removal of the indictment in the Hunter case from Lancashire to London, have recently been sent in for taxation. The bill of costs delivered amounted to £373 16s. 10d., made up of £293 4s. 6d. payments out of pocket, and £80 12s. 4d. The total amount of the bill as taxed and allowed against the defendant Hunter is £128 3s. Thus £245 13s. 10d. of the total amount charged has been disallowed by the taxing-master; and the total amount allowed falls short of the actual payments by £165.

THE NEW WATER-WORKS OF THE ALFRETON LOCAL BOARD.—The Alfreton Water Committee's new impounding reservoir at Lindway, has now been formally inaugurated by Mr. Joshua Roberts raising the valve and letting in the water. The reservoir is substantially constructed, and of sufficient capacity with the old reservoir to store water enough for the driest summer. The capacity of the reservoir is 8 million gallons. Since the resignation of the late Engineer, Mr. W. H. Radford, C.E., of Nottingham, has superintended the works; and he has brought them to a satisfactory conclusion.

THE WATER SUPPLY OF NORTHALLERTON.—At their monthly meeting on Thursday, the Northallerton Local Board had under consideration the question of obtaining a supply of pure water for the town. The Clerk read a memorial, which had been drawn up at a special meeting of the Board and forwarded to the Ecclesiastical Commissioners, dwelling on the importance of securing a supply of potable water, and asking them to allow of its being taken from Osmotherley Moor. To this a reply had been received from Messrs. Smith and Gore, the Agents to the Commissioners, in which they stated that they were prepared to advise the Ecclesiastical Commissioners to grant to the Board, for a term of 42 years their interest as Lords of the Manor of Northallerton, in the use of certain waters situated on the unenclosed portion of Osmotherley Moor, together with the use of their rights to the surface, to erect any necessary works thereon, or sink any well or tank—the Board to pay a yearly sum of £10, and to undertake on their part to compensate for any damage that may arise to the stinholders on the common, and riparian owners on the streams below. The Clerk remarked that he had written to the Commissioners' local agent, asking him to explain the term 42 years, and requesting that the grant might be made in perpetuity. A reply had been received that he did not think the Commissioners could make the grant in perpetuity; but he would recommend that the term be extended to 63 years, and the cost £20 per year. After some discussion, the Clerk was requested to write to Messrs. Smith and Gore asking them to either grant the right in perpetuity or sell a portion of the moor; at the same time pointing out that under the arrangement at present suggested, the Board could not borrow money from the Local Government Board.

STRIKE AT THE BLACKBURN GAS-WORKS.—Owing to a dispute about wages, a number of the stokers at the No. 2 gas-works of the Blackburn Corporation have come out on strike.

SUGGESTED PURCHASE OF THE HEANOR GAS-WORKS BY THE LOCAL BOARD.—At the meeting of the Heanor Local Board last Tuesday, the Clerk was instructed to write to the Langley Mill and Heanor Gas Company, asking if they were willing to negotiate with the Board for the transfer of the gas-works.

LEAD POISONING AT DRIGHLINGTON.—Dr. Forsyth, Medical Officer of Health for Drighlington, in presenting his monthly report at the meeting of the Local Board last Wednesday, stated that he had been in attendance on several cases lately where there had been symptoms of lead-poisoning. On examination of some of the town's water-pipe joints, traces of lead had been found by him. He advised the Board to have some samples of the water analyzed by a public analyst, as he was not altogether satisfied with the quality of it as it at present passes along the mains. The Board decided to send a sample of the water to the Leeds public analyst.

ILKESTON CORPORATION WATER SUPPLY.—At the monthly meeting of the Ilkeston Town Council last Tuesday, on the motion for the adoption of the minutes of the General Works Committee, Mr. Moss proposed an amendment to the effect that an engineer be employed to advise the Council as to what course they should take in reference to a new water scheme, and that the minute recommending that two pumps should be put in the large shaft at Kirk Hallam, and the large engine shifted nearer the shaft and attached to the pumps, and a temporary engine-shed be erected, be expunged. Mr. Mitchell seconded the amendment, and urged the Council to purchase new plant if they were going to ascertain whether or not a permanent supply could be obtained from this shaft. Mr. Robinson pointed out that the sum of £7500, which the scheme was estimated to cost, was not required to test the supply at Kirk Hallam; but a great deal of it would be required in laying down new mains throughout the town. Mr. Trueman objected to the appointment of an engineer, as the Committee and Surveyor were, he thought, quite qualified to deal with the matter. He suggested that they might make £2500 do instead of £7500, and let the mains remain as they were for a time. Alderman Snodbury contended that there was an ample supply of water for the use of the town. Mr. Haslam opposed the recommendations of the Committee, in a lengthy speech. The water supply of the town, he said, was a disgrace to them, depending as it did on several different stations. Mr. Hall, whom they had called in to report on their plant, had condemned it. They ought to find a site for a plentiful supply, have one station, one set of plant, and one set of men. After further discussion, the amendment was lost by 11 votes to 7; and the minutes were adopted without alteration.

THE QUALITY OF THE LONDON GAS SUPPLY

DURING THE FOUR WEEKS ENDED DEC. 4.

[From returns to the Metropolitan Board of Works by Mr. W. J. DIBDIN, F.I.C., F.C.S.]

COMPANIES—DISTRICTS.	ILLUMINATING POWER. (In Standard Sperm Candles.)						SULPHUR. (Grains in 100 Cubic Feet of Gas.)						AMMONIA. (Grains in 100 Cubic Feet of Gas.)					
	Maxi- mum.	Mini- mum.	Means.				Maxi- mum.	Mini- mum.	Means.				Maxi- mum.	Mini- mum.	Means.			
			Nov. 13	Nov. 20	Nov. 27	Dec. 4			Nov. 13	Nov. 20	Nov. 27	Dec. 4			Nov. 13	Nov. 20	Nov. 27	Dec. 4
The Gaslight and Coke Company—																		
Notting Hill	17.1	16.1	16.4	16.6	16.5	16.4	12.6	8.1	10.0	11.2	10.6	11.4	0.3	0.0	0.1	0.0	0.1	0.0
Camden Town	17.4	15.8	16.9	16.6	16.5	16.6	19.8	9.4	12.8	14.4	14.0	15.0	0.2	0.0	0.1	0.1	0.0	0.0
Dalston	16.8	16.2	16.6	16.5	16.5	16.4	15.6	13.3	13.8	14.6	14.1	14.7	0.1	0.0	0.0	0.0	0.0	0.0
Bow	17.3	16.1	16.9	16.6	16.5	16.7	11.3	6.0	7.2	7.5	8.0	8.6	0.4	0.0	0.2	0.1	0.1	0.2
Chelsea (Fulham)	16.7	16.0	16.4	16.4	16.3	16.4	18.5	11.8	15.0	14.6	13.2	14.5	0.3	0.1	0.2	0.2	0.2	0.2
Do. (Nine Elms)	16.6	16.1	16.3	16.3	16.3	16.3	14.3	10.8	14.1	12.1	11.7	11.6	0.6	0.2	0.4	0.5	0.4	0.2
Shoreditch	17.6	16.1	..	16.9	17.3	16.8	15.7	8.5	..	11.1	12.4	11.2	0.2	0.0	..	0.0	0.0	0.0
Charing Cross (48-inch main)	17.3	16.3	17.0	16.9	16.8	16.6	12.3	7.0	11.5	9.0	8.9	10.3	0.6	0.2	0.2	0.4	0.2	0.3
Do. (district main)	17.2	16.4	16.7	16.6	16.9	17.0	10.7	7.2	9.0	8.1	8.9	9.5	0.5	0.1	0.2	0.4	0.4	0.3
St. John's Wood	16.8	15.6	16.0	16.5	16.5	16.3	11.5	8.7	9.0	9.6	10.0	10.6	0.5	0.1	0.3	0.3	0.3	0.3
Lambeth Road	16.9	16.0	16.3	16.6	16.6	16.6	14.5	10.4	13.7	11.6	11.9	11.3	0.5	0.1	0.4	0.3	0.2	0.2
Holloway	17.2	15.9	16.5	16.5	16.3	16.4	13.9	9.5	11.8	10.9	11.4	11.7	1.3	0.0	0.3	0.2	0.3	0.4
Westminster (cannel gas)	21.2	20.4	20.9	20.7	21.1	21.0	12.1	9.1	10.2	10.7	10.6	10.0	0.6	0.3	0.5	0.4	0.4	0.4
South Metropolitan Gas Company—																		
Peckham	16.8	16.2	16.5	16.4	16.6	16.6	15.9	9.6	10.6	12.4	11.5	11.1	0.8	0.0	0.0	0.3	0.4	0.2
Tooley Street	17.1	16.0	16.6	16.6	16.5	16.7	14.5	9.0	10.5	11.3	11.2	11.1	1.0	0.0	0.0	0.5	0.8	0.7
Clapham	16.5	16.0	16.3	16.3	16.3	16.3	16.9	7.0	11.0	9.6	11.5	12.8	1.0	0.0	0.0	0.2	0.1	0.1
Lewisham	16.8	16.2	16.4	16.6	16.6	16.5	11.0	5.4	7.5	7.7	10.2	7.8	0.0	0.0	0.0	0.0	0.0	0.0
Blackfriars Road	16.8	15.4	15.7	16.4	16.4	16.3	13.0	9.3	11.9	11.8	11.4	11.1	0.6	0.0	0.0	0.4	0.3	0.4
Plumstead	18.3	15.2	16.8	16.2	16.0	16.3	17.3	7.0	7.3	9.0	14.3	14.4	2.0	0.2	2.0	0.9	0.1	0.4
Commercial Gas Company—																		
Old Ford	17.4	16.1	16.8	16.6	16.8	16.8	7.4	5.3	*	*	*	6.5	3.4	0.0	*	*	*	0.1
St. George's-in-the-East	17.0	16.1	16.5	16.5	16.6	16.8	13.7	7.0	8.6	11.8	11.7	9.1	0.8	0.2	0.3	0.4	0.3	0.3

* Apparatus under repair.

SULPHURETTED HYDROGEN.—None on any occasion.

PRESSURE.—In excess on all occasions.

Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 22 grains in 100 cubic feet of gas; ammonia not to exceed 4 grains in 100 cubic feet of gas. Pressure between sunset and midnight to be equal to a column of 1 inch of water; between midnight and sunset, 6-10ths of an inch.

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OR OF

WALTER KING, "Journal of Gas Lighting," 11, Bolt Court, Fleet Street, E.C.

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CHRISTMAS HOLIDAYS.

In consequence of the Christmas Holidays, the next number of the JOURNAL will be published on Monday morning. Correspondents and Advertisers will please note this, and let us have any communications not later than the first post Saturday.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, DECEMBER 18, 1888.

THE GAS INSTITUTE IN EXTREMITY.

THE time has now arrived when the question of the future of The Gas Institute must be decided; and, unfortunately, those to whom the general body of members naturally look for guidance in all matters affecting their corporate existence, have not made the expected sign. The decision of the fate of the Institute will, therefore, be left to the unassisted judgment of individual members, unless the President, for whose promised declaration of policy they have waited in vain, breaks silence during the next fortnight with the

expected ultimatum. At the time when the members of Council and others (for reasons which need not be repeated) consummated the great secession which shook the Institute to its foundations, and left it with a fragmentary governing body, the President issued to the members, from the Council meeting at which the bulk of the resignations were received, a notification of the fact, and a request for abstention from similar action until a general meeting could be called. It was also stated that an extraordinary general meeting would be convened in the course of the autumn. The latter announcement made the preceding request reasonable; for while it would have appeared audacious, to say the least of it, to ask members who sympathized with the seceders to wait a whole year, and pay another subscription, before giving effect to their inclination, it was only common prudence to check a movement that might have resulted in swift disintegration of the Institute. At the next Council meeting, held on Sept. 4, and alluded to in our issue for the following week, it was decided to abandon the proposed meeting, under circumstances which looked very like a difference of opinion, or at least a misunderstanding, between the President and some of the members of the Council. We did not lay stress upon this point at the time, because we recognized that both President and Council had as much as they could expect to accomplish by the end of the year, if they worked in the most complete harmony. We pointed out, however, that by thus depriving members of the opportunity of considering the position of the Institute during the period covered by the current subscription, the President and Council took upon themselves greater responsibility for the success of next year's ordinary meeting. It having been announced that another Council meeting would be held in November, we showed that it was due to the members that, after this meeting, a statement of policy should be promulgated, in order that they might decide whether or not to renew their subscriptions. That in so arguing we only spoke the sentiment of many members was proved by the interrogation of the President at a subsequent Midland Association meeting by Mr. P. Simpson, of Rugby, who was manifestly in touch with his assembled colleagues in this action. Upon that occasion Mr. Henry Woodall—whose public-spirited policy in visiting the meetings of the various District Associations deserves the fullest recognition—stated that he had no doubt that the policy of the Council would be put forward after the November meeting. This portentous meeting was held on the 27th ult., and was adjourned for a fortnight, nothing being done, but the difficulty of the situation having been aggravated by the retirement of another member—Mr. A. Colson, of Leicester. Although we are not in the secrets of the Council, this fresh resignation, by one of the most respected of the younger and rising order of engineers, struck us as not hopeful for the future; and distrust was fanned by the rumour that one if not two other members of the Council had begun to feel their position growing intolerable. At any rate, the adjourned meeting took place last Tuesday, and that something is very wrong may be inferred from the fact that the President, prompt man of business as he is, has not up to our going to press made any statement for the information of the members, who, as he is well aware, expect a declaration from him before the end of the year.

The question that consequently arises is plainly this: Has there occurred anything like a schism in the Council; or does the absence of any declaration of policy merely mean that neither the President nor any member has a distinct policy to recommend? If the President, upon whose request members have refrained from resigning, has been baffled in any way in such steps as he may have considered necessary for redeeming his pledge, it is only what he owes to himself that he should publish a statement to that effect, and follow it up by resigning. He, at least, cannot escape personal responsibility in this matter. We do not here wish to compare Mr. Woodall in reputation and standing with the ordinary members of the Council, although the comparison is one that his friends would not fear. The plain fact is that he is the President; and it is to him that the general body of members look for guidance, in a way that they certainly do not look to any single member or group of members of the Council. He has manfully stuck to the ship through a condition of affairs unprecedented in the history of the Institute, in the hope that he would be able to bring it safely through its troubles; and if he does not break silence with a satisfactory statement directed to this object, the members whom he has induced to remain will construe his reticence as a confession of defeat, and

will solve the difficulty, so far as they are concerned, by not renewing their subscriptions next year.

There is no mistaking the elements of a satisfactory policy for The Gas Institute. It means that the organization shall be reformed in such a manner that the members who have retired can come back again with honour, and that the besetting evil which was the prime cause of their withdrawal—trade jealousy—shall be for ever eradicated. The idea that the Institute can exist for long without including in its membership the leaders of the gas engineering profession is preposterous. It comes to this, that with the various District Associations so popular and thriving, a central society of the same order has to justify its existence. It is not now as it was in the early days of the British Association of Gas Managers, when a gas manager might only meet his nearest neighbour once a year at the general meeting. For most of the practical purposes which the British Association was established to serve, the District Societies have fully supplanted it. They enable men occupied in the same part of the country, and therefore admitting a common bond in addition to that of their calling, to meet together for the friendly interchange of ideas and experiences; and they are free from some of the objectionable features of the annual gathering from all quarters. There is no carping between the members; there are no cliques; and those who find it to their interest to manufacture grievances and sow dissension, discover that the field is too small for their labours. Why should busy men take the trouble to give up a week of their time, and travel hundreds of miles, it may be, to a meeting which they find spoilt for them by the play of spite, rancours, and jealousies which are no concern of theirs; and why should they accept office in a society which exposes them to persecution actuated by the pettiest and most personal of motives? For no other crime than standing by and doing their best for The Gas Institute, a number of members have been compelled to retire from it; but these are the very men who are at the present time among the most honoured members of the comparatively cosy and comfortable District Associations. If they are not fit to be members of The Gas Institute, why are they welcomed at the district meetings? If, as a certain section of members and their hangers-on have of late tried to make out, these men have been guilty of every possible crime towards the Institute, how comes it that they are so universally respected by those other colleagues who, by neighbourhood, ought to know them best? Supposing for a moment that these leaders of the profession, and those who respect them too highly to support any society from which they are by implication excluded, keep aloof from the Institute, how can the latter justify its existence? Where can it meet when London, Glasgow, Liverpool, Birmingham, and many other places give it the cold shoulder? We take our position firmly on the point that—apart from all consideration of the personal respect due to these gentlemen—no national professional association of this kind can justify its existence unless it includes (not necessarily always in office, but at least in full membership and active sympathy) the recognized heads of the profession. If anybody will dispute this point, we should like to see what sort of arguments he proposes to use.

It is idle for men who, whatever their estimable qualities, are not recognized leaders of their colleagues, to think that an accidental position in office in a mutual society confers any additional lustre upon their personality. Men who are already eminent confer distinction upon any society to which they belong; but no society, unless it is known to be mainly composed of better men than himself, can confer distinction upon a member. These are, or should be self-evident truths; and their application to The Gas Institute at the present crisis in its existence is not less obvious. There is no need for the mention of names; but it is incontrovertible that any association which permits to remain outside it the most eminent of those for whom it is ostensibly formed, must be a society of mediocrities. What attraction, dignity, or authority can attach to an assembly of such a quality? Every society requires the support of the best men that can be encompassed in it. The members who have already achieved their positions in life will attend its meetings for the purpose of clashing wits with their peers, and with the desire to help those of their professional brethren who are yet climbing upwards. Men with their future before them will gladly come together to learn from their seniors, and to hear, perhaps to consult, the shining lights of their calling. Can an association deprived of these, its original reasons for existence, live and

thrive after it has lost them all? It may linger on through a discredited decadence, more or less protracted, in the interest of those whose usurpation of nominal leadership is rendered possible only by the absence of better men; but where is the glory of this? Wherefore we say that if The Gas Institute is to be saved, the President must immediately disclose sufficient reason for the renewal of their subscriptions by those members whose desire is for its continued existence in honour, unity, and usefulness.

A DISCUSSION AT THE MANCHESTER DISTRICT MEETING.

IN another column will be found a report of the proceedings at the recent meeting of the Manchester District Institution of Gas Engineers, when the interest principally centred in the discussion on Mr. J. Dalglish's paper on the effects of oil and other illuminants on gas consumption. Before noticing the speakers' remarks, it will be well to draw attention to the fact that, for various reasons, this debate has been deferred for a year after the reading of the paper, which cannot be regarded as a satisfactory arrangement. There is too much of the "resurrection" aspect about the review, after such a long interval, of statements which, however true and valuable, must have been far more interesting when fresh. Life is too short, as well as progressive, to allow us to keep open a "suspense account" of our views and projects for a whole twelvemonth. The incident in question may be exceptional; and it is to be hoped that it will remain so. There are many objections to postponing the public discussion of technical papers; and, so far as can be seen, only one argument in favour of this course, which is that those who take part in the debate may have time to bring up their data and form their opinions respecting the author's statements. There is not much in this plea, however, when it is examined; and we suspect that it is only advanced as a cloak for the real reasons for putting off debates, which are commonly want of time, and fatigue of the meeting by other business. This is really an argument for short papers, if discussion is looked for, and especially for having all technical communications printed in advance and distributed to the members a day or two before the date of the meeting at which they are to be read. If this latter point were attended to, there would seldom be any necessity for the suggestion to defer a discussion; which is a growing, though a bad practice. Admitting the disadvantage under which the speakers laboured, the discussion was as good as could have been expected. A useful contribution to it was a letter from Mr. Newbigging, now absent on a South African engagement, in which the writer offered some sound advice, worded in a rather picturesque style, upon the conduct of gas undertakings with a view to gaining public favour. While admitting the force of Mr. Newbigging's objections to the deposit system, however, it may be well to remark by way of comment upon the assertion that "all round the practice of enforcing the payment of "deposits is a most objectionable one," that the writer of this sentence seems to have forgotten for the moment that Gas Companies are under compulsion to supply all comers, whatever their commercial reputation. There are certain customers whom the most enterprising and trustful of shopkeepers may reasonably refuse to serve with goods unless the money in payment is first passed over the counter, and safely deposited in the till. If the condemnation of the deposit system is modified to allow of exception in such cases, we willingly subscribe to it; for, as unintelligently applied by some Gas Companies, it has undoubtedly done more damage than can well be estimated. Mr. W. Woodward, of Bury, said a trenchant thing when—having premised that the selling price of gas had been brought down—he declared that "they had neither deposit system nor meter-hire at Bury; and this year they had an "increase of more than 10 per cent. in the consumption, "whereas in other years they had had a decrease." We cannot go with Mr. T. Banbury Ball, who seemed to think that the question of the desirability of a consumer depends entirely upon the amount of his account. It is easy to argue that the transaction of a very small amount of any kind of business does not pay; but what would become of trade if every shopkeeper, merchant, railway company, and fire or life insurance agent conducted his affairs upon this principle? It is curious that very soon after Mr. Ball talked in this vein in Manchester, a proposal to reduce the price of gas in his own town of Rochdale was opposed by an Alderman on the ground, among others, that hundreds of consumers were already supplied at a loss. It is a mischievous thing to go through a classification of the gas

consumers of a town according to whether they require two-light, five-light, or fifty-light meters, and to discriminate which pays best. All help one another; and this axiom cannot be lost sight of without danger of going further wrong among the fallacies of "fair" price, commercial value, and the other delusions that have everywhere served to cheat consumers of their dues. To sell gas to everybody at the lowest possible price consistent with the safety of the capital invested and the quality of the commodity, is the only safe policy for owners of gas undertakings, whether public corporations or statutory companies. The President, Mr. Duxbury, of Darwen, offered good evidence of the advantage of cultivating the cottage class of consumers; and Mr. Dalgliesh satisfactorily wound up the debate. On the whole, while the discussion was not perhaps all that might have been desired, it shed a certain amount of fresh light upon a question that requires elucidation in accordance with local conditions in all parts of the kingdom.

GAS AFFAIRS IN DUBLIN.

THERE is another squabble between the Corporation of Dublin and the Alliance and Dublin Consumers' Gas Company; the subject this time being the illuminating power of the gas supplied within the city. One of these Dublin gas disputes follows another, at short intervals, without the introduction of any such difference as might prevent the repetition by Aldermen and Councillors of their stock denunciations of the Company and all its works, at the same time that the subject-matter is always varied sufficiently to give a superficial aspect of freshness to the quarrel. The last "row"—it is impossible to use dignified language to describe these particularly undignified outbreaks—is a result of the recent appointment of a Gas Inspector who, there is reason to believe, was specially selected for the post because he was deemed likely to make things generally disagreeable for the Company. The fact of the Inspector being very nearly related to the Secretary and General Manager of the Company gives a peculiar zest to the disputes of which he is expected to be the cause. He has reported to his employers that the gas was below the standard on seven recent occasions; and his bare statement, communicated to the Town Council by an Alderman, was, of course, quite sufficient to call down condemnation on the Company, without a suggestion of their being heard in their own defence. This is apparently the idea of fair play entertained by the majority of the Corporation; for we do not see that one voice was raised at the Town Council meeting to point out the *ex parte* nature of the evidence on which the Company was being held up to public opprobrium. As soon as the proceedings were reported to the Gas Company, however, the Directors and their General Manager prepared for action. Seizing upon the fact that dates were given for the alleged periods of shortcoming on their parts, they have challenged the Corporation to prosecute them for the damages which, according to this story, they must have incurred under the Act. As Mr. W. F. Cotton points out, in the communication to the Corporation of which we publish an account elsewhere, if proceedings are not taken to recover these penalties, it will look as though the Gas Committee are willing to slander the Company, yet are afraid to put their accusations to the proof. As the matter has been referred to the Paving and Lighting Committee, it is possible that a prosecution may be impending; but, on the other hand, it is equally likely that, the aspersions having been made, nothing further will be heard of the matter.

THE TRIAL OF MR. CARR.—The trial of Mr. William Carr, at the Leeds Assizes, on the charge of unlawfully mutilating "a certain book" belonging to the Halifax Corporation, has been specially fixed to take place to-day (Tuesday) before Mr. Baron Pollock.

MID-SUSSEX WATER COMPANY.—We understand that an allotment of shares in this Company (the prospectus of which was published in the JOURNAL for the 27th ult.) was made on the 5th inst.; but, the whole of the shares not having been applied for, the Directors have decided to allow the list to remain open for a short time, to enable those who are desirous of becoming shareholders to send in their application.

MR. PERCY G. WINSTANLEY (son of Mr. George Winstanley, Engineer and Manager of the Newcastle-under-Lyme Corporation Gas Works) has been appointed Secretary and Manager of the Halesowen Gas Company. In moving the adoption of the Gas Committee's minutes at last Tuesday's meeting of the Newcastle Town Council, Mr. Briggs referred to the appointment obtained by Mr. Winstanley, jun., who, he said, had been an efficient servant of the Corporation for six years. He had now gone to take a responsible position elsewhere; and he was sure the Council wished him success.

Water and Sanitary Affairs.

IN Lord Bramwell, the Water Companies (in common with the proprietors of other public undertakings of a similar class) have always found a vigorous and consistent champion. To those who favour the so-called public policy of compulsory purchase by municipal bodies, we commend some remarks which will be found in his Lordship's address on "Economics r, Socialism"—recently re-issued by the Liberty and Property Defence League. You do not, says Lord Bramwell, compensate a man when you take from him what as a matter of business he would rather keep—even if you pay him twenty shillings for his sovereign. Almost immediately after this, his Lordship makes a pointed reference to the case of the London Water Companies, in connection with the question of annual value. The Companies were originally authorized to charge according to the real annual value of the houses supplied with water. But what happened? Only a few years ago, at the instance of a private member, it was enacted that the charge throughout the Metropolis should be on the rateable value, "which is" "very commonly five-sixths of the real value. The measure was passed, adds the writer, "by some who knew no better, by "others who did, not without a blush; but it was £9000 a "year loss to one Company."

These schemes and ideas receive encouragement from Parliament; while the far more urgent question of maintaining the purity of the Thames, and placing adequate powers at the disposal of the now helpless Conservancy Board, is allowed to remain in abeyance. Is it more important that a man should pay a few shillings less for the water annually supplied to him, than that the quantity received, whatever it may be, should be pure and undefiled when it is sent into his house? The question answers itself in days when people scoff at the primitive customs of their forefathers, and plume themselves on their zeal for sanitation. It is not our habit, nor wish, to be alarmists; but, nevertheless, it may be well to remember what river pollution has effected in bygone times. The events which led to the Health of Towns Commission more than forty years ago ought not to be forgotten. It was then tardily realized that the sewage of London which had formerly been accumulated in cesspools had been gradually transferred to the Thames; and, to quote Sir Francis Bolton's description of the consequence, the river itself became a polluted sewer on an enormous scale, with a mass of water, black and foul, passing continually up and down at each change of the tide—"a condition of things "which culminated in the cholera outbreaks of 1845 and "1849." Of course, the shocking state of affairs which then existed can never be repeated, because it is now illegal for the Metropolitan Companies to take water for domestic consumption from any part of the Thames below Teddington Lock. The present, or the threatened, danger is to be traced to the riverside towns situated above the present intakes of certain of the Companies; and the point is whether the Local Authorities who bear rule in those localities are to be permitted to turn certain stretches of the Thames into public sewers. All will be agreed that it is not expedient; but, unhappily, the law seems to favour the offenders—if not individually, at least collectively.

With regard to the rights of individuals *inter se*, the case of *Ballard v. Tomlinson*, decided in the year 1885, is no doubt an important authority; but the decision of the Court of Appeal (reversing that of Mr. Justice Pearson) was of a more or less qualified character. It was then laid down that no one has a right to use his premises in such a way as to be a nuisance to his neighbour; and, therefore, if a man puts filth or poisonous matter on his land, he must take care that it does not escape so as to poison water which his neighbour has a right to use, even though the neighbour may have no property in such water at the time it is fouled. The argument, put in another way, involved the question whether anyone of those who have unlimited rights of appropriation has also a right to contaminate that common reservoir or source described as percolating water, or whether he is bound to do anything which will prevent those who enjoy a similar right of appropriation from receiving the water unaltered in quality. This latter question Mr. Justice Pearson decided in the negative; but, as just mentioned, the Court of Appeal took a different view. The result is that, although nobody has any property in such a source of water supply, yet everyone has a right to appropriate it, and to appropriate

it in its natural state. Therefore, it becomes illegal for one man to foul the common source, so as to prevent his neighbour from enjoying the full value of his right of appropriation. This is sound doctrine. If similar principles could be enforced as between the Staines Local Board, on the one hand, and the Conservators (as representing the rights of the public and of the London Water Companies) on the other, a way might be found out of the present discreditable and dangerous deadlock.

In our present issue we have to record the half-yearly meetings of three of the London Water Companies—the Southwark and Vauxhall, the Grand Junction, and the Chelsea. The rate of dividend with the first is 6 per cent.; and with the two others, 9 per cent. In each instance the Directors rendered their account with a light heart; although a wet summer had so affected the demand for water as to diminish the revenue accruing from the meter supply. The Chairman of the Grand Junction Company referred in terms of satisfaction to the new reservoir at Ealing; though slightly apprehensive lest some rigid economist should object to the expense of the opening ceremony. It is perfectly certain that neither the Local Authorities nor the public have an adequate idea of the magnitude of the operations necessary to supply the Metropolis with water, and the Companies will act wisely in seizing every opportunity to dissipate the prevailing ignorance on this subject. The Chelsea Company's balance-sheet afforded the usual example of economy in expenditure; leaving a trading profit of 70 per cent. In this respect the undertaking stands unrivalled, except by that of the Kent Company. A remarkable feature in the Chelsea Company's district consists in the enormous demolition of old houses; something like 1000 having been lately pulled down. This process, which might have been expected to reduce the income of the Company, has been greatly neutralized by the rapidity of building operations, and the higher value of the new structures compared with the old. The activity of the builders between Acton and Sunbury has also served to benefit the Grand Junction Company; though necessitating additional works to meet the demand. The vote of thanks to the Chelsea Directors gave rise to an amusing example of gratitude for favours to come; the mover of the resolution dwelling on the steady progress that was being made "towards the maximum dividend of 10 per cent." One discouragement bearing on the London Companies in their efforts to economize expenditure, consists in the perpetual and extraordinary growth of local imposts, in the shape of rates and taxes. This was mentioned by the Grand Junction Chairman, and still more emphatically by the Chairman of the Southwark and Vauxhall Company, Sir H. E. Knight, describing the increase of this burden as "continual and enormous." The rates and taxes of the Company have risen by £800 in the last half year, as compared with the corresponding period of 1887. More than 8 per cent. of the gross income of the London Water Companies is thus absorbed—independently of the income tax. We have before remarked that the Local Authorities will feel the difference, if ever they obtain possession of the London Water-Works. We observe that no reference was made at any of the meetings to the approaching establishment of the County Council for London. An item of scientific interest relates to the Streat-ham well of the Southwark Company. This somewhat famous undertaking has, like others, resulted in reaching the primary rocks, and demonstrating the absence of the lower greensand in the vicinity of the Metropolis. Sir H. E. Knight signifies that the idea of an unlimited supply of water from the strata under London is now at an end; and it thus becomes a matter of increasing importance to protect the Thames from pollution. Concerning the absence of the lower greensand, it should perhaps be borne in mind that, although the statement is practically correct, it is not literally true; a thin stratum having been found under the Tottenham Court Road.

THE *Garth Castle*, in which Mr. T. Newbigging left England for South Africa to fulfil an engagement at Johannesburg (as intimated in the JOURNAL for the 27th ult.), arrived safely in Cape Town last Friday, and "all well" is reported.

THE duties of Mr. J. F. Bromley, late of the Bolton Corporation Gas Department and now Manager of the Batley Gas-Works, have been divided by the Gas Committee; and Mr. Walter Collins, the late Borough Analyst's son, has been appointed Gas Examiner.

WE understand that Madame Altling-Mees commenced yesterday a series of lectures on cooking by gas in the new hall of the Gaziers Belges, Boulevard du Nord, Brussels. From thence, about new year, Madame Altling-Mees purposes proceeding to Lille to fulfil a similar engagement.

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(FOR STOCK AND SHARE LIST, see p. 1083.)

THE week just concluded has not been a bright one for the Stock Exchange markets. It opened as gloomily as possible; and, indeed, Monday was perhaps the flattest day all-round that we have seen for a long time. Subsequently there was some degree of improvement, as probabilities pointed to a relaxation of the stringency in the Money Market; but towards the end there was another fall back, and closing prices were below the best of the week. It may be expected that the markets will continue in this unsatisfactory condition until the monetary prospect becomes clearer. As the present position of affairs prejudicially affects even the highest class of securities, it might have been expected that the Gas department would exhibit a greater falling off than it does; the actual extent being very slight indeed. Gaslight "A" has receded 1 in quotation; but the prices at which business has been done are much about the same as those of the previous week. The stock has been extremely quiet; and on the last three days of the week, there was not a single transaction recorded in it. In fact, there was almost as much business done in the Company's secured stocks as in the ordinary. All the debenture stocks are quoted *ex div.* since Thursday at old *cum div.* prices. If this is right, it is equivalent to a rise of from 2 to 3 per cent. in each. There was a fair amount of business done in South Metropolitan; but the prices were not very good, though the closing mark on Saturday for the "A" stock was the best of the week. The £50,000 of Five per Cent. Debenture Stock which was disposed of at the Mart on Friday averaged about £130 8s. per £100 of stock; yielding, therefore, nearly £3 17s. per cent. per annum as an investment, which may be considered a handsome return for so excellent a security. Nothing at all has been marked in Commercial; but we fancy it is being quietly bought by those who know what they are about. Suburban and Provincial undertakings have been almost unnoticed, and present no feature. The Foreign division has had rather a weaker tendency. Imperial Continental has receded 1; and Bombay old is $\frac{1}{4}$ lower. The Water Companies have been so excessively inactive that only two or three transactions have been marked in them all the week. Changes are few and unimportant; comprising a fall of 1 in East London, and a recovery of 1 in each of the Southwark and Vauxhall issues, upon adjustment of *ex div.* quotations.

The daily operations were: On Monday, Gas was at its most active point, and prices were steady, though only moderate. Tuesday's Gas business was decidedly limited; and prices were much the same as the day before—if anything, a little better, though Gaslight "A" was quoted 1 lower. In Water, Southwark and Vauxhall was the only Company touched, and the ordinary shares rose 1. On Wednesday, Gas was quiet again, and prices generally were not good, especially for Bombay and Imperial Continental. In Water, East London was weaker, and fell 1. There was a shade more activity in Gas on Thursday—mostly in Gaslight and Coke and South Metropolitan issues. The only change was a fall of 1 in Imperial Continental, and $\frac{1}{2}$ in Bombay. There was nothing at all done in Water. On Friday, Gas was quiet, and prices were low; but quotations remained unchanged. On Saturday, a couple of transactions in South Metropolitan were all that was done in Gas; and all quotations closed without further variation.

ELECTRIC LIGHTING MEMORANDA.

THE ELECTRIC LIGHTING OF KENSINGTON; AN OLD DELUSION—ELECTRICIANS' ENTERPRISE—ELECTRIC LIGHTING OF THE PARIS THEATRES AND CONCERT ROOMS.

IT has been mentioned repeatedly in this column that various electric lighting schemes are afoot with special reference to that most favoured of London districts which centres in Kensington. There is already a central station supplying a small number of houses in West Kensington; but this is nothing to the business that half-a-dozen separate electric lighting interests expect to do when once fairly started in the neighbourhood. The House-to-House Company, which works under the supervision of the hitherto unfortunate Mr. Robert Hammond, seems to have greatly impressed the Special Committee of the Kensington Vestry who were appointed some time since to inquire into the various electric lighting projects affecting the parish. A deputation of the Committee went to Eastbourne to inspect the lighting of this pleasant town, which is Mr. Hammond's mainstay; but it is stated that they could not find time to go to Deptford, to see the new station of the Metropolitan Company. The result of this blunder on the part of the Committee has been the return of their report by the Vestry, together with the nomination of half-a-dozen more members "to strengthen the Committee and equalize the representation," as the report has it. The Vestry, for their part, are not much wiser than their Committee, who fell too easily under Mr. Hammond's fascinations; for they appear inclined to lay down the principle that the interest of the consumer requires the active competition for business of two electrical undertakers in every district. They are not yet prepared to concede the advisability of unlimited competition, and the consequent interminable trouble with superfluous wires; but they cling with touching simplicity to the belief that two favoured undertakers will always vie with each other in the attempt to give the

better service at the less cost. It is a pity to dash such infantile hopes; but the electricians will not overlook the teachings of gas supply, if the Kensington Vestrymen ignore them. There are the examples of Brighton and Edinburgh to show the inevitable consequence of attempting to pit one Gas Company against another in the same district; and there is no reason to suppose that men of business will look less keenly after their own interests when these are bound up with electricity than did their precursors in the days of competitive gas undertakings. If the Kensington Vestrymen want to make different electric lighting companies rival each other without detriment to themselves at the time and to the public afterwards, let them be given adjacent and similar, but independent districts. In this way, they will begin with all the advantages of that districting system which the London Gas Companies did not achieve until enormous amounts of the capital, which the consumer of the present day has to pay interest for, had been lost through insensate competition.

As an indication of the difficulty experienced by electric lighting contractors in obtaining orders for street lighting, and also of the lengths to which some of them are prepared to go by way of advertisement, it is reported that Messrs. Laing, Wharton, and Down have agreed to fix and run six arc lamps for a month, free of charge, in the streets of Reading. The offer has been accepted by the Town Council, who are to provide the necessary lamp-posts and supports for wires, as they are naturally willing that the local public should see the effect of electric lighting on such easy terms for the town. Whether Messrs. Laing and Co's experiment will lead to business is, of course, uncertain; but the experience of other towns with the arc light is not encouraging. It seems impossible that advertisement upon such a lavish scale can pay the contractors; but this is their affair. The incident should be instructive for gas companies, and teach them to be a little freer upon occasion with displays of the capabilities of gas. To people who have never seen anything better than the ordinary street gas lamp, the possibilities of gas for lighting streets and open spaces are as unsuspected as are the qualities of electric lamps to those who have had no experience of them.

The progress of electric lighting in connection with theatres and concert halls in Paris has been recorded with particular fulness in the French technical journals. It appears that the managements of these places of amusement have largely adopted the system of engaging with certain contractors for the supply of the lighting required in consideration of an agreed payment. In this way the contractor is responsible for everything connected with the lighting service, down to the minutest detail; the management having nothing to do with it. This is a very different state of things to that which prevails when similar establishments are lighted with gas, when the management merely pays a rental to the gas company, and has to undertake all the interior service beyond the meters. Up to the present time, however, the new system has worked fairly well. The Continental Edison Company light nine theatres, including the Opéra and the Comédie-Française, and used to light one more; but the contract for this has just expired. A private contractor lights five other theatres; the Electric Lighting Company light three more; another similar Company light the Scala concert; and the Hippodrome has its own installation. The lighting of the Opéra is far and away the most important contract of the kind; requiring nine steam-engines and fourteen dynamos established in the vaults. The complete lighting service includes 6500 incandescent lamps, ten Jablochkoff lamps on the façade, six more in the engine-rooms, and eight Pieper regulators in the loggia. There is nothing remarkable in the lighting arrangements of the other theatres. No comparative statement of the cost of the new and old systems of lighting has yet been published; and, of course, it is not known how much the Paris Gas Company have lost by this irruption of electricity into their old domain, the inciting cause of which is doubtless to be found in the catastrophe at the Opéra-Comique.

THE STOCKTON AND MIDDLESBROUGH WATER BOARD AND THEIR GENERAL MANAGER.—The General Manager of the Stockton and Middlesbrough Water Board (Mr. D. D. Wilson) has recently applied for an advance of salary; and the following flattering resolution has been passed by the Finance Committee of the Board:—"That a gratuity of £100 be granted to the General Manager in recognition of his services in connection with the recent parliamentary contest; and that his salary be advanced to £850 per annum, to date from the termination of his seventh year—the engagement to be for three years."

DEATH OF MR. W. MATTHEWMAN, OF LEEDS.—The death is announced, as having taken place quite suddenly last Thursday, of Mr. W. Matthewman, who for many years had been in the service of the Leeds Corporation as Secretary or Chief Clerk in the Water-Works Department. Mr. Matthewman, who was always regarded as a valued and trustworthy official, had been in the employ of the Corporation from the acquisition of the water-works by the town; and before that time he was engaged by the Water Company. He was about 70 years of age. At a meeting of the Water-Works Committee last Friday, the sad death of Mr. Matthewman was referred to; and a vote of condolence with his family was unanimously adopted. The Chairman (Mr. Alderman Woodhouse) and several members of the Committee spoke in appreciative terms of the manner in which Mr. Matthewman had performed his duties during all the years he had been in the service of the Corporation.

DOMESTIC FIRES; THEIR ACCESSORIES AND SUBSTITUTES.

THE domestic hearth is a standing grievance to persons of an inventive turn. The reflection that the most opulent stock-jobber, or other high product of nineteenth century civilization, who is able by the instrumentality of the railway to live thirty, forty, or sixty miles from the scene of his daily labours, and whose business methods depend upon the constant use of such essentially modern appliances as the telegraph and telephone, yet returns every evening to the comfort of such a "sea coal fire" as warmed his grandfather, is by a numerous class of restless people regarded as a reproach to the practical science of the age. All sorts of invidious things are said of the cheerful open fire in which the average Briton delights, as did his forefathers. It is condemned by economists as wasteful, by social reformers as troublesome, and by sanitarians as the aggravator of fogs; yet it retains its place in despite of all that can be said against it. The candid partizan of the general use of coal gas is forced to confess that, while for cooking a good gas-stove is as cheap as and better than most coal kitcheners, gas "fires" and heating-stoves in general, although extremely useful in their way, cannot satisfactorily supplant the old-established open fire. The late Sir W. Siemens claimed to have solved the problem of the smokeless, hot, and cheerful open fire by his combination of coke and gas; but the arrangement has not taken root in the affections of the great body of householders. There can be no doubt in the mind of anyone who has thought in earnest about the matter, that the British open hearth is one of the symbols of a stage of social organization which may not persist for longer than the period covered by one or two more generations in this country, and is already dying in the United States and the British Australasian Colonies. The permanence of the open fire for the living room, in short, with the very considerable amount of work which it entails, must depend upon the continuance of the old-world system of domestic service. Very many and serious modifications of the ordinary arrangements of people brought up in the old-fashioned European manner, in communities where there exists a class of menials, must be accepted as the price of that so-called amelioration of the common lot in which this class disappears. We in England are beginning to feel the influence of this change, in the attempts that are made to rescue much of the necessary service of a household from the category of menial offices, and even in the disrepute into which this latter phrase itself has fallen of late years. We have boldly accepted the idea that no necessary and useful service can be degrading; but it is beyond the power of argument to make some of them anything other than unpleasant. Little by little, however, the unpleasantness has to be faced until it no longer remains noticeable. In this way, nursing the sick and cooking—more especially the former—have been rescued from the list of things which no lady could be expected to know anything about. Yet if such a desirable consummation as a respectable sisterhood of cooks, to match the admirable nursing sisterhoods, should be realized, there would yet remain a good deal of tedious and disagreeable work in a household conducted on the ordinary model. We might live in flats, with porters and boot-boys to perform such services as they could undertake, but there would still remain the problem of cleaning the grates. There is no scope for enthusiasm in the work of the housemaid. The nurse may display all the qualities that ennoble humanity, the cook may exercise brains and taste of no mean order; but the work of attending to the grates is simple drudgery, and can never be classed higher than that "hewing of wood and drawing of water" which has from time immemorial been held the lowest of human employments.

When domestic servants are no longer obtainable, the glory of the British hearth will also have departed. In the Northern States of America the disappearance of housemaids is rendered less noticeable in connection with this particular matter because of the exigencies of the climate, which has long prescribed the general use of stoves in preference to open grates. Consequently the step is not so great from the use of a more or less ornamental stove placed in the room which it is intended to heat, to a furnace fixed in a cellar where it can be attended to by someone who is not strictly a domestic, and whence heated air can be drawn as required for any or all the rooms of a house. American rhymesters have made merry over the detriment to the poetry of the home affections due to the substitution of a "hole in the floor" for the hearth which formerly served as the focus of family life; but, in despite of poetry, the change has been made merely because of its convenience. The extended employment of heating by steam, distributed from central stations, is only another testimony to the need felt by modern Americans for simplifying their domestic service. It is only what one might expect, when servants are few and bad, that householders should prefer an arrangement that only involves the turning of a valve by themselves to one that requires a considerable amount of dirty work. The facility afforded by electricity for transmitting movements for the regulation of valves and dampers has not been lost sight of. Recently an American technical journal described and illustrated an "automatic electric regulator," introduced by a manufacturing concern rejoicing in the name of "The Consolidated Temperature Controlling Company," of Minneapolis. The illustration showed a furnished sitting-room on the first-floor, and a huge iron stove in the basement, with hot-air flues opening through gratings near where the fireplace of the upper room had been. The temperature controller consisted of a thermostat fixed against the wall of the room, communicating electrically, in a manner that need not be described in detail, with

an electro-motor connected with the dampers of the furnace. It is set at the temperature required to be maintained in the room by day or night, and is warranted to do its work, making "the ordinary hot-air furnace" a satisfactory heating apparatus, so long as the requirements of feeding the fire with coal, and removing the ashes, are attended to. Of course, if stove heat is to be employed for warming dwelling houses, it is as well to use a regulator for keeping the temperature uniform.

The most peculiar attempt on the part of electricians to make themselves useful in connection with house heating is, however, that narrated by Mr. Legh S. Powell, who has contributed an article to the *Electrical Review* upon the employment of electricity for lighting domestic fires. Electrical heating arrangements, although often suggested, having been found infinitely less serviceable and more costly than gas-stoves, the idea now is to use the precious current in substitution not only of the gas fire-lighting torch—which was never a satisfactory toy—but also to replace the humble "firelighter" of the oil-shops. This is a modification of the "electric furnace" which would certainly have called up a gentle expansive smile upon the countenance of Sir William Siemens. The method of procedure is simple enough. "As cinders and coke are conductors of electricity, all that is requisite to produce incineration of the fire by electric means is to make the bars one pole of the arrangement and a plate of iron, inlaid into the back fire-clay part of the grate, the other electrode. On laying cinders or coke of suitable size between these terminals and then switching on the current, the heat developed in the circuit occurs exactly where it is required—viz., at the points of contact between the pieces of fuel." It will be noticed that the electrician does not describe his purpose by the usual phrase "lighting a fire"—he "incinerates" it, which, of course, is a much more scientific proceeding! As with some other proposed and practised dealings with strong electrical currents, however, the beautiful simplicity of the method is attended with a variety of difficulties and drawbacks when it is tried in common use. It is just possible, for example, that the arcs formed between the fire-bars and the fuel might be so intense as to destroy the former in an inconsiderately brief period. Or, again, the current might not always be strong enough to ignite the fuel, and yet might waste a good deal of energy in the attempt. It appears that the author has actually made experiments in this direction in the laboratory of Mr. J. W. Swan; and although the game does not appear to have been found worth the candle, the experiments are described with some enthusiasm as pretty and moderately successful. With a current of 50 volts, Mr. Powell says he managed several times to "incinerate" about 3 or 4 lbs. of coke in small pieces, in a "small rectangular stove." The fuel had to be closely watched for 10 or 12 minutes, however, and kept constantly packed close together by the humble aid of a poker, or it would not light at all. The cost of this method of fire lighting, with electricity charged at 7d. per unit, would be from 1½d. to 2d.—which Mr. Powell admits to be a prohibitive price. The money would, of course, go much further in firewood or lighters of the common type. Mr. Swan, who seems to have been interested in the experiment, suggested that "perhaps some arrangement of a fire-clay tube to be filled with powdered plumbago and rendered incandescent by passing a current through it" might be more successful. It is a curious idea, at any rate.

On the whole, however, unless electricians can devise a means of clearing out ashes, polishing the bars, sweeping up the hearth, and laying the fire as well as lighting it, by merely pressing a button, they are not likely to gain much by meddling with the domestic fireplace. Notwithstanding its obvious drawbacks—which, by the way, chiefly affect other people—the average British householder will cling to his dusty, smoky fire as long as he can get anybody to attend to it for him, and can buy the coal to burn in it. Whenever these prime requisites can no longer be obtained, and not till then, the Englishman's open fire will give place to something else; but we take leave to doubt whether the community will be appreciably happier or healthier for the change. Nobody can tell at present what the substitute for coal fires is likely to be; it may be gas, it can scarcely be electricity.

SOME NEW BOOKS, PAMPHLETS, AND CATALOGUES.

THERE has of late been such a demand upon the columns of the *Journal* devoted to technical matters, that many things well deserving of attention have been kept over week after week. Among the rest are several books and pamphlets touching more or less upon the gas industry, some of which have awaited notice so long that their authors and publishers may be pardoned for fearing that they have been forgotten. We take the present opportunity, therefore, of dealing with some of these arrears, premising that the publications we mention together have no sort of connection with each other, except that of lying in one pile on our desk.

The first that comes to hand is a work entitled "Golden South Africa," written by Mr. Edward P. Mathers, F.R.G.S., and which is published by Messrs. W. B. Whittingham & Co., of London, and Messrs. P. Davis & Sons, of Durban and Maritzburg. This work has also been published in another edition under its second title of "The Gold-Fields Revisited." The book has probably been forwarded to us on account of the recent development of interest in regard to the supply of gas to South African towns. It appears to contain a great deal of information respecting "up-country" affairs, from which intending investors in local gas and water companies' stocks can form their own opinions as to

the prospects of such ventures. Writing of Johannesburg, for example, the reader is informed that "nothing has yet been done by the Government to light the town. At night Johannesburg streets are in darkness, but for the brilliant and welcome lights of the canteens," from which it may be inferred that the writer at least experienced a want in this regard. If the gold-field towns and others in this part of the world are not speedily provided with gas, it will not be for the want of inquiry by competent authorities. Meanwhile anybody desirous of learning something about this remarkable region will not be wrong in obtaining a copy of Mr. Mathers's well-written little book.

"The *Mechanical World Pocket Diary and Year Book*" for 1889 is a specimen of a very numerous and varied order of productions which come under notice about this time of the year. It has the good point, to begin with, of containing very few advertisements; and those that it includes would not be missed if they were omitted. The technical portion of the little book is good, so far as it goes, although the besetting evil of all books of the class—that of containing elaborate notes on elementary points that nobody is likely to forget, to the exclusion of data that are apt to escape the memory—is not absent from it. The usual equivalents of the Birmingham wire gauge are given; but the Standard wire gauge is not so much as mentioned. On the whole, however, the book is well worth the sixpence asked for it.

"Pumps: Their History and Construction," by Philip R. Björling, published by Messrs. Emmett and Co., of Manchester and London, is the substance of two lectures delivered at the Gloucester School of Art in January last. The author places pumping machinery in the fore-front of mechanical engineering, on the ground that the minerals by command of which civilized men are distinguished from savages could not be won but for pumping. It is rather idle to talk in this strain; but it is true enough that, as the pumping of water was one of the first concerns of engineers in the early days of power machinery, it constitutes a capital subject for the training of engineering students of the present age. If a student knows all about pumps, he has not much more to learn in the way of mechanical engineering.

We have received a catalogue of the Albion Engine Company, of London, Liverpool, Paris, and New York, from the sole licensees, Messrs. Hartley, Arnoux, and Fanning, of Stoke-on-Trent. The "Albion" silent gas-engines found brief mention in our account of the recent Ironmongers' Exhibition; but the later information received respecting them supports the opinion that these motors constitute a valuable additional resource to the consumer of gas for the development of power. These engines are at present listed up to 16-horse power; and with regard to their performance, it is reported that, with a poor quality of gas, a 3-horse power (nominal) engine, running at a mean speed of 183·6 revolutions per minute, developed 5·96 indicated horse power; the brake load = 4·843-horse power (weight of brake strap and apparatus additional, not included). The consumption of gas was after the rate of 31·2 cubic feet per brake horse power per hour—per indicated horse power 25·33 cubic feet per hour, firing lights included in both cases. The same size and make of engine, but with better gas, is stated to be doing a fraction more on the brake, and using 10 per cent. less gas. In both cases it is remarked that there was no attempt to obtain anything beyond a rough test of what could be done in everyday work. These "Albion" engines are made both horizontal and vertical. They are reversible, and can be had fitted with a self-starting attachment. It is claimed that as the charge is ignited at the centre, and burns both ways, there is complete combustion and absence of carbon deposit. The details of the engine are simple, strong, accessible, and not likely to get out of order.

Mr. B. Gibbons, Jun., of the Dibdale Fire-Clay Works, Dudley, has issued a striking trade catalogue, in the shape of a strongly-bound book fitted for hanging against a wall, with a shifting calendar in a pocket on the front of the cover. This is Mr. Gibbons's third illustrated list; the last, which it supersedes, dating from 1882. It contains a mass of information calculated to be of use in gas-works, drawing offices, and elsewhere. There is an interesting account of the methods of manufacturing fire-clay retorts by hand and machinery, and other data concerning the equipment of gas-works with fire-clay goods, which engineers and managers will do well to take note of. No one turning over the pages of this part of the book, however carelessly, could avoid the reflection that there cannot be any real necessity for the great variety of sections and patters of retorts catalogued or referred to by Mr. Gibbons. We note that the author draws special attention to the fact that fire-clay retorts made abroad are usually only 2½ or 2⅓ inches thick; whereas English retorts are 3 inches thick. He remarks that the thinner retorts last just as long as the thicker, and evidently inclines to recommend English engineers to give them a trial. Original articles upon points arising out of the carbonizing of coal in clay retorts complete this very well got-up catalogue, which is thus made like a text-book on the subject of fire-clay construction for gas-works purposes. It is neatly illustrated, printed, and bound.

THE THIRD DRAWING OF THE SYDNEY GASHOLDER.—This is given with to-day's number of the *Journal*, and is closely connected with drawings Nos. 4 and 5, which will be published in our next and following issues. It is, therefore, proposed to defer until the first number in January any description of the details appearing this week.

Technical Record.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

The Seventy-sixth Quarterly Meeting of this Institution was held on Saturday, the 1st inst., at the Victoria Hotel, Manchester. The PRESIDENT (Mr. T. Duxbury, of Darwen) occupied the chair. After the transaction of the formal business already recorded in the JOURNAL (*ante*, p. 980), the members proceeded to discuss the paper read by Mr. J. Dalgliesh, of Glossop, at a previous meeting, entitled

OIL AND OTHER ILLUMINANTS AND THEIR EFFECT ON GAS CONSUMPTION.

The PRESIDENT said he had to apologise on behalf of the Committee for the delay which had occurred in taking the discussion on this paper. It was read at their meeting on Dec. 3 last year; and twelve months was a long time for a discussion to be deferred. He had experienced the same difficulty in connection with the last paper he read. The result of such delay was that the subject got out of one's mind; and they had to read up for one meeting after another, or else they forgot what had taken place in reference to the particular matter to be debated. This militated against discussion, which was to be deplored, because an Institution like theirs was more valuable for the discussions which took place than for the reading of papers. However, there had been many difficulties in the way; and the discussion had been postponed from time to time. But he hoped that now it was to take place, there would be as good a discussion as the subject warranted, and as was consistent with the delay that had occurred.

Mr. DALGLIESH expressed regret at the delay. There had, he said, been other business which had necessitated the postponement of the discussion; and he was unable to attend the last meeting, held at Doncaster, so that the matter had to be again deferred. In compiling the paper, he experienced considerable difficulty in not being able to get from the various engineers and managers to whom he applied exact answers to his question as to the local consumption of oil. Very few were able to state, even if they applied to the railway companies, the quantity of oil imported into their town, nor could they give the actual number of consumers of oil, without a house-to-house canvass, which would have been very difficult, and required much time. He could not expect that managers of gas-works would go to the trouble and expense of obtaining such information; and even if they did, the time at his disposal before he had to read the paper was so limited that it would not have sufficed for such an inquiry. He therefore took this course: Taking the population of the towns as shown in the table, he allowed the Government standard of five persons to each house; and thus arrived approximately at the number of dwellings. Of course, from the returns published each year, he was able to get the exact number of consumers of gas; and deducting this actual number from the assumed number of dwellings, he arrived at the number of residents not using gas, and these, he presumed, were users of oil or other illuminants.

The HONORARY SECRETARY (Mr. Harrison Veevers, of Dukinfield) said he had received a letter from Mr. T. Newbigger, who was on his way to South Africa, in which he said that he had intended contributing something to the discussion on Mr. Dalgliesh's paper, and had jotted down a few things that had occurred to him. The enclosure was as follows:—"I had not the opportunity of listening to Mr. Dalgliesh's paper; but I have recently perused it, and was entertained with the choice passages from the ancient and modern history of artificial lighting communicated to us by the author. Indeed, I consider that some such title as that would have been more appropriate for the paper than the one which Mr. Dalgliesh adopted; for he does not give us many suggestions as to how illuminating gas may best meet the competition of oil and electricity. Probably he thought that the discussion would supply the deficiency. As a slight contribution to this end, I venture to express the opinion that gas lighting has no competitor to fear, so long as those who have the control and management of gas undertakings aim at the cultivation of what I would call the three graces—Cheapness, Lighting Power, and Purity; and the greatest of these is Purity. Whatever other hindrances stand in the way of the more extensive adoption of gas for lighting and cooking purposes, should be removed. Chief amongst these, I class the deposit system. The adoption of this system at the outset might almost have been a suggestion of the enemy. At any rate, save in very exceptional cases, it ought to be discarded. There is nothing, in my opinion, that more handicaps the extension of the use of gas, and assists the competition by oil, especially amongst the smaller consumers in towns. But all round the practice of enforcing the payment of deposits is a most objectionable one. I candidly confess that if I had it to pay in my own case, I should look upon it as a reflection on my honesty or my credit, or both, and would refuse to comply with the requisition. Under a prompt and efficient system of collection, there is no need for the deposit system."

Mr. W. WOODWARD (Bury) said there could be no doubt that they did owe an apology to Mr. Dalgliesh for the neglect with which they had treated his paper; but in some respects Mr. Dalgliesh was himself to blame, for he had submitted two or three sets of statistics, and the Committee might be excused for diffidence in bringing the matter forward under the circumstances. There was no doubt in his mind that the great obstacle to the increased

consumption of gas was its price. They found in Bury that, by reducing the price to slightly under 2s. per 1000 cubic feet, they had recovered consumers who gave up the use of gas six or seven years ago. Although they had lost one or two large consumers, their consumption had increased 2 million cubic feet a month since they reduced the price of gas. This went to prove that the price had much to do with consumption; and he was assured by pawn-brokers in the town that, if they were willing to take them, they could have their shops simply flooded with oil-lamps. Oil was at a discount in Bury at present. He considered the meter-hire system an injustice altogether. It was absurd to charge customers for the instruments by which they measured the gas. They had neither deposit system nor meter-hire at Bury; and this year they had an increase of more than 10 per cent. in the consumption, whereas in other years they had had a decrease.

Mr. T. B. BALL (Rochdale) observed that, although he agreed with Mr. Woodward that the reduction of the price of gas to a minimum was the best means of competing with oil and illuminants of that description, he did not agree with him altogether that this would to any appreciable extent bring back consumers who were lost to the gas company or the corporation. Nor was he altogether sure that, if it would, it would be an unmixed gain. A great deal had been heard lately about small consumers. In Rochdale they had a considerable number of small consumers. The population was perhaps 70,000; and they had nearly 20,000 meters in use. Of these 83 per cent. were two-light meters, which was tolerably conclusive evidence that they had a great many small consumers; indeed, it was an exceptional thing for property to be erected in the town without the gas supply being put in. The fittings were put in, and the meters supplied by the landlord; they had not a single meter belonging to the Corporation. This, as he had said once before, was a great evil; but it removed at any rate the difficulty sometimes put forward, of the expense incurred by small consumers in procuring these things. And yet, with this advantage, and with no expense whatever to be incurred—they could have the gas turned on at will—the people still preferred oil; and the quantity of gas they would burn under any circumstances was exceedingly small. In many cases it did not exceed 2000 cubic feet per annum; and the cost of inspection and collection on that amount would certainly not be less than 1s. per 1000 feet. The inspector went eight times a year; the collector probably had to go another eight; and there was all the expense of book-keeping for the 2000 feet, exactly as there was for a consumption of 200,000 cubic feet. Altogether, he was not at all sure that the small consumer was such an acquisition as some appeared to suppose. The prompt collection of accounts was stated to be one method of counteracting the difficulty these people experienced in getting together 3s. or 4s. at the end of the quarter; but if they were to spend another shilling per 1000 cubic feet in collecting these small sums, it became a losing, instead of a profitable business. He quite agreed with the recently-expressed opinion of Mr. Hunt, that they must look at these things after all from a commercial point of view. It was no use attempting to sell gas in quantities of 2000 cubic feet per annum if the transaction ended in loss. They would not be any better off for any amount of that business; and this, after all, appeared to be the rational view to take of it. Everything, he thought, had been done at Rochdale, except the collection of accounts at short intervals, to encourage consumption. Whether even the plan of frequent collection would bring these people back to burning gas, he must take leave to doubt; and he also doubted whether they would be very great gainers by the transaction even if it did.

Mr. W. W. HUTCHINSON (Barnsley) observed that the competition of oil and other illuminants had to be met in the course of their business; and it was necessary to know the best means of dealing with it. He believed that if means could be taken to induce all property-owners to put in gas-fittings, one reason for the non-consumption of gas would disappear. As it was, the few shillings which it cost to put fittings in a cottage house formed an insuperable bar with many people to the use of gas. Though these small consumers might be rather troublesome and expensive in the matter of the collection of accounts, and might not be a source of much profit, they were nevertheless a stable source of consumption, and were not liable to much change. It, therefore, seemed to him desirable to stimulate this branch of the business. Oil-lamps could be obtained at an almost infinitesimal price—for about 1s. each; and then the consumers of oil had the advantage of the weekly payment system. The cart went round with the oil; and the weekly payments were so low that the sellers of gas could not very well adopt the system, and collect such small amounts. He was afraid the attempt to meet the competition of oil in these cases by weekly collections would not pay. The adoption of prepayment meters might afford a means of overcoming the difficulty; but whether there was a prepayment meter in the market sufficiently reliable for the purpose, he was not just then prepared to say.

Mr. J. BRADDOCK (Radcliffe) remarked that his experience was that the small consumer might be depended upon to take about 4000 cubic feet of gas per annum, which was double the quantity named by Mr. Ball.

Mr. A. SHIRES (Biddulph) said it did not invariably happen that an increase in consumption followed a reduction in the price charged for gas. He had only obtained five new customers as the result of a recent reduction; and he did not know that all these would pay him. As to fortnightly or weekly collections, he could

not say that he was much enamoured with the idea. A certain class of cottage occupiers would not pay; and if they were to go for the money fortnightly, they would appear to be praying and begging for it in a way which would not be pleasant.

The PRESIDENT said that in Darwen they had reduced the price of gas, in addition to taking away some restrictions; and since he mentioned this matter in his Inaugural Address last February, 700 or 800 cottage-meters had been connected—the result being that the consumption of gas was 15 or 20 per cent. more than last year. They expected, of course, that there would be some increase of the loss through bad debts; but still they obtained a stated consumption, which was going on continuously. As they had enlarged their works, they could produce the extra gas required; and the standing expenses were just the same whether they had this additional consumption or not.

Mr. BALL inquired whether the President could say what proportion of the increase was due to the old, and what to new consumers?

The PRESIDENT was afraid he could not answer that question correctly; but taking the increase at 15 per cent., he should say that certainly from 5 to 7½ per cent. of the increase came from houses where they formerly had gas, but at which they were not consuming it previous to the reduction in the price. The rest of the increase was from new houses and new mills; but he estimated that, at any rate, from one-third to one-half of it was from old property. He was in the same difficulty as Mr. Ball with respect to the meters, which in most cases belonged to the consumers, or the owners of the property. It seemed to him a remarkable state of affairs. None of them, if in business as grocers or drapers, would ask the customer to bring his own scales or his own yardstick; but in this matter of the sale of gas, gas companies had, practically speaking, done this. In his opinion, the practice was totally indefensible; and it certainly had been one of the drawbacks to obtaining consumers. So far as the internal fittings were concerned, the houses in Darwen were like those at Barnsley, referred to by Mr. Hutchinson. No one thought of building houses without putting gas-fittings in; and he did not want anyone to get into the habit of doing so, because, the fittings being in, they certainly had gone a long way towards getting a consumer of gas when a tenant came into the house. Mr. Ball had told them that, with a population of 70,000, he had 20,000 meters. That certainly appeared to be a very great proportion; and they had nothing like it in Darwen. It would seem, as Mr. Ball said, as if they had a meter in almost every house in Rochdale, and perhaps more than one on some premises. The information which Mr. Dalgliesh had collected would be valuable for reference. He could not say that the whole of it was strictly correct, because, as Mr. Dalgliesh explained, he had had to take for granted certain bases for calculation. In Darwen a calculation based on the population did not work out correctly. The preparation of the table must have involved a great deal of trouble; and he hoped it would be found useful.

Mr. C. W. HASTINGS (London) asked whether the President meant to say that the houses in Darwen were provided with chandeliers and brackets, or only lined with pipes.

The PRESIDENT replied that a place was left for the meter, and pipes were laid to the centres of the ceilings, or to the walls in every room of the houses, except perhaps the attics; and brackets and one or two light pendants were fixed.

Mr. HASTINGS said this was a thing they did not experience in the South at all.

The PRESIDENT remarked that it was very general in Darwen the gas-fittings being included in the architect's specifications for new houses.

Mr. N. MEIKLEJOHN (Longwood) said that the sum of 1s. per 1000 cubic feet which Mr. Ball mentioned as the cost of inspection seemed to him an absurd amount. In his (Mr. Meiklejohn's) case, it would come on this basis to more than £1500, as about 80 per cent. of the meters in his district were two-light meters; and the £1500 would be more than the total of his gross profit.

Mr. BALL explained that he did not mean to say that the cost of inspection alone would be 1s. per 1000 cubic feet. He meant that the cost of inspection, collection, book-keeping, expenses of the accountant's department, and bad debts would come to 1s. per 1000 feet for these small tenement occupiers.

Mr. DALGLIESH confessed that the discussion had not been so extensive as he thought it would have been; and as no doubt it would have been if it had been taken earlier. He could quite understand that the subject had gone out of the minds of members, as a good part of it had escaped from his own. He was sorry Mr. Newbigging was not there to give expression to what he had been pleased to write. The only fault he seemed to find was that he (Mr. Dalgliesh) might have called the subject of his paper "Artificial Light," instead of "Oil and other Illuminants." If the members read the paper carefully, they would find that he dealt pretty largely with the production of oil, both in regard to its manufacture from shale in Scotland, and as about it being obtained from the natural wells of America and Russia. He also showed the commercial and financial position of the oil industry last year. So, with all deference to Mr. Newbigging, he thought there was ample justification for the title. He also referred in the paper to electricity. Some of them—himself amongst the number—had to compete with it; and the result had been to prove that it was not so much electricity they had to fear as the consumption of oil, which was retailed in small quantities. As to Mr. Woodward, if he had known the facts, he would not

have committed himself to the statement that he (Mr. Dalgliesh) had issued two or three sets of statistics. He had never altered a single figure. He explained once before that, in the table, the consumption per mile of main was substituted for the capital. He wished to correct this, but was not allowed to do so; and this being the case, he had to go to the expense of having slips printed showing the figures in their correct form. Under these circumstances, he ought not to be charged with having altered a single statistic; and possibly if Mr. Woodward had known the facts, he would have been a little more charitable. He thanked Mr. Ball for his temperate remarks, all of which he agreed with, except in the statement that cottage consumers only took 2000 cubic feet per house. He (Mr. Dalgliesh), had the misfortune to be in a wide district where the consumption was very small; but he found that the cottage consumers burned more gas than Mr. Ball mentioned. He also considered the statement as to the 1s. per 1000 cubic feet was over-estimated. The great evil in many towns where they were supposed to be supplying dear gas was the extent of the district, and the unprofitable length of the mains. His own was a case in point. They had 66 miles of mains, with a consumption of 773,843 cubic feet per mile. The average of the United Kingdom (as worked out from the official returns) was 4,114,000 feet per mile of main; but if they could only get it in places like Glossop to two or three million feet per mile, undoubtedly the companies and corporations would be glad to bring down the price materially. He agreed with what certain speakers had said in regard to gas-fittings. The fault was not in some cases so much dear gas as bad fittings. It was a great mystery to him how some of the fittings in Glossop could be termed "fittings" at all. In nine cases out of ten, in the old fittings of houses, there was nothing but ¼-inch piping hung like ropes, without the slightest attempt to make a gradual fall to the meter. With the slightest disturbance, these fittings got out of order; and the people refused to do anything towards repairing them. There were at least a hundred houses in the town in that condition to-day. He hoped the statistics he had prepared would be useful. The best guide would be found to be the consumption per mile of main. Whatever differences there might be in the consumers or the population, the consumption of gas per mile of main was a true indication of the position of a company or corporation.

The PRESIDENT remarked that the duty of passing a vote of thanks to Mr. Dalgliesh was discharged at a previous meeting.

The members next proceeded to discuss the paper read by Mr. T. Newbigging at the preceding meeting, entitled "Gas-holders without Upper Guide-Framing." A report of the discussion will be given next week.

SOCIETY OF ENGINEERS.

The Thirty-fourth Annual General Meeting of this Society was held yesterday week at the Rooms of the Society, No. 9, Victoria Chambers, Westminster, S.W. The chair was occupied by Mr. A. T. Walmisley, the President. The following gentlemen were duly elected, by ballot, as the Council and Officers for the ensuing year:—President, Mr. Jonathan R. Baillie; Vice-Presidents, Mr. Henry Adams, Mr. R. W. Peregrine Birch, and Mr. William Newby Culum; Ordinary Members of Council, Messrs. Chris. Anderson, James Henry Cunningham, George A. Goodwin, Robert Harris, James William Restler, William Schönheyder, William Andrew Valon, and Joseph William Wilson, Jun.; Honorary Secretary and Treasurer, Mr. Alfred Williams; Honorary Auditor, Mr. Alfred Lass. The proceedings terminated with a general vote of thanks to the Council and officers for 1888, which was duly acknowledged by the President.

On Wednesday the annual dinner of the Society was given at the Guildhall Tavern; the general arrangements being most efficiently carried out by the Secretary, Mr. G. A. Pryce Cuxson. The President, who occupied the chair, was supported by Sir Robert Rawlinson, K.C.B., Sir Edward Herslet, C.B., Sir Philip Magnus, and by most of the Council named above. Among other members of the Society and visitors were: Messrs. Jabez Church, Charles Gandon, and R. P. Spice, Past-Presidents; and Messrs. R. L. Andrews, Hubert T. Bailey, A. F. Broadberry, James L. Chapman, Samuel Cutler, John Gandon, Henry Gandon, W. H. Hardy, Joseph Manwaring, M. Mildred, Charles M. Ohren, H. F. Packham, W. Porteous, W. Syms, S. Tamburini, J. Tysoe, and James Watson. In proposing "Success to the Society of Engineers," the President stated that the Society has now been in existence for more than one-third of a century; and notwithstanding the fact that kindred professional bodies exist, having somewhat similar objects, the Society continues to increase in numbers. The main object of the Society has always been to benefit the younger members of the profession; principally by visits to works—a privilege which forms one of the chief benefits of membership in the Society. He added that it was incredible to anyone who had not made the experiment, how much more might be learnt by the comparison of ideas, when conversing together in a body while examining work in progress, than when left alone simply to inspect. Various papers have been read during the past session by eminent authors at the ordinary meetings; and, in his opinion, no just critic of the Transactions could charge the Society with a want of freshness in the papers read, nor with a desire to exclude subjects profitable for discussion. The toast was responded to by Mr. Alfred Williams.

Register of Patents.

WATER-METERS.—Pauwels, J. C. W., of The Hague, Netherlands. No. 15,306; Nov. 9, 1887. [6d.]

This water-meter consists of a cast-iron box (preferably of elliptical shape) formed of two flanged pieces connected together in any suitable manner. Inside the casing is arranged a wheel, square shaped in cross section, and having the form of a hollow ring furnished with a groove for the purpose hereafter described. Within this wheel revolve a number of spokes, arms, or ribs, connected to a central axis, and provided with fans at their extremities which project within the groove into the wheel. The latter carries at each end a pipe leading outside the case; one an inlet, the other an outlet for water. The central axis is connected with registering mechanism to which the patentee lays no claim.

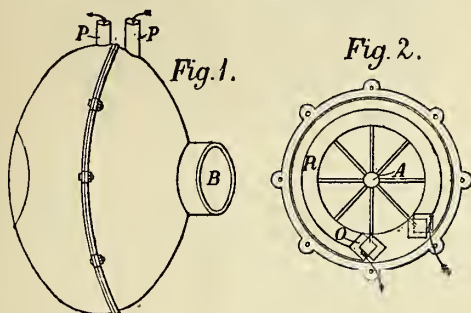


Fig. 1 is a side view in perspective of the meter; and fig. 2 a perspective of one-half of the meter, showing the inside mechanism.

R is a ring fixed to the half box shown in fig. 2 by means of straps, and having a square cross section or ends as shown by the inlet I and the outlet O, both of which are furnished with pipes P as shown in fig. 1. The spokes of the fans pass through a groove formed in the ring R. A is the axle communicating with any suitable registering mechanism arranged in the box B. When water is admitted to the meter, it enters at I, travels through the ring R and causes the fans to rotate and the axis to revolve and to register the amount of water flowing through it.

REGENERATIVE GAS-BURNERS.—Lamb, G. W., of Peckham Rye, London. No. 16,982; Dec. 9, 1887. [8d.]

The object of this invention is to arrange the burner portions of regenerative gas-lamps so that "a great intensity and brilliancy of flame is produced and the maximum of flame more rapidly obtained."

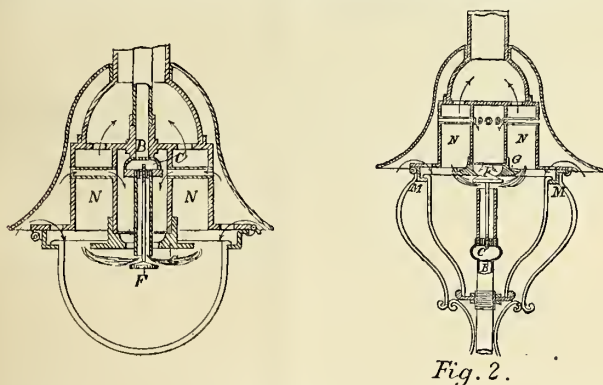


Fig. 1 is a sectional elevation of the lamp with the gas supplied in a downward direction; and fig. 2, in an upward direction.

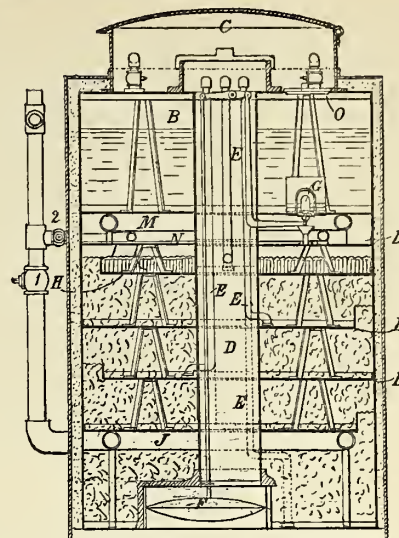
The patentee employs one tube or casting only, and forms the upper part B with holes so that gas is supplied in minute streams to the interior C where it impinges against a baffle-plate of gauze to charge a lower chamber at a uniform pressure for consumption at the lower part. It is here deflected by a button F into a circular sheet of flame; the flame striking against a ring-plate G secured to the air supply-tube. The air, after passing through a sheet of gauze, acts upon the top surface of the ring of flame, and causes it to spread to the outer edge of the ring plate so as to enable the full lighting power of the gas to be obtained with perfect combustion. The exterior of the flame is supplied with air by the perforations in the rim which carries the glass. The gas-supply tube is open at its lower end; but the button or spreader F is secured to a central stem which is adjustable to regulate the opening or ring slit from which the flame emerges. The products of combustion pass up the passages N to the chimney or outlet, within which the gas-supply pipe is arranged. The heat from the products of combustion thus raises the temperature of the gas while descending the pipe; and from the heat imparted thereto from their proximity to the flame, the gas is heated to great intensity before it gets to the point of consumption.

When the gas is fed upwards, as in fig. 2, a stem or branch is connected to the upper end of a bracket, pedestal, or other ordinary supply to a burner, arranged so that the gas is furnished in minute streams to a chamber C, and from thence to the button or spreader F, which is arranged so that the gas issues in ring form and is spread still further by the ring G before mentioned.

ENRICHING GAS.—Lawrence, R. S., of Philadelphia, U. S. A. No. 17,676; Dec. 23, 1887. [1s. 3d.]

This is an improvement on patent No. 16,992 of 1886—an automatic gas carburetter—which has been purchased by the Lawrence Gas Company, to whom several references have been made in the JOURNAL.

The illustration shows, in central vertical section, a carburetter



according to this invention; certain parts of it, however, being shown in elevation.

The generator (made of copper or other suitable material) is packed with any absorbent material such as short-cut coarse "Excelsior," as are also all but the uppermost of the distributing pans hereafter described. [As is well known, says the patentee, "Excelsior" is a material consisting of curled shreds of wood, and which is used as a substitute for curled hair in stuffing cushions and the like.] The uppermost pan contains charcoal to form the bottom of the condensation chamber also hereafter described. On top of the generator is mounted a reservoir B, of the same superficial area as the generator, for containing hydrocarbon. The bottom of the reservoir is made sufficiently strong not to yield under the weight of the hydrocarbon, which is let into it through one of two stopcocks on top; the other cock serving as a vent for the gas which may be conducted back into the supply tank by any suitable connection. Each cock is provided with a short pipe having a screw cap at its outer end, which may be removed when it is desired to attach the connections for supplying hydrocarbon to the reservoir and for conducting away gas or vapour therefrom. In the top of the reservoir a screw-threaded opening O is formed, large enough to admit a man's arm, but closed by a screw plug. C represents a chamber on the top of the reservoir, to be filled with water for sealing the stop cocks and also the opening O, in order to prevent the escape of gas. This chamber is provided with a hinged lid. D is a tube (about 5 inches in diameter) extending centrally from the top of the reservoir to near the bottom of the generator. It is designed to support the pans and also as a container for a portion of the valve-operating mechanism. F is an air-tight copper float surrounded by a wire screen, and connected at one end to a rod which passes up through the tube D, the other end being connected to one end of a lever pivotted within the tube near its top. To the other end of the lever there is connected one end of a right-angled bent rod, which passes through a slot in the tube D, and to the outer end of which is attached a spindle passing through a longitudinally perforated valve seat plug secured in the bottom of the reservoir. The diameter of the perforation in the plug at its smallest part is about three times the diameter of the stem. To the spindle is secured a conical cork valve G, the face of which accurately fits the valve seat in the plug. By this construction of the valve-operating mechanism, the perforating of the top of the reservoir for the passage of the valve spindle is avoided. The upper and lower ends of the spindle are arranged to work through guides secured to the upper and lower sides respectively of the valve seat plug. Thus the valve G, whilst being moved, is kept vertical. There is a cylinder of wire gauze (closed at its upper end) arranged to surround the valve G; and serving to prevent grit or other dirt passing to the valve seat. A pin arranged to work against the outer side of the tube D and at the sides of the slot, serves to prevent the rod moving into the tube D under the action of the weight of its horizontal arm and the valve and valve spindle connected thereto. A funnel-mouthed tube is arranged below the opening in the valve seat plug, and serves to direct the hydrocarbon to the upper tray H. As the hydrocarbon cannot pass over, the reservoirs of any number of carburetters can be filled from a principal supply tank located at a distance from the carburetters. Furthermore, by this construction the valve can be removed through the opening O in the top of the reservoir, and its operating rod be withdrawn through the slot in the tube D.

H represents a series of square pans, about 2½ inches in height and of the full width in one direction of the interior of the generator, to the sides of which they are firmly riveted and soldered. The width of each pan in a direction at right angles to the direction just referred to, is such that the pan does not extend to the adjacent wall of the generator—an opening is left. Alongside this opening there is a dam of a height greater than that of the remaining sides of the pan. The pans are perforated centrally to permit them to be slid down on the tube D, to which they are firmly soldered and by which they are centrally supported. A wire gauze cover extends from the top of the dam in each pan to the side of the generator, to confine the packing in position. The pans are so arranged in the generator that the opening at the side of one is at the opposite side of the apparatus to the opening at the side of the next pan. The top pan not only serves as a distributing pan, but also to hold a layer of charcoal that forms the lower wall of the condensation chamber I, whose upper wall is formed by the bottom of the reservoir. It is found advantageous to use sticks of charcoal consisting of carbonized limbs of wood, carefully selected and (say) approximately 1½ inches in diameter and as long as practicable. One layer of such sticks of charcoal will suffice, says the patentee, if they be placed side by side and held in place by covering the pan with a wire gauze screen having 4 to 8 meshes to the square inch.

J is the distributing pipe located immediately beneath the lowest pan

and supported in position by trestles resting on the bottom of the generator. The bottom of the pipe is perforated; the perforations increasing in size or number in each direction from the inlet, so as to equalize as nearly as possible the distribution of the air or gas. It must be understood that the pressure in the pipe gradually decreases from the inlet inward, as the air or gas reaches each successive perforation. The perforations being in the bottom of the pipe ensure a free escape from all precipitates. L is a perforated plate located in the condensation chamber and secured to the sides of the generator. It is of sufficient thickness to give it rigidity; and is perforated throughout its entire surface for the purpose of dividing the volume of ascending gas into a great number of small currents, and thus distributing it evenly to the upper portion of the condensation chamber, in which are located certain gathering and sub-distributing pipes. The plate L likewise constitutes an efficient scrubber, depositing any excess of hydrocarbon. M is the gathering pipe located close against the bottom of the reservoir, and supported in this position by trestles (like those supporting the distributing pipe) resting on the plate L. This pipe is round, and its bottom is perforated; the perforations being evenly disposed over its entire surface. It is connected with the outlet pipe P. Immediately under the gathering pipe, and supported in the same manner, is located the sub-distributing pipe N; its purpose being to distribute air or gas directly into the condensation chamber, as it is perforated in the same manner as the pipe J.

From different causes (changes in weather, &c.) the temperature is liable to vary in the condensation chamber; and it might well happen, says the patentee, that after working for a time in cold weather, the temperature in the condensation chamber might become so low as to condense too large a proportion of the hydrocarbon vapour away from the gas or air. Then by admitting some gas or air through the sub-distributing pipe into the condensation chamber, the temperature could be raised, since the gas or air so admitted would have a higher temperature than the contents of the chamber. Thus, although a lower grade of gas would then leave the apparatus than that normally produced, yet the quality would be much higher than would be the case if the condensation due to an excessively low temperature were permitted. Not only so, but excessive condensation would be liable to result in the freezing of the vapour and closing of the pipe M, which by the use of the sub-distributing pipe in the manner described may be prevented.

E are pipes for clearing the generator and the pans H of any residuum which may collect therein. The upper ends of these pipes may be attached to a suction pump when necessary. The lower ends pass through openings in the tube D and communicate respectively with the interior of each pan and with the bottom of the tank, as seen in full and dotted lines.

The reservoir being filled with hydrocarbon, the hydrocarbon will flow through the hole in the valve seat plug and into the upper pan, where it will be freed of its impurities by the filtering material. When this pan is filled, the hydrocarbon will flow over the dam in a thin sheet and into the packing below, thoroughly saturating it, and finally into the next pan and so on until the hydrocarbon reaches the bottom of the generator. When a sufficient quantity of hydrocarbon has accumulated in the bottom of the generator to raise the float, the latter will be moved upward; thus raising one end of the lever and lowering the other, and thereby pulling the valve G down on to its seat and shutting off the supply of hydrocarbon. When there has been sufficient evaporation of the hydrocarbon to allow the float to descend, the valve will again open and admit a fresh supply. The air or gas to be carburetted is admitted under pressure to the distributing pipe J, and is forced therefrom through the perforations therein, into the interior of the generator; and owing to the fact that these perforations at points distant from the extreme end of the pipe are larger or more numerous than those in the vicinity in which the pressure is greater, a comparatively even distribution of the air or gas is obtained. On leaving the distributing pipe, the air or gas permeates the packing in the bottom portion of the generator; and then rising, passes through the opening next the bottom pan. It then again spreads out into the packing above, and moves directly across the generator to the opening at the side of the next pan; and so on until it reaches the upper pan, when it passes through its opening and spreads out over the under side of the distributing plate L, and passes through the perforations therein, being thus directed to all parts of the condensation chamber, from which it makes its exit through the gathering and outlet pipes.

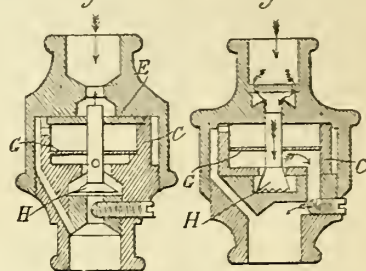
The top pan being fitted with a bad conductor of heat—viz., charcoal—and the bottom of the reservoir being covered with hydrocarbon, it will (in the patentee's own words) be "apparent to persons familiar with the manufacture of gas from a volatile hydrocarbons that the chamber between the bad conductor and the reservoir will always be at a very low and uniform temperature while the apparatus is in operation. Thus when the gas reaches this chamber, it is almost immediately reduced to a very low temperature. The temperature of the chamber being below that at which supersaturation of the gas can exist, all excess of carbon is removed, and thus smoke at the burners is avoided. As the gas expands on reaching the outlet, it cannot condense in the service pipes until it reaches a point so cold as to contract it beyond the degree to which it was condensed in the chamber. Supposing ordinary illuminating gas is being carburetted, and it is desired to use burners of the largest size, and avoid all danger of smoke at the tips, it is simply necessary to partially close cock No. 1 and partially open cock No. 2, and admit a quantity of gas direct to the condensation chamber. This results in the production of a gas containing less carbon than if the whole volume had passed through the generator. Now supposing air is being carburetted for illuminating purposes, and it is desired to produce a gas suitable to the particular burners being used—for different styles and sizes of burners are suitable only for different grades of gas—instead of adjusting the burners to suit the gas, the grade of gas is raised or lowered to suit the burners. For instance, if the whole volume of air is being passed through the generator, and the gas is found too rich for the burners, the grade is lowered by admitting the proper quantity of air through the branch inlet pipe direct to the condensation chamber. During the day, when it is desirable to produce gas for heating purposes only, a comparatively small quantity of air is passed through the generator, and the required additional quantity is supplied through the branch inlet pipe. By the various manipulations

of which the apparatus is susceptible, a smokeless flame can be produced ranging in luminosity from 6 to 50 candles."

GAS-GOVERNORS.—Cole, H. W. and A. F., of Stonorport. No. 126; Jan. 4, 1888. [3d.]

Apparatus constructed according to this invention is more especially suitable for regulating the supply of gas to regenerative lamps or other suspended lamps; and it illustrates other modifications of the governors described in patent No. 16,817 of 1887.

Fig. 1. Fig. 2.



In the governor represented in fig. 1, C is an annular projection or wall on the lower portion of the casting; and E, a disc fitting into a rebate formed on the annular wall, and provided with a central perforation. The central perforation of the disc is of such a size as will admit of the valve-tube sliding freely therein, but will not to any appreciable extent permit the passage of the gas between the outer surface of the tube and the edge of the perforation. G is a float, and H a valve closing the lower end of the valve tube. At the valve seat around the tube are formed notches for the passage of gas therethrough; while the projections between the notches serve to guide the lower end of the tube in its vertical movements. When gas is passed in the direction of the arrows, the quantity escaping at its full ungoverned pressure through the hole in the valve tube to the underside of the float being greater than that capable of passing the regulating screw, the float which normally rests on a shelf formed on the annular wall C is raised, and the valve is consequently moved nearer to its seat—sufficient to admit only the quantity of gas which can pass the regulating screw. It therefore follows that as the gas pressure at the outlet side of the regulating screw is maintained equal by means of the free gas passages, and the weight of the tube and its attachments is properly adjusted, any increase in the pressure of gas must first act on the underside of the float, and by raising it close the valve in proportion to such increase; and, in the reverse manner, if any decrease of pressure occur, the valve will be opened in proportion to such decrease, thus ensuring a regular and uniform flow of gas through the outlet.

The construction of the governor represented in fig. 2 is similar to that shown in fig. 1 excepting that the annular wall C forms part of an independent casting. This construction admits of the wall being made of some hard metal. The valve in this case is hollow, and admits of the passage of gas therethrough; the gas being afterwards throttled between the outer surface of the valve and the valve seat constituted by the bottom of the casting C, which is also drilled to communicate with the outlet. The lower edge of the valve is notched to admit of the gas initially passing through it. At the inlet a guard is provided to prevent dust carried along with the gas from entering the governor.

APPLICATIONS FOR LETTERS PATENT.

17,455.—WINTERFLOOD, J., "Improvements in water apparatus." Nov. 30.

17,516.—REY, H., "Improvements in gas-lamps." Dec. 1.

17,517.—JONES, F. J., "An improved method and apparatus for manufacturing gas." Dec. 1.

17,538.—WECK, F., "An improved mode of gasholder construction." Dec. 1.

17,562.—STEARNS, DE WITTE, "Improvements relating to apparatus for the production of gas from liquid hydrocarbon, and to devices for the utilization of gaseous fuel." Dec. 1.

17,609.—BROWN, J., "Improvements in apparatus employed in the manufacture of gas for prevention of stoppages in pipes." Dec. 3.

17,613.—JONES, F. J., and ALEXANDER, L. C., "Improvements in apparatus for the manufacture of gas for illuminating and other purposes." Dec. 3.

17,648.—LOWE, F., "Improvements in contrivances for controlling the supply of gas to burners." Dec. 4.

17,659.—BAKER, H., "Improved apparatus for carburetted coal gas." Dec. 4.

17,736.—HOWARTH, J., "Improvements in and connected with apparatus for exhausting, propelling, and circulating air or gases." Dec. 5.

17,814.—CLARK, A. W., "Improvements in gas-lamps." Dec. 6.

18,027.—BATE, W. T., "Improvements in apparatus for the manufacture of gas." Dec. 11.

18,036.—O'NEILL, W. P. and F., "Improvements in gas, petroleum, and other heat engines." Dec. 11.

18,065.—BROWN, A. O., "Improvements in gas-lamps." Dec. 11.

18,119.—GADD, W., and MASON, W. F., "Improvements relating to the construction of gasholders." Dec. 12.

18,153.—FOXALL, J., "The control of the pressure of gas, fluids, and liquids." Dec. 12.

18,223.—BRUCE, L., "An improved regenerator gas-lamp and burner." Dec. 13.

PATENTS WHICH HAVE BECOME VOID.

[AFTER THE FOURTH YEAR.]

11,286.—MORLEY, C. W., "Regulating gas, &c."

11,538.—JOSLIN, G., "Gas-meter indices."

11,549.—KENT, W. G., and another, "Gasaliers."

11,576.—GRIFFIN, S., "Lubricating gas-engines, &c."

11,578.—CROSSLEY, F. W., "Gas motor engines."

11,606.—BROWN, J., "Lighting street lamps."

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

THE POSITION OF GAS ENGINEERS.

SIR,—I am sorry to see a tendency to depreciate the value of the services of engineers and other high officials of gas undertakings. Evidence of this is to be found in the practice, just beginning, of applying to contractors, not only for tenders, but also for plans and specifications of important works such as gasholders—as, for instance, at Leeds, where Messrs. Clayton, Son, and Co., have designed, and have the order for, a large gasholder; and more recently Messrs. C. and W. Walker appear to have done the same for Sydney. Other signs pointing in the same direction, are a remark made to me a few weeks ago by a director of two important companies, that he would back a certain firm to design works against all the engineers; and the action of town councils who, from their acts and discussions, create the impression that skilled engineers are in some cases considered unnecessary, and in others not rightly appreciated.

Now it is an undoubted fact that the great advances made in gasholder design and construction are not due to contractors. Had we depended upon them, very few (if any) improvements would have been made. They would have followed the old lines, and properly so; because it would not have been wise on their part to have introduced innovations on established practice. Had they been so inclined, the greatest difficulty would have been found in inducing boards and committees to adopt their ideas. I can remember one great improvement introduced by a gasholder builder—viz., the late Mr. Joseph Piggott's curved-cup, designed in 1862. Although there was no royalty, he had the greatest difficulty in getting it adopted; and but for the fortunate circumstance that just at the time he had a contract with a company not afraid of novelties, there is no knowing how he could have got it tested.

I have no intention of criticizing the fine holders designed by Messrs. Clayton and Messrs. Walker respectively, though I do not agree with the latter entirely in the principles set forth in the JOURNAL of the 4th inst.; but while cheerfully recognizing the excellence of their work, I must utter a protest against the possible development of the practice. I am quite prepared to admit that contractors can render most valuable assistance to engineers, consisting mainly in suggestions whereby economies may be effected in the use or adaptation of material so that weight and labour may be saved. But it will be a very bad day for the gas industry, if the time should ever arrive when it is thought that skilled engineers and other high-class officers may be dispensed with. The case of Leeds may be referred to, as was done at the Birmingham Town Council the other day, as an argument in favour of low salaries. The Gas Committee of Leeds evidently do not consider their officers capable of designing a gasholder; and to suppose that the low salaries and the low price of gas in that town are in any way connected, is a great fallacy. Leeds was until recently in the hands of one of the ablest men in the kingdom, Mr. H. Woodall, who was not rightly appreciated, and left on receiving an offer of an appointment at about three times the salary he was getting at Leeds. It was his work in the course of a few years that reduced the price of gas, by one-half, to its present low figure of 1s. 10d.; and during the same period he converted the gas-plant from a dilapidated condition into one of great efficiency, at small cost. He showed contractors how to build good and cheap gasholders; and they are now simply adopting the good points in his designs and those of other engineers, to which they have access. But does anyone suppose that gas in Leeds would now be sold at 1s. 10d., and that the works would be in good condition, if he or some other able engineer had not been the manager.

Manchester also was named in the Birmingham discussion, in conjunction with Leeds; but the Manchester Corporation, though paying very moderate salaries to their officers, have (as you pointed out last week) in other ways paid much more for skilled assistance than Birmingham. They gave £1000 in premiums for the ground plans only of their new works, which the expense of adjudicating brought up to probably not less than £1500. To this must be added the cost of making the designs for the buildings and works, and the professional fees paid for carrying them out, which had not after all the great advantage possessed by Birmingham of being designed and executed by engineers interested in making them a success, as is necessarily the case when the permanent resident engineer does this work.

It is universally recognized that Birmingham is well served; and it is gratifying to the profession to find this is understood and appreciated by the Chairman and members of the Gas Committee. If those members of the Town Council who objected to the salaries, knew the extent to which the prosperity of their great undertaking is due to, and in the hands of the principal officers, there cannot be a doubt that they would take the same view of the question.

GEORGE LIVESEY.

Tunbridge Wells, Dec. 15, 1888.

TESTING METERS *IN SITU*.

SIR,—In the JOURNAL for the 11th inst., there appears a paragraph referring to the testing of gas-meters *in situ* in dwelling-houses in Dublin, now inaugurated and mentioned as a success. Will you allow me to make a few remarks thereon? A similar wish has often been expressed here for meters to be tested without the trouble and expense of forwarding them to the Standards Office.

The testing of meters generally—like weights and measures—*in situ*, cannot be a success, if inspectors are to be “a law unto themselves,” and the Sale of Gas Act treated as a secondary authority; for sections 12 and 13 of the latter give plain directions or rules for testing, and section 11 states that a “fine not exceeding £5 for unlawfully acting,” or in “breach of any duty imposed upon him by this Act,” awaits him. Seeing, then, the testing of meters *in situ* generally cannot be done so as to comply with the rules laid down—as I will hereafter show—where is the legal value of the test, and what confidence can it give to either seller or buyer of gas?

Only in the exceptional case of large and heavy meters, such as our mills and warehouses possess, can a test *in situ* be justified; for such meters are with difficulty removed (fenced about, as they often are, with brick and masonry), and the expense would be no small matter also.

But even in such a case, the test cannot be a satisfactory one, and but an approximation to legality. The first requirement in testing meters is pressure as a test for soundness or leakage. The Act prescribes 3 inches; but for an average day pressure, I suppose 1 inch would only be found in the main. The test for percentage of error requires 5-10ths as the maximum pressure; but how many meters fail to work at this pressure, but work at 10-10ths? In the testing-room, such a meter would be rejected; but tested *in situ* it would escape.

Again, as regards speed, or the rate per hour the standard meter will pass gas to prove the capability of the meter to be tested, to deliver its legal number of cubic feet per hour. The small standard 20-light, at 5-10ths, delivers 120 cubic feet per hour; but in testing by this standard, say, a 50-light=300 cubic feet per hour at 5-10ths—if this legal pressure is found in the main—it would fail to supply the volume of gas required in a given time, and hence the test would be futile.

In testing domestic meters, where the small standard—20-light—is too small, the large standard—100-light—would often be found too large to be got into a cellar or basement of a dwelling-house. The meter to be tested has to be disconnected at the inlet and outlet. In parting with the gas in the process of testing, it must be blown into the open; hence, here is an element of danger. To burn the gas through the fittings in the usual way, would probably check the flow and lessen the rate per hour below what it should legally deliver at. I have not referred to the question of temperature (water and gas), which is equally important.

The foregoing will show what unreliable and illegal results follow from testing *in situ* generally. The question of remuneration follows; and not the least either. The fixing together of the standard with its complex fittings, filling with water and emptying of the same, the connections to be made with the service-pipe and the meter to be tested, and the care to be exercised to have all “as tight as a drum,” are matters requiring much skill and time; and if the meter in question is a 5-light, the charge is only 1s., if a 10 or 20 light, then 2s. What a liberal fee for a legal decision! For remember, the inspector's certificate produced in Court influences the verdict for seller or buyer as the case may be.

Manchester, Dec. 14, 1888.

JAMES URQUHART.

THE WATER SUPPLY OF THE WAKEFIELD OUT-TOWNSHIPS.—It is reported that the Rural Sanitary Authority of the Wakefield Union have arranged with the Corporation of Dewsbury for a supply of water for several large townships just outside Wakefield, at the rate of 6d. per 1000 gallons. The Wakefield Corporation offered to supply the same districts at 9d. per 1000 gallons from their new scheme of water-works, which has entailed so vast an outlay of the ratepayers' money.

SUTTON-IN-ASHFIELD GAS SUPPLY.—At the last monthly meeting of the Sutton-in-Ashfield Local Board, on the recommendation of the Gas Committee, it was resolved that the scale of charges for gas in future should be: To consumers of 20,000 cubic feet and under, 3s. 5d. per 1000 feet; between 20,000 and 50,000, 3s. 4d.; between 50,000 and 100,000, 3s. 3d.; and over 100,000, 3s. 2d.; and to places outside the parish, 3d. extra per 1000 cubic feet throughout. As £5000 of the gas-work's debenture stock will fall due in January, it was resolved to offer the same at public auction. Mr. Bonser, in the course of the proceedings, said that with the revision of the scale of charges, they stood to lose £300; but it was thought that the reduced price would induce more persons to use gas. In Sutton there were 2040 houses, and only 519 consumers of gas; whilst at Kirkby there were more than 600 houses, and only 104 consumers. He further announced that the reduction would take place as from the 25th inst.; and he thought that only one town in Nottinghamshire was offering gas so cheaply, and that was Nottingham.

THE STRETTFORD GAS COMPANY AND THEIR CUSTOMERS.—At the Sale Petty Sessions on Monday last week, Mr. J. Richardson, made an application, under the Gas-Works Clauses Act, 1871, to obtain a Justices' order for the appointment of some “competent and impartial person” as gas examiner for the parish of Ashton-on-Mersey and the townships of Sale and Timperley. Having put in a petition signed by various consumers, he said that, so far as the Stretford Gas Company were governed by the general law, it appeared to him that, if they elected to come into Cheshire with their works, they ought to have in Cheshire a proper place to test the gas; and it would be for the Bench to say whether they would order a place to be erected to enable the inhabitants of the district to have the gas tested. The Bench doubted their right to make any such order. Mr. Newman, on behalf of the Company, submitted that under their Special Act Mr. Richardson was bound to apply to two Justices in Lancashire; so that these proceedings really ought to have been taken at Strangeways. He contended, however, that the Company had complied with the Act in having a testing station and experimental meter at their works. After a long argument, the Chairman intimated that the Act was permissive; and the Bench thought they would be foolish to make the order without hearing witnesses, so as to learn what the complaint was.

LECTURE ON GAS MAKING AT HEYWOOD.—Under the auspices of the Heywood Congregational Young Men's Society, a lecture was given, on Tuesday, the 27th ult., by Mr. J. Jakens, Consulting Chemist, of Bury; his subject being “Gas Making.” The lecture was illustrated with plant and diagrams. Mr. H. Hawkins, the Corporation Gas Engineer, who presided, said gas making concerned every ratepayer; and the Gas Committee of the Corporation were always anxious that the consumers should know everything in connection with the gas they burned, and the best means of burning it. They had in oil a great competitor; its main advantages being that it could be procured in small quantities and paid for on delivery. Gas was supplied on quarterly accounts; and he regretted that many cottage consumers did not make that provision for payment which they might. If cottagers would put by every week as much as they spent in oil, they would find that gas was 25 per cent. cheaper than oil or candles. Occasionally lamps exploded from causes over which the consumers seemed to have no control, or from a little negligence. If the wick did not reach to the bottom, the lamp would have a tendency to explode. In the course of his lecture, Mr. Jakens advocated the use of gas for cooking and heating purposes. No less than 30,000 feet of gas could be produced from a ton of coal for heating purposes against 10,000 feet for illumination. Gas-fires in houses, instead of coal fires, would be more cleanly and comfortable. In Bury gas was cheaper than coal for heating purposes. Oil gave off as many impurities as gas, with the exception of the sulphur compounds. In closing the proceedings, the Chairman said he looked upon the electric light as the illuminant of the future. Gas would no doubt be used as a motive power and for heating. He believed the time would come when houses would be built without chimneys; there would simply be flues through the walls to carry off the products of combustion from gas fires and stoves.

Miscellaneous News.

CONTINENTAL UNION GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Tuesday, at the London Offices, 7, Drapers' Gardens, Throgmorton Street—Mr. H. MCLAUCHLAN BACKLER in the chair.

The SECRETARY (Mr. F. W. Himing) read the notice convening the meeting; and also the following report of the Directors:—

The Directors have to report that at the two stations which are the direct property of the Continental Union Gas Company—viz. Messina and Montargis—there has been some increase in both the public and private lights.

At Messina the reduction in price of gas, which had only been in operation about three months at the date of the last report, has since had time to bear fruit; and a marked improvement in the private consumption, as compared with two years ago, is now manifest.

The Cholera which broke out at Messina with great virulence in the autumn of last year, and the effect of which was to still further reduce the profits, gradually subsided, and has now entirely disappeared.

The outlay on capital account at these two stations during the period under review was £585, chiefly for new mains, lamps, and services, sulphate apparatus, &c.

With regard to the Union des Gaz, the total outlay on capital account at the 13 stations which constitute the property of that undertaking, amounted, during the working year 1887-8, to £53,800, nearly half of which was expended in extending the Milan works. This was rendered necessary by a reduction in the price of gas there resulting in largely increased consumption. In consequence of this reduction the right has been secured to continue to supply gas at Milan until the year 1925.

The dividend received on the Continental Union Gas Company's investment in the Union des Gaz was the same in 1887 as in the previous year.

The following information regarding the working of that Company's stations will also be interesting to the shareholders:—The net increase in the number of lights during the year 1887-8 was: Public, 352; and private, 23,359. The quantity of gas sold shows an average increase of more than 7 per cent. The cost of coals per ton was 7d. more than in the previous year. The total amount of bad debts incurred and written off was only £433. The average price received for the coke shows an increase of 1s. 3d. per ton; while that for the tar shows an average decline of 6d. per ton, but this product is now being disposed of on better terms.

The Union des Gaz carry forward an undivided balance of £23,984, which, added to the special reserve account of £32,400, makes a total of £56,384 available, in case of need, for equalizing dividends in that Company.

Reverting to the affairs of the Continental Union Gas, the debenture debt of this Company stood in the balance sheet at £3100 on the 30th of June last; but the Directors are glad to be able to report that it has since been entirely paid off.

After making all the usual charges and reserves, the net profits of the Continental Union Company for the year amount to £116,867 1s. 5d.

The available sum to the credit of general revenue is £149,694 16s. 10d., out of which the Directors propose to declare a dividend at the rate of 13 per cent. per annum on the ordinary shares; being an increase of 1 per cent. on the previous year. The 7 per cent. preference shares participate *pro rata* in all ordinary dividends exceeding 10 per cent., and will therefore yield 10 per cent. for the year.

After deducting the interim dividend (paid in July last) of 5 per cent. on the ordinary and 3½ per cent. on the preference shares, the balance of 8 per cent. on the former and of 6½ per cent. on the latter, all free of income-tax, will be paid on the 4th of January next. The amount carried forward to the new account will be £35,159 0s. 10d.

The Directors are pleased to be thus justified in congratulating the shareholders on this prosperous state of affairs—a prosperity which they may reasonably hope to see maintained in the future.

The Congress of the Société Technique of foreign gas engineers having been held this year at Boulogne, The Gas Institute took the opportunity of inviting its members to extend their journey to London. The Directors of this Company had thus an opportunity of personal communication with their Managers, and availed themselves of it to the satisfaction of all concerned.

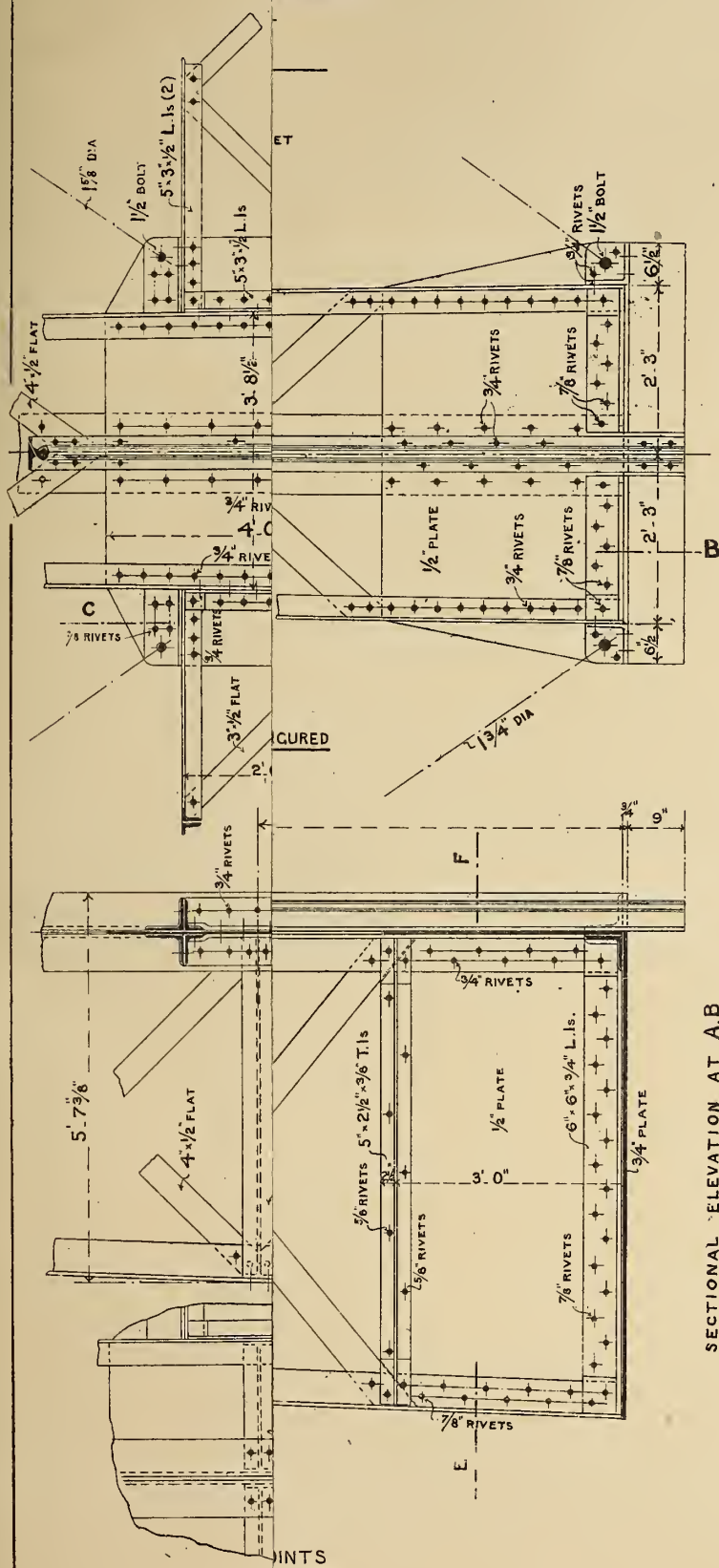
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The vacant auditorship has been filled up by the election of Mr. Eastman. The Director who retires by rotation is H. M.L. Backler, Esq., and the Auditors (Alfred Hersee, Esq., and A. T. Eastman, Esq.) also retire. All, being eligible, will be proposed for re-election.

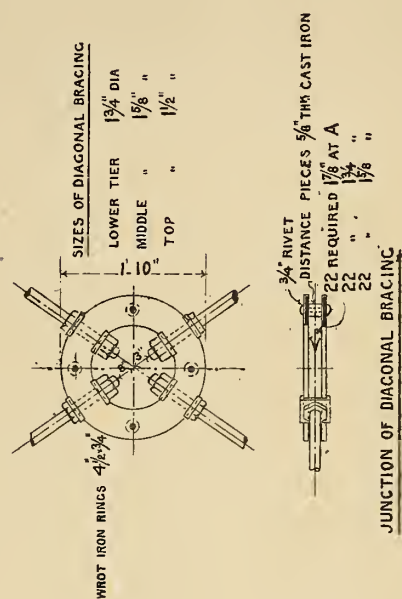
The CHAIRMAN: Gentlemen, you have heard the report and accounts read; and you see how favourable they are. In commenting upon them, I will first of all take our own two stations—those stations which are our direct property—Messina and Montargis. You have seen how badly we were affected at Messina by the cholera—to such an extent that for a time it almost deprived us of our revenue. I am glad to say that this has entirely ceased; and we are now in a better position than we were before it took place, because the reduction in the price of gas which we consented to under the circumstances which I explained at the last meeting, has been productive of a great portion of the advantage which we expected from it, and which we shall ultimately secure. There can be no doubt of that. Now, I believe Messina will be a growing station—that is to say, it will bring a better revenue than it has done in the past; and for this reason, that the price of gas was really too high there. I thought so myself for some time; but the difficulty was how to give way without getting something in return. You will recollect that we did get something in return for the reduction in price, by obtaining from the Municipality an undertaking that all projects of electric lighting should be suppressed during a period of seven years; and I thought, during this period, we should take the opportunity of pushing the consumption of gas by reducing the price—the temptation being considerable to the consumers, who hitherto had been deprived of the use of gas by the high price at which we supplied it. Montargis has done fairly well during the year; we have no reason to complain of it. Having mentioned our own two stations, I will now pass on to make a few remarks on those of the Union des Gaz. The coal cost more than in the previous year; and for this cause: That the means of conveyance on the Italian railways are, at certain seasons of the year, so restricted, owing to the great traffic for which the railways are not yet fitted, that we experience considerable difficulty in getting coals from the ports at which the ships are discharged (almost entirely at Genoa) to the different stations we have in Italy—Milan, Parma, Modena, and Alessandria. Such, being the case, a certain number of waggons are allotted to the principal shippers of coal at Genoa; and we get our allotment in proportion to the accommodation which can be afforded. But it was not sufficient for our consumption, although we had laid in a large stock at Milan, which is the chief station to be supplied. In order to provide coal, at Milan principally, we were obliged to obtain a transfer of waggons allotted to the coal merchants who were sending coals to Milan, and who had these waggons allowed them as their proportion. We were obliged to buy the coals also which were loaded on the waggons. The consequence was that the coal merchants in Italy, who, like their brethren in England, do not do business for nothing, obliged us to pay them pretty well for the accommodation which they afforded us under these difficult circumstances. This is the reason why coals have been more expensive. Coal, as you are aware, is now rising in price; but I do not think we shall feel the effect of this very much, because we have coal contracts running over three years, and our freights are also secured for some time on favourable terms. Of course, when the contracts terminate, we shall have to run the chance of the markets, as

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This is a very important advantage to us for a place like Milan; and we feel that it adds materially to the value of our interest in the Union des Gaz. The concessions, by the extension of this contract at Milan, have been raised in average length from 25 years—at which they stood last year, and from which, without this taking place, they would have been reduced to an average of 24 years—to 26 years; the longest being for 45 years. The gas-rental—I am still speaking of the Union des Gaz—has been increased by £16,522, or 4½ per cent. This is a very fair percentage; but the gas sold has been increased in a large ratio—that is, 7½ per cent.; and the reason why, while we have sold such a large excess in quantity of gas, we have received a smaller proportion in rental, is the various reductions of price to which we thought it wise to assent in the several towns, in order to conciliate our consumers, and to offer them the inducement to remain with us rather than go over to our competitor the electric light. We have succeeded as far as we expected to do in the matter. I will now pass on to our financial position with the Union des Gaz. You will recollect that we are holders of exactly 37,000 out of the 50,000 shares of that Company; and the market value of these shares has considerably improved since last year. We take the quotations of the Bourse of Paris, as recorded in the financial returns; and we find that the improvement is £58,000—that is to say, the market value of the shares we hold was last year £58,000 less than this year. This is the increased profit, or increment of value, of our holding in the Company; but you know we do not take that into account in our profits; this merely shows the stability of the Union des Gaz. If we were to add the increased market value of the shares this year, and the value were to fall, we should have to write it off the next; and we might perhaps pay you 20 per cent. this year, and be obliged to pay you only 14 or 15 per cent. (which I hope we shall some day be able to do) the next. We have the shares in our books at the price we paid for them—that is, the par value, £20 per share—representing a sum of £740,000. The market value of these shares represents a total sum of £1,908,000, at the present prices quoted on the Bourse; and consequently the investment we have in the Union des Gaz shows a total profit of £1,168,000, or £58,000 more than last year. (Applause.) That is very satisfactory to me, and so it appears to be to you, gentlemen. The stability of the Union des Gaz is also shown by the amount of their reserves. They have altogether reserves amounting to £378,514; and £35,990 has been taken out of the profits of the last year as an addition to the amount which stood to the credit of these reserves in the previous year. I think I may now take leave of our investment in the Union des Gaz for the present. You will clearly see what a satisfactory investment it is for us; and you will see whether or not we were justified in paying a considerable sum for the goodwill. The sum which we paid for that is now entirely extinguished. We have written it off in the course of years, little by little as our finances permitted; and although it is such a valuable property, it now stands in our books at par—that is *nil* for the extra commercial value of it. I will now revert to the Continental Union Gas Company, and just remark that, as you have heard in the report, the amount of the debentures has been entirely wiped off—we do not owe a farthing on debentures. The amount, which was originally £218,000, has been liquidated by small sums from year to year. There are few companies in this position—entirely free from debt of any kind. Now, the sum which we annually set aside for the writing off of these preliminary expenses having ceased during the past year, we were able to take into account the subject of increased dividend; and we are able to pay you an extra 1 per cent., which we now declare, owing to the cessation of this charge on our profits. The charge last year was something over £12,000; and we therefore declare this increase of 1 per cent., which will amount to £9272, and, in addition to that, we add to the undivided balance of profits £2331. This makes the undivided profits in the Continental Union Gas Company £35,159. If we did not leave a farthing over; if we had no reserve of undivided profit in this Company, we should still be in a first-rate position as to reserves, owing to the large one made by the Union des Gaz. However, we wish to be as prudent as we possibly can, in order to secure ourselves in every way; and therefore we have got this “nest-egg” of £35,159, which will enable us to keep up the dividends if it were necessary to do so at any time, or appropriate it for any other purposes we consider desirable. I will now merely refer to one or two matters which have occurred during the year. One is the visit of the Société Technique du Gaz to this country. While we are prosperous ourselves, we wish to show good-feeling towards our *employés*, and all who serve us so well; and we seized the opportunity of the Société Technique coming over to England, and being well received everywhere, to invite them, in conjunction with the Imperial Continental Gas Association and the European Gas Company, to a dinner at the Crystal Palace; and we did this in the best style—we did not spare expense. We were very glad to have the opportunity of showing the good-feeling we entertained towards them; and which we believe to be reciprocal towards us. There is another matter to which I must refer; and I do so with very great sorrow, because Mr. White, my former colleague, had been a friend of mine for 40 years. In losing him, I feel that it was indeed a very great loss; for he was ever ready to give us his vigorous assistance under all circumstances. Mr. White was an original Director of this Company; and at all times, and especially on occasions of difficulty—for we had to go through a season of very great difficulty and anxiety after the formation of the undertaking—he was a great help, and prevented disasters which might otherwise have occurred. I think, therefore, that Mr. White's memory is entitled to the regret which we deeply feel, and which is, I am sure, participated in by the shareholders. We, of course, sent a resolution of condolence to his family, in which we associated the shareholders. Then there came the question as to who should succeed Mr. White; and we elected Mr. Tendron, one of our Auditors—he having applied for some time to fill the first vacancy. Mr. Tendron is a gentleman who is well acquainted with the accounts and business of the Company; and we felt that we could not do better than nominate him, subject to re-election at the time when Mr. White's term of office would expire. We did so; and we have had the benefit of Mr. Tendron's assistance at the Board for some time; and find that we have done quite right in taking that course. We had also to make another appointment to fill the position vacated by Mr. Tendron; and we elected Mr. Eastman, who is a qualified Accountant, and who was, I believe, the

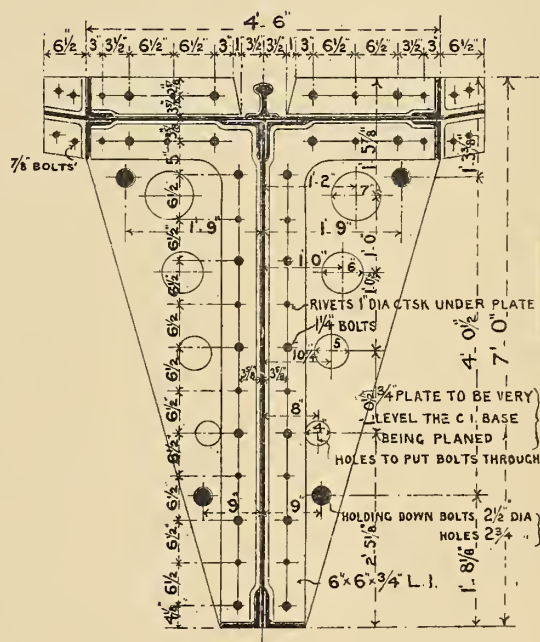
DRAWING N^o 3



ELEVATION OF FRONT MEMBER



SECTIONAL ELEVATION AT A.B



SECTIONAL PLAN AT E.F.

DESIGN OF FRONT MEMBER $\frac{1}{4}$ TO 1.0" OR $\frac{1}{4}$ " PER BAY

Miscellaneous News.

CONTINENTAL UNION GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Tuesday, at the London Offices, 7, Drapers' Gardens, Throgmorton Street—Mr. H. M'LAUCHLAN BACKLER in the chair.

The SECRETARY (Mr. F. W. Himing) read the notice convening the meeting; and also the following report of the Directors:—

The Directors have to report that at the two stations which are the direct property of the Continental Union Gas Company—viz. Messina and Montargis—there has been some increase in both the public and private lights.

At Messina the reduction in price of gas, which had only been in operation about three months at the date of the last report, has since had time to bear fruit; and a marked improvement in the private consumption, as compared with two years ago, is now manifest.

The Cholera which broke out at Messina with great violence in the autumn of last year, and the effect of which was to still further reduce the profits, gradually subsided, and has now entirely disappeared.

The outlay on capital account at these two stations during the period under review was £385, chiefly for new mains, lamps, and services, sulphate apparatus, &c.

With regard to the Union des Gaz, the total outlay on capital account at the 13 stations which constitute the property of that undertaking, amounted, during the working year 1887-8, to £53,800, nearly half of which was expended in extending the Milan works. This was rendered necessary by a reduction in the price of gas there resulting in largely increased consumption. In consequence of this reduction the right has been secured to continue to supply gas at Milan until the year 1925.

The dividend received on the Continental Union Gas Company's investment in the Union des Gaz was the same in 1887 as in the previous year.

The following information regarding the working of that Company's stations will also be interesting to the shareholders:—The net increase in the number of lights during the year 1887-8 was: Public, 352; and private, 23,359. The quantity of gas sold shows an average increase of more than 7 per cent. The cost of coals per ton was 7d. more than in the previous year. The total amount of bad debts incurred and written off was only £433. The average price received for the coke shows an increase of 1s. 3d. per ton; while that for the tar shows an average decline of 6d. per ton, but this product is now being disposed of on better terms.

The Union des Gaz carry forward an undivided balance of £23,984, which, added to the special reserve account of £32,400, makes a total of £56,384 available, in case of need, for equalizing dividends in that Company.

Reverting to the affairs of the Continental Union Gas, the debenture debt of this Company stood in the balance sheet at £3100 on the 30th of June last; but the Directors are glad to be able to report that it has since been entirely paid off.

After making all the usual charges and reserves, the net profits of the Continental Union Company for the year amount to £116,867 1s. 5d.

The available sum to the credit of general revenue is £149,694 16s. 10d., out of which the Directors propose to declare a dividend at the rate of 13 per cent. per annum on the ordinary shares; being an increase of 1 per cent. on the previous year. The 7 per cent. preference shares participate *pro rata* in all ordinary dividends exceeding 10 per cent., and will therefore yield 10 per cent. for the year.

After deducting the interim dividend (paid in July last) of 5 per cent. on the ordinary and 3½ per cent. on the preference shares, the balance of 8 per cent. on the former and of 6½ per cent. on the latter, all free of income-tax, will be paid on the 1st of January next. The amount carried forward to the new account will be £35,159 0s. 10d.

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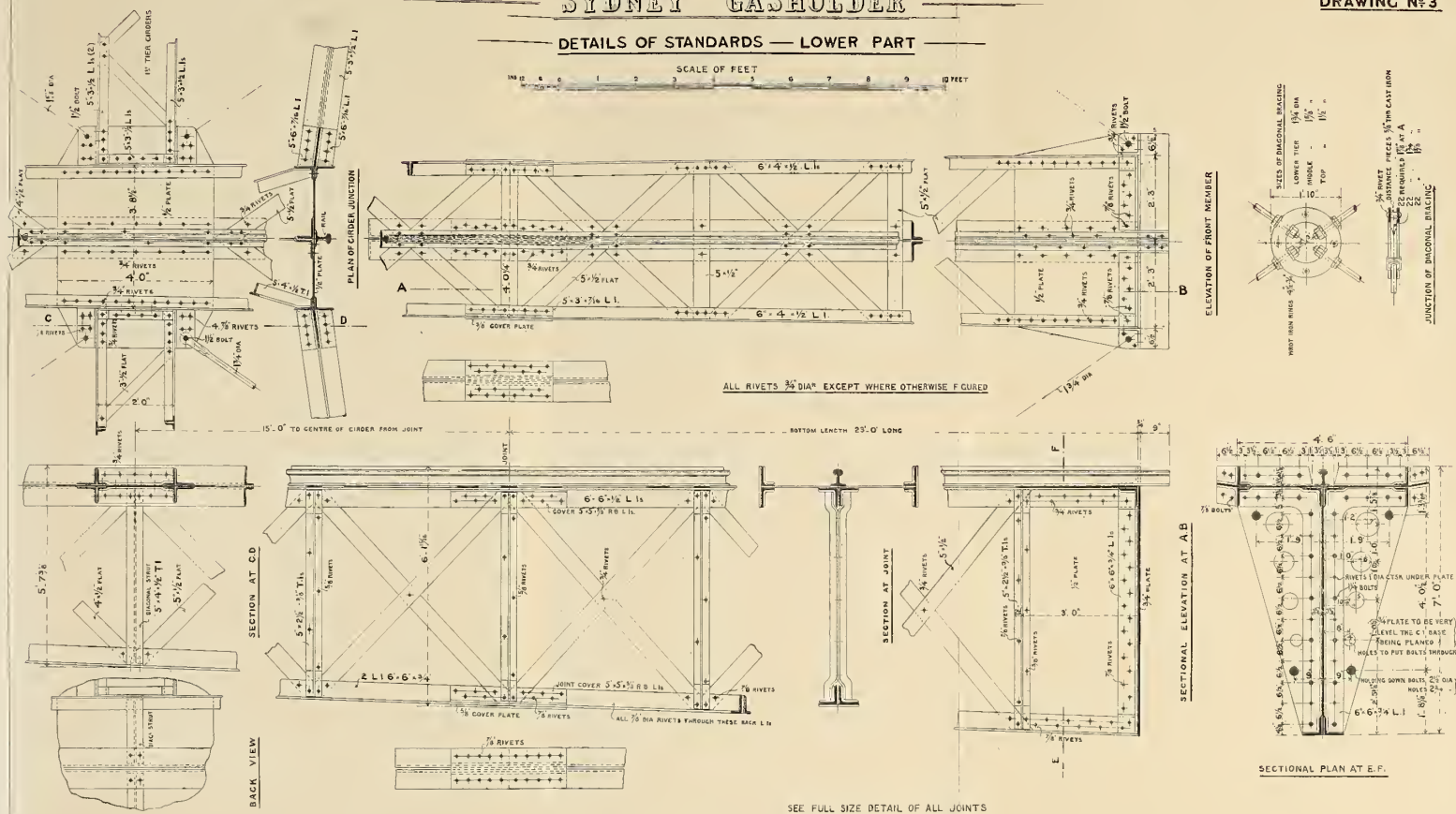
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We did so; and we have had the benefit of Mr. Tendron's assistance at the Board for some time; and find that we have done quite right in taking that course. We had also to make another appointment to fill the position vacated by Mr. Tendron; and we elected Mr. Eastman, who is a qualified Accountant, and who was, I believe, the

SYDNEY GASHOLDER

DRAWING N^o 3

DETAILS OF STANDARDS — LOWER PART



DESIGNED & CONSTRUCTED BY
C. & W. WALKER.

TAPER OF BACK MEMBER = $\frac{7}{16}$ TO 1.0" OR $2\frac{3}{16}$ PER BAY

TAPER OF FRONT MEMBER $\frac{1}{4}$ TO 1' 0" OR $1\frac{1}{4}$ " PER BAY



only applicant for the post. I regard the position of the Company as excellent in every respect. You see we have an improved security in the Union des Gaz; and we have likewise improved our position in the Continental Union Gas Company. We have secured to the Union des Gaz the extension of the Milan concession; and have reason to believe that we shall, little by little, as circumstances permit, also obtain extensions elsewhere where the contracts are of short duration. I may safely congratulate you on the investment which you hold in this Company. I am sure it is a good one. I feel it is a good one so far as my portion is concerned; and what I feel for myself, I am able to apply to you all. I will now move—"That the report of the Directors and the accounts now read be received and adopted."

Mr. H. WOLLASTON BLAKE seconded the motion, which was at once carried unanimously.

Mr. BLAKE then proposed the re-election of Mr. H. M'L. Backler, who retired from the Board by rotation. In doing so, he observed that the shareholders owed very much indeed to Mr. Backler for the success of the Company.

Mr. H. SOLOMON seconded the proposal, which was heartily confirmed by the shareholders.

The CHAIRMAN having acknowledged his re-election in a few appropriate words,

On the motion of Mr. R. G. COOPER, seconded by Mr. A. HOWARD, the retiring Auditors (Messrs. Hersee and Eastman) were re-instated.

Mr. A. LUCAS, in proposing a vote of thanks to the Secretary, Engineers, and staff generally, referred to the visit which he paid some time since to the stations of the Company, and remarked upon the excellent order in which they were kept, and the great ability shown by those who had the supervision of the technical departments. The Engineers not only had to look after the works, but had also to act as agents to push the business, and had often to conduct complicated negotiations like those they had lately had at Milan.

Mr. TENDRON seconded the proposition. The Chairman, he said, had asked him to narrate the impressions he received during his visit in October last to the French stations of the Company. His impressions were eminently favourable. Four of the cities—Rueil, Roanne, Nîmes, and Cette—were, he thought, capable of great development. Their extension would not depend upon any effort of the Company, but from the nature of things the cities must extend. As to the competition which they might expect to meet from the electric light, it seemed to him that the French were not only the most economical nation in many things, but they were especially so in the use of light; and anything that would educate them into a keener appreciation of the immense advantages that a good light will bring, would be to the Company's benefit. In some of the cities, the only really well-lighted shops were the cafés and restaurants; and in many of the streets of the smaller towns, gas is not used at all—petroleum being the illuminant. In only one of the cities which they supplied had there been more than a commencement of the electric light. In conclusion, he said that the Company had by no means reached its maximum prosperity.

The motion was carried *nem. con.*

The SECRETARY having acknowledged the compliment,

Colonel WILKINSON moved a vote of thanks to the Chairman and Directors; speaking in high terms of the admirable manner in which the affairs of the Company were conducted.

Mr. COOPER seconded the motion.

The CHAIRMAN briefly responded; and the proceedings then terminated.

SOUTHWARK AND VAUXHALL WATER COMPANY.

The Half-Yearly General Meeting of this Company was held last Tuesday, at the Offices, Sumner Street, Southwark—Alderman Sir H. E. KNIGHT in the chair.

The SECRETARY (Mr. Alfred Jelley) read the notice calling the meeting, and afterwards, at the request of the chairman, the minutes of the ordinary meeting held on the 12th of June and of the extraordinary meeting held on the 30th of October last. These minutes having been approved by the meeting as correctly entered, the report of the Directors and statement of accounts were taken as read.

The CHAIRMAN: I shall detain you but a very few moments to-day. I have little to tell you different from what I had the pleasure of telling you at the last meeting, and I think you may judge from that that we are going on prosperously and well, because generally when a Chairman has not much to say things are progressing satisfactorily. I will follow my usual custom on these occasions, and go through the accounts. You see that we have over-spent our capital account by £79,900; and that will show you that the £100,000 of debenture stock which we have issued was absolutely wanted to make good those payments and to leave us with a little surplus. That stock is to be applied for by tender, and the tenders are to be received, I think, next Monday. I have very little doubt that we shall issue that stock at a very satisfactory price. In dealing with our revenue account you will notice that under the head of maintenance, we have an amount of £14,000, as against £11,000, this time last year, showing a large difference; but I may tell you that this £3000 is an exceptional expenditure mostly made up by money that we have spent in erecting hydrants for the Metropolitan Board of Works, and which they have not yet paid us for, and the credit for which is therefore not brought into account. I should next like to call attention to the item of rates and taxes, amounting in the present accounts to £8400, against £7600 in the preceding year. I have frequently called your attention to the continual and enormous increase in the rates and taxes which we have to pay. The total expenditure under the head of maintenance is £39,000, as against £36,000 this time last year. There are certain savings in some of the other items which bring the increase to only about £3000. Thus, you will find that the amount we have for dividend and interest is £55,801. This is a very good increase on last half year, when the amount was about £53,000, so that we have now an increase of nearly £3000. But the item is less than it was at September, 1887, by some £3600, which is mainly accounted for by the items to which I have already called your attention—the charge for hydrants erected for the Metropolitan Board of Works, and the large increase in our rates and taxes. On the other side, the item of water rents accrued is a satisfactory one to refer to as the amount this year is £106,874, against £100,600 in March last, showing a very handsome increase indeed for the half year. But when I compare it with that of September, 1887, I find only the small increase of £200. This is accounted for because in September last year we had a wonderfully good meter account. It was a very dry summer that year and we received a large amount for road watering and a very large amount for meter-rental, whereas this summer it was wet and we had a very large falling off in the amount received for road watering and meter rental. Still, it is a good increase in the half year, and you will notice that we have not taken into account the money due from the Metropolitan Board of Works for the hydrants we have fixed for them. This item stands now at the largest amount we have ever had since September, 1884, when the water rents accrued stood at £108,411, so that within about

£1500 we have recovered the loss which we sustained in consequence of the alteration made in the basis on which the water rents were charged. Bringing this £55,000 into the account and deducting from it the dividend which has to be paid on the preference stock and so on, we have a balance of £38,305 applicable to dividend. As it will take £30,861 to pay you a dividend of 6 per cent. we shall carry forward £7440 or something like £1500 more than we carried forward last half year, showing that we are making substantial progress in getting a nice surplus in hand. Now, I really do not know that there are any other items to which I need refer. There is the temporary loan of £66,000; but if we have over-spent our capital by £79,000, we must have money from somewhere. This temporary loan, however, will now be paid off when we get out our debenture stock. It has been a financial operation of a very delicate nature, which I think we have carried out very successfully, managing the matter very much to the financial benefit of the Company. We cannot issue these debentures in small sums; they must be issued in respectable amounts, and we must avail ourselves of our credit to carry us through until the time when we allot them. With respect to the report that is before you—and I do not know that I can enlarge upon it—we have mentioned the salient features in connection with our working. I can only say as regards the gentlemen who retire, that we should be very sorry to lose them as colleagues, and I think you would not do well to lose them as Directors. They know your business well, and I have no doubt that when the proper time for proposing their re-election arrives you will duly re-appoint them. As to the question of Auditors, we were very sorry to lose the services of Mr. Young who had been Auditor for a long while. He was removed, however, as you know, by death; and we have had to look about for another gentleman to take his place. We recommend to you with great confidence Mr. Child, who is mentioned in the report. We have availed ourselves of his services in the present half year. That is an appointment, however, which rests with you; but we recommend this gentleman, believing that he will serve you properly. I had hoped that we should have seen you this half year in our new offices round the corner; but there was some delay in connection with the warming and the lighting which we did not anticipate, and we thought it wiser to stay here a few weeks longer and get everything completed at the new offices. Some of you have seen the building, which will give us every facility for conducting the business of the Company. It is an excellent investment, and none of the cost will be borne by the proprietors—the premium on the investments being a great deal more than the cost of the land and the buildings—and we shall be able to do our business well without any fear of our clerks falling ill in consequence of the wretched accommodation to which they have to submit here. We think the building will last us a great many years as it is, and there is room for an increase of accommodation in it in the future; and I have no doubt when you see it completed you will again express your great satisfaction with it as you have done already in its incomplete state. I believe you will say that for a Company with a capital of £2,000,000 we have now provided respectable offices. With regard to the well at Streatham, that is a question which has been a most interesting one for a great many years. Supported by you at every meeting, we have persevered with that work in the hope that we should tap the great supply of water which geologists told us lay under this London of ours. We went on until we got down to a depth of 1239 feet; and we were then on sandstone rock. The Geologists told us the samples brought up could not tell us whether it was the old red sandstone or not; and advised us to continue boring, and we did so to the depth I have mentioned. We then came to the conclusion from the samples obtained, and from the opinion of the Geologists, that there was no hope of obtaining water; and we considered that our duty in connection with the matter was at an end. We were boring for water and sinking for water, and when we came to the conclusion that it was not to be found we did not feel justified in spending another penny. We therefore ceased boring; but I may tell you that the contractors in a very spirited manner continued the boring at their own expense, and they got down to 1271 feet. They at this greater depth to which they went came across a fossil. That fossil has been submitted to the geologists, who, I believe, say that there is no doubt that it is a fossil on the old red sandstone, which confirms the belief which we have that there is no use in seeking for the water any farther. It is a very interesting business; but taken in conjunction with the fact that at Richmond they went down 1446 feet and found nothing but sandstone, and that at Meux's brewery they went down to 1146 feet and found no water, I think we may take it for granted that the theory which existed that there was an unlimited supply of water under London for its supply is exploded. We have proved now by these three borings (and there have been others) this fact indisputably; and it is of no use people thinking that they can be supplied by water that is under London. They must be supplied therefore from a distance or else from the source placed at their disposal by Providence in the River Thames. It is therefore more than ever necessary to keep the Thames pure and wholesome; for it is an infinitely better source than can be found in any well for domestic purposes. Before I sit down, I must bear testimony to the good conduct of your staff, all of whom are working well. I have spoken of the Engineer before; and I mention him now to say that we are greatly indebted to him for his advice and assistance in all our undertakings. The magnificent engines he recently put up at Hampton are saving you greatly in the consumption of fuel, and the pumping is done infinitely better. Our Secretary and the other members of our staff are also looking well after your interests; and I may say that our work is now done much better than it was a few years ago—I think indeed that it is now done far better than ever it was before. With these remarks, and again expressing my readiness, as on previous occasions, to answer any questions that may be put to me, I beg to move "That the report and accounts of the Directors submitted to this meeting be and the same are hereby received and adopted."

Mr. CHARLES MARSH VIALLS seconded the motion.

In reply to Mr. Bradford,

The CHAIRMAN said that, speaking from memory, he did not think they had power to compel the consumers to have cisterns with the constant supply; but any man who was discreet would not rely entirely on the constant supply and do away with his cistern. The cistern required to be cleaned out every 3 or 6 months, and if that were done the consumers could not have a better water supply.

Mr. FRENCH asked questions with reference to the commission paid to the Engineer and other items in the accounts.

Mr. WASHINGTON asked where they expected to get water from as they had failed in their efforts at Streatham; and afterwards inquired the loss the Company estimated they sustained by boring for water which they did not obtain. He thought the provision for bad debts was heavy.

Mr. GREEN spoke of the steady increase in the last nine years in the item of maintenance, which had risen from £5691 to the extraordinary amount which now figured in the accounts. He had no doubt, however, that sufficient reasons could be given for this increase in the charges. He thought the law and parliamentary charges for the last half year (£584) were heavy, because he had imagined that their parliamentary difficulties were over. He afterwards expressed extreme satisfaction at the steady

and continual decline in the item of allowances for overcharges. In 1885 that item stood at no less than £7228 from which point it had decreased by leaps and bounds, figuring in the present accounts for under £1000. This reduction in the item seemed to him to indicate that the shareholders and the ratepayers were working more in harmony and that much pleasanter feelings seemed likely to exist. In looking back for the last nine years he found that only on one occasion had the item in question been less, viz. in 1882, when it was £723. He hoped and felt sure that the Directors would continue to reduce the item even still further in the future.

After a few observations from Mr. JONES,

The CHAIRMAN, in further reply, stated that their former Engineer, Mr. Rumball, received a large salary—£1700 or £1500 a year, all of which was a charge against the revenue. That system was a wrong one. For instance, part of the cost of a building was architect's commission, and part of the cost of erecting an engine was engineer's commission. They paid to the present Engineer a salary of £750, and to a gentleman outside their staff they would have to pay on calling in his services full commission. They paid not the full commission which they would have to pay to outside people, but a commuted commission—something like one-half, or in some cases one-third, of the full commission. Therefore the proprietors got their work done by a man who was perfectly well acquainted with their affairs, and could look after the work thoroughly. Mr. Restler was exceedingly competent to advise the Board in every way as to the building. In regard to Mr. Washington's question, they had only failed to find water at the deep borings at Streatham. In the upper sand above the chalk they had met with a large supply of water—some few million gallons a day—and they were thus amply repaid for the outlay there. They had an abundant supply for their district; and when the new main was laid from Hampton they would have an ample supply of water for 10 or 15 years. If the well at Streatham had turned out what they expected, and had given them a large supply of water from the lower green sand, they would not have had to lay a new main from Hampton, and then they would have saved £70,000. It was therefore worth some risk to see if such a large outlay could be avoided. They always depended on their supply from the Thames; and having failed in tapping a large supply at a reasonable depth at the well at Streatham, they were now in much the same position as before they undertook to sink the well. He had explained that the item of £14,094 for maintenance included an exceptional amount of £3000 which would appear on another occasion in their revenue account. The lower figures to which Mr. Green had referred under the head of maintenance were the charges which prevailed before the Company began giving the constant supply. In the past year alone 18,000 houses in their district had been put on constant supply. They had had very few parliamentary expenses; but they had had to incur some outlay in watching Bills in Parliament and in arranging clauses for the protection of the Company's interests. A considerable part of the item of law and parliamentary charges was in connection with one or two claims which had been made against them for accidents arising in the progress of their works, and which they had thought it more advisable to settle. As regarded the reduction of the overcharges, there was no doubt that that was a very gratifying feature in their accounts; but it had to be remembered that the large sums mentioned came just after the Torrens Bill was passed. With reference to Mr. Jones's question, the total amount received for water-rents was so much, and he was afraid that Mr. Jones was confusing that amount with the amount of the charges which included the old houses, debts, &c. In connection with this item also, a difficulty arose in the book-keeping owing to the way in which the rents were collected from one quarter to another, the accounts being made out for the other two quarters. The Company would incur no loss at all in having sunk the well at Streatham, because the quantity of water which they had obtained from the chalk and above the chalk would make the outlay a good investment. The provision of £8000 for bad debts they had to make at the request of the Government Auditor; but the amount was to meet the contingent loss they might have in connection with empty houses, overcharges, and bad debts.

The motion was carried unanimously.

The CHAIRMAN proposed the following resolution: "That the following half-yearly dividends be declared after the 15th day of January, 1889, viz. :—at the rate of 45 per cent. per annum on the preference stock, and 46 per cent. per annum on the ordinary stock and the class "D" shares of the Company."

Mr. VIALLS seconded the resolution which was carried unanimously.

On the motion of Mr. BRADFIELD, the retiring Directors (Mr. Henry Whiting, Mr. C. M. Vialls, and Mr. E. Ponsonby) were re-elected.

And subsequently also on the motion of Mr. BRADFIELD, Mr. Trayton Pagden Child, C.A., was elected Auditor to fill the vacancy caused by the death of Mr. Young.

Votes of thanks were passed to the Chairman and Directors; and to the Secretary, Engineer, and staff after which the proceedings terminated.

GRAND JUNCTION WATER-WORKS COMPANY.

The Half-Yearly General Assembly of this Company was held last Wednesday, at the Offices, No. 65, South Molton Street—Mr. E. G. Fox in the chair.

The ACTING SECRETARY (Mr. J. W. Fisher) read the notice convening the meeting; and it was agreed to take as read the report of the Directors and the statement of accounts for the half year ended Sept. 30. The report was referred to in the JOURNAL for the 4th inst., p. 996; and from the revenue account we learn that the total receipts for the six months, including £6500 brought forward, amounted to £92,532, and the expenditure to £31,798. The sum carried to dividend account was £54,233; leaving £6500 to be carried to the next account, to provide for losses.

The CHAIRMAN: I have but few remarks to make to you on this occasion. We are in a very happy state. I do not think there is any point to which I need refer in the accounts, except that we find our water-rental has been less by some £1260, in consequence of the wet weather during the half year. But for this, there would have been an increase in the item. As to maintenance and management charges, there is a little excess; but we are now increasing by 1100 or 1200 every year the number of houses that we supply. It is therefore necessary that we should have more power; so that you cannot expect always to see these items less. With regard to rates and taxes, there has been an increase; but whatever may be the position of the accounts, they have passed through the hands of the Government Auditor, and he is perfectly satisfied. From the report, you will gather that last year the weather was very dry; and therefore a great deal of water was wanted, and we had the benefit of that. In the past summer, however, the season was very wet, so that we were minus in our receipts by about £1260. We are happy to say that, on the whole, we have an increase in our undivided balance, after paying the dividend, of about £300. We shall have £3900 left after paying the dividend of 9 per cent.; so that we are not going back. With respect to our works and pumping station and the quality of the water

we have supplied, we stand exceedingly well; and as to the latter point, our report shows that we stand better than some of the other companies, as far as the clearness and brightness of the water are concerned. We have opened our large reservoir at Ealing; and looking at the interests of the shareholders, we decided on having a little ceremony on the occasion, so we invited a number of people connected with the locality—such as the members of the Local Board, and the members of Parliament for the district—and the event was most successful. All who were present felt that they were allowed to look on a work such as they had never seen; and one Medical Officer who was among the company, took me on one side, and said: "I am delighted that you have given us the opportunity of seeing these works. I had no idea that the water companies took so much care in regard to the water they supply." Well we had a great number of friends amongst us on that occasion; and we enlightened many people who wished to know something about water-works. The subject had been a sealed book to them before. There is only 10 feet of water in the reservoir at present. We intend to fill it by degrees, so as to keep the pressure gradually on before regularly using the reservoir. Last year the number of houses we supply increased by 1074; and in consequence of the continuous increase, and the rapid growth of the district, more especially between Acton and Sunbury, we felt obliged to have more power, and we have ordered a new pumping-engine, and three boilers, to be erected at Hampton. This work is now proceeding; and I hope it will be finished next year. We found in the dry summer we had last year that a great strain was put upon us. However, we got over all our difficulties; and therefore I will say no more about it. But it would not do to let such a dry summer come upon us again, without being prepared to meet it by improved resources; and so we took the precaution of ordering this new pumping-engine and additional boilers. In his last return, the Water Examiner stated that we have 42,483 houses supplied on the constant system, as compared with 41,772 in the previous return. Then I must call your attention to another matter. Our friend Mr. Coe took leave of us on Sept. 29, after spending 57 years in the Company's service. The work done by that gentleman has been alluded to more than once at our meetings; but one can always say something kind of a man who served the Company so well. He was for 34 years our Secretary. I mention this now, because the resolution which you passed on a former occasion voting him an annual sum as a retiring pension in recognition of his services is now to come into force. We feel it our duty to mention this to you to-day. I have now to move—"That the report of the Directors and the statement of accounts be approved and confirmed, and that the recommendations contained therein be adopted."

Mr. H. MOTT seconded the motion, which was carried unanimously.

On the motion of Mr. F. TAGART, seconded by Mr. C. J. B. HERTSFLET, the following resolution was also unanimously agreed to:—"That a dividend for the last financial half year at the rate of 9 per cent. per annum upon the ordinary share capital of the Company and of 7½ per cent. per annum on the £25 "C" shares, and of 7 per cent. per annum on the new ordinary £50 shares, together with interest in accordance with the conditions of sale on payments on the shares issued in February, 1883, be now declared, and that warrants be issued for payment of the same on and after the 15th of January next."

Mr. W. HUNTER moved, and Mr. GIVENS seconded, a vote of thanks to the Chairman and Directors for their admirable conduct of the business of the Company during the half year.

The CHAIRMAN briefly acknowledged the compliment, and the proceedings terminated.

CHELSEA WATER-WORKS COMPANY.

The Half-Yearly General Meeting of this Company was held last Thursday, at the Offices, Commercial Road, Pimlico—Sir W. H. WYATT in the chair.

The SECRETARY (Mr. G. H. Gill) read the notice convening the meeting; and the report of the Directors and statement of accounts for the half year ending Sept. 30 were taken as read. The gross income in the six months amounted to £65,914; and the working expenses to £19,736. The capital account showed an expenditure of £2144, which included the final payment to the contractors in respect of the new Worthington engine at the Molesley works, the cost of the erection of a stand-pipe at the Putney Heath reservoirs, and the expenditure on ordinary extensions in the district. The quantity of water pumped into the service reservoirs during the half year was 1755 million gallons.

The GOVERNOR: Gentlemen,—In rising to move the adoption of the report, I must say I have very little to add to what has been circulated among you. I would first call your attention to the fact that our income for the half year has been £65,900; and the expenses have been £19,700. This you may take to be a very satisfactory state of things; and it will certainly compare favourably with any other water company. When you can get your expenses to a point not exceeding 30 per cent. of your revenue, you can feel quite satisfied that there is not much to complain of. You may find that some other companies do quite as well (I am not sure that many of them do), but none of them do better. If you can get 70 per cent. of your receipts paid as dividend, it must be a matter of satisfaction. The only way to do this is, of course, to watch very closely the expenditure, as we do. You will see that we have paid a certain amount to the contractor for the Worthington engine during the past half year; and I am glad to tell you that this engine is doing its work exceedingly well, and will result in very considerable profit to you, so far as the consumption of coal is concerned—that is to say, it will do a much larger duty per ton than the others did. The quantity of water pumped in the half year has been less than that in the corresponding period of 1887. But the summer of that year was very dry; and this summer has been wet, which has made a considerable difference. The next point I would call your attention to is with respect to the demolition of old houses in Chelsea and Brompton. I forget how many were pulled down; but I believe there were more than 1000; and we thought this half year we should find our rental very considerably diminished. I am glad to say that this has not been the case, for rebuilding has gone on very quickly; and the houses that are being put up are of a different character, and will yield a much better income, though probably they may use more water. The Directors are, therefore, particularly pleased with the income for the year, because it enables us to pay the full dividend of 9 per cent., with a slight surplus over, though not much. This is a better result than we had anticipated. We were afraid this half year that we might have had to draw on our reserves to make up the 9 per cent. We are exceedingly gratified that we have not had to do so. I ought to say—and it is only fair that I should say it—that a great deal of the saving in expense is due to the great attention and care given to the working of the engines. Under our present Engineer, the old engines have been almost entirely recast. The result is that they do a much better duty, and they do not consume anything like the quantity of coal which they did previously. This is owing entirely to the care and ability which the Engineer has shown in bringing this about. It is, of course, important for us if we can save a thousand pounds in coal. The quality

of the water that we have supplied has been good. I do not think it was ever better; showing the great care that has been paid to the filtration. There has not been a single complaint, I believe, as to the quality of the water from any of the consumers during the year—a fact which I think shows a satisfactory state of things; and, moreover, no fault has been found by those who have to examine the water. We have had to raise, as you are aware, a small amount of capital. We keep the capital down as much as possible, because the more capital you have to pay dividend on, the less there is for everyone. Therefore, we have kept it as low as possible. We have obtained a quotation in the past half year for the Company's preference and debenture stocks. I believe that this has added to the welfare of the proprietors; inasmuch as it may have improved, by 1 or 2 per cent., the selling value for anyone who wishes to dispose of his stock, though, of course, the quotation has not added to their real value. I have now to move the adoption of the report and accounts.

The DEPUTY-GOVERNOR (Mr. F. S. Clayton) seconded the motion, which was carried unanimously.

On the motion of the GOVERNOR, seconded by the DEPUTY-GOVERNOR, resolutions were afterwards passed authorizing the Directors to provide for the payment of the preference dividend, and declaring a dividend for the past half year at the rate of 9 per cent., per annum.

Mr. WARD proposed a vote of thanks to the Governor and the Court of Directors for their careful management of the Company's affairs in the past half year, speaking in terms of great satisfaction of the position of the Company and the steady progress it is making towards the payment of the maximum dividend of 10 per cent.

The resolution was seconded, and carried unanimously.

The GOVERNOR, in acknowledging the compliment, assured the proprietors that with the aid of a most excellent staff, the Directors did everything in their power to promote the interests of the Company.

The proceedings then terminated.

THE PUBLIC LIGHTING OF DUBLIN.

At the Meeting of the Dublin Municipal Council on the 10th inst., the question of the public lighting of the city was again under discussion.

Mr. DENNEHY called attention to "the number of serious complaints of the citizens with reference to the present defective lighting of the city, and to the serious liability that will result to the Corporation in case any accident should occur therefrom." He moved—"That this matter be referred to the Paving and Lighting Committee, with a request that they will report to the Council on the subject."

Mr. DOHERTY seconded the motion.

Mr. MAYNE observed that he was a member of the Gas Sub-Committee who were at present considering the question. They found the lighting of the city was bad; and they called the attention of their Gas Inspector to it. The gas-testing arrangements on which they were accustomed to rely were more or less of a sham. The testing station at Burgh Quay was in a room next to a garret; but as all the gas-pipes of the city did not happen to pass Burgh Quay, it was impossible to test the gas supplied to the bulk of the consumers. The gas supplied to the south of the city did not appear to be tested at all. Their officer suggested that the gas-testing apparatus in Hanover Street, which had not been used for a great many years, should be put in order, and the latest improvements added to it. This was done; and the result was very strange. The gas tested at Hanover Street was not of 16-candle power; and in many instances was not 14-candle gas.

Alderman DILLON: What about Dr. Tichborne's test?

Mr. MAYNE replied that Dr. Tichborne must answer for himself. He tested the gas at Burgh Quay and his own house at the north side of the city. The main that passed Burgh Quay was the great north main; but there was a peculiarity about Burgh Quay, that, until very recently, it was absolutely impossible to make a proper test there, for the instruments were defective. The Committee suggested Tara Street as a suitable place for testing. They would there have the command of all the principal mains except one. With all the anxiety of the Gas Company to help to do what was right and proper, yet, although it was three months since the Committee made this suggestion—in fact, made the demand—yet from that time to the present they had never obtained any satisfactory answer from them. The Committee had thought it well to call in an expert to make an independent series of testings, which corroborated their own Inspector to a fraction, both with regard to quality and purity. As soon as the Lord Mayor returned to Dublin, they would resume their representations to the Gas Company; and if they continued unsuccessful they would have to ask the Corporation to take legal steps to insist on the Gas Company putting the testing station where it ought to be—that was, where the largest number of mains could be tested.

Alderman MULLIGAN said the Committee had frequently had to call upon the Gas Company to keep the lighting plant in order. The lamps of Dublin were falling asunder for want of care. He found from the report of their Inspector that on Oct. 25, the quality of the gas was 13·8 candles; on the 26th, 14·50; on the 27th, 15·80; on the 29th, 15·50; on the 30th, 14·70; on the 31st, 13·90; on Nov. 1, 14·10; and on the 2nd ult., 13·60 candles.

Mr. GILL asked Alderman Mulligan, to read Dr. Tichborne's report.

Alderman MULLIGAN replied that he had not got it. Continuing, he said that the quality of the gas on Nov. 28 was 14·4 candles; on the 29th, 15·5; and on the 30th, 15·2. Mr. Cotton mentioned to him that on Saturday last the quality of the gas was 13·8 candles. These were testings taken at the official station.

Mr. GILL said that Mr. Mayne and Alderman Mulligan had made observations from two different standpoints. Mr. Mayne stated that Mr. Cotton's testing took place in a different place from Dr. Tichborne's, and that it might be accounted for by assuming that different gas was sent through the mains to Mr. Cotton from what was sent to Professor Tichborne.

Mr. MAYNE: I did not say so.

Mr. GILL observed that it might be accounted for in that way. He hoped that Dr. Tichborne would answer for himself, because both Mr. Mayne and Alderman Mulligan, by implication, had accused him of assisting the Gas Company to cheat the public (No. no). Dr. Tichborne tested the gas; and every week stated that it was up to a certain standpoint. Mr. Cotton tested the gas; and according to Alderman Mulligan and Mr. Mayne, he made it more than 2 candles less than an experienced tester like Dr. Tichborne. Had Alderman Mulligan or Mr. Mayne proof that Mr. Cotton ever tested a single jet of gas up to the time that he was employed by the Corporation? Then they brought over someone to back up his testing; it might be a friend of his, or somebody that knew no more about testing than he did himself. The whole tendency of the present dispute was almost, in set words, to accuse Dr. Tichborne of helping the Gas Company to cheat the public.

Mr. MAYNE thought he was justified in saying that if Mr. Gill could make a case for his Company in opposition to the strong one that he (Mr. Mayne) had made, let him do so. He did not know what Dr. Tichborne was doing with the gas; whether he was testing it or not. If he was testing

it, and gave in a report about his testing he (Mr. Mayne) would believe it. He was aware that Dr. Tichborne made his testing late in the evening; and everybody was aware that the bulk of the consumption of gas was over before six o'clock, when Dr. Tichborne made his test. There might be, and had been, in previous years a very bad quality of gas in the mains while the consumption was large; and a good quality in the mains at seven or eight o'clock in the evening.

Mr. M'QUAID said if the Corporation had allowed the state of things to go on that was described by Alderman Mulligan, it was a disgrace. A gentleman who made a contract and acted as the Company had done would be scouted out of public life.

Alderman DILLON remarked that he could well understand Mr. M'Quaid's indignation; but he did not think he ought to blame the present officers or Committee. This state of things had been going on in the city for several years. The relations between the Corporation and the Gas Company were only changed a few months ago. He thought every latitude ought to be given to the present Inspectors of the Gas Committee. It would have been better if this discussion had not taken place until they had an independent report in writing from the Committee. He was disposed to think a condition of things would be found to exist which justified all the accusations made by the officers of the Corporation last year, and all the suggestions made for many years past as to the unsatisfactory relations between the Gas Company and the Corporation; and he would be very much surprised if he did not find Mr. Gill coming forward like an honourable man, and saying that he had been deceived, and that he had discovered that the relations between the Company and the Corporation were such as should not be allowed to exist. He begged of the Committee not to disclose their hand to the Company until the time came for doing so.

Mr. M'QUAID remarked that he did not intend to convey any reflection on the Sub-Committee.

Mr. DOHERTY said he would like to know if any communication had passed between the Paving and Lighting Committee and Professor Tichborne. He hoped it would be conveyed to the Gas Company by their friends in the Corporation that there were penalties hanging over them if they did not supply the city with proper light.

Mr. CUMMINS said it was a disgrace that two bodies like the Corporation and the Gas Company could not come to some honourable understanding on the subject. Mr. Cotton, their Gas Inspector, had done good and efficient service since his appointment; and the testing by an independent expert bore out the view of his capacity taken by those who elected him.

Mr. DENNEHY observed that he did not think the Gas Company or their Secretary would deliberately commit such a fraud as to supply gas so inferior to what they were bound to afford. But it was obvious that the subject was one of vast interest, and deserved the most careful consideration.

The CHAIRMAN, referring to an observation made by Mr. M'Quaid, said he wished to give one word of explanation. He, as a member of the Council, felt that he would be seriously liable if he allowed a state of things such as that described to go on without drawing instant attention to it. But it should not be understood that there had hitherto been any discrepancies between Professor Tichborne's reports and those of their officers. Before Mr. Cotton's appointment, they had an Inspector who came to them with a return agreeing with Professor Tichborne. Now, under the new state of things, they were presented with returns differing from Professor Tichborne; and they at once took action, so that they were free from any blame in the matter.

Mr. M'QUAID said he did not wish to be misunderstood. He only meant to convey his opinion that a course of conduct should not be tolerated by the Corporation which would not be permitted by private individuals; and he never intended for a moment to reflect upon, or act as censor on the gentlemen who were in the Council before he became a member.

The motion was then carried.

Mr. W. F. Cotton, Secretary and General Manager of the Alliance and Dublin Consumers' Gas Company, has addressed a letter to the Corporation of Dublin, under date of the 13th inst., in the course of which—alluding to the debate reported above—he says: "My Board have directed me to state that for some time past reckless and unfounded charges and insinuations have been made affecting the honesty of this Company, and which, if true, would show that the Company, with the knowledge of the Board and their Manager, have been defrauding the public for many years. These charges have been made under the shelter of the privilege which the position the members hold in the Corporation affords them, and when challenged are met by vague evasions, but only to be repeated again and again, until the public are led to believe that there must be some foundation in fact for the statements so often made. In the debate, however, on the 10th inst., a definite charge has been made which should be dealt with at once—viz., that on the following dates, Oct. 25, 26, 27, 29, 30, 31, Nov. 1, 2, 28, 29, 30, and Dec. 8, the gas supplied by the Company was under the standard fixed by Parliament. This statement, apparently, has been made on the authority of your Inspector of Public Lighting, corroborated by some person whose name is not given to the public. These charges have, if true, involved the Company in liability to penalties of £20 for each occasion, amounting to £240, payable to the Corporation; and this sum can be recovered before the Divisional Magistrates of the city. My Board respectfully demand that the Corporation should test the correctness of their charges; and, in fairness to the citizens, and in justice to the Company, direct that proceedings be at once taken to enforce these penalties. If the above challenge is declined, my Board can only conclude that the members of your Committee, while giving publicity to charges made by your Inspector, which may injuriously affect the Company, have no confidence in their correctness."

In alluding to the above letter, the *Freeman's Journal* characterizes it as "the not unnatural outcome of the last meeting of the Corporation. The dispute between the Gas Company and the City Council is no longer a matter of vague allegation or suggestion; it is a definite accusation. The Company are charged with having supplied the city with gas which is under the standard fixed by Parliament, and twelve dates are specified as those upon which the insufficient supply was detected. . . . While we think the Corporation have, to some extent, exhibited an exceedingly bad spirit in the discussion of this question, and have gone the worst way to effect a settlement, we do not expect that they will feel compelled to accept Mr. Cotton's challenge. In the matter of legal proceedings, the Corporation need not go beyond its own excellent Law Agent. Nor is it, in our opinion, a matter for litigation at all. Doctors differ, and so may inspectors of public lighting; and, as we have said again and again, half-a-dozen level-headed, practical men, who honestly wanted to settle the matter, could find a basis for friendly agreement in two days. Such a squabble as has been carried on so long between the Corporation and the Gas Company is creditable to neither party."

The stokers in the employ of the Wolverhampton Gas Company have had their wages advanced by 2s. a week.

ROCHDALE CORPORATION GAS-WORKS.

A REDUCTION IN PRICE.

On Thursday, the 6th inst., at the Meeting of the Rochdale Town Council—the Mayor (Mr. J. E. Petrie) in the chair—the Gas Committee presented a resolution recommending the Council to reduce the price of gas within the borough from 3s. 2d. to 2s. 11d. per 1000 cubic feet, with discounts as before; such reduction to commence as and from the next quarterly inspection of meters.

Alderman PETRIE moved the adoption of the resolution. He said the reason the Committee moved in the matter was not because their circumstances had changed in any way; but rather in fulfilment of the understanding which was tacitly arrived at when the last reduction was made. That was now nine months ago, at the beginning of the financial year. It was then felt that 3d. per 1000 feet was not the full amount by which they were warranted in reducing the price; but it was deemed prudent to "come downstairs" gradually, three steps at a time, rather than jump down the whole flight at once. As to the estimated effect of the 3d. per 1000 feet reduction, it would be about £3300 for the year. That was the lessening of the revenue consequent on the last reduction, which took effect throughout the whole financial year. The present reduction would take effect after the end of this month; and it would mean little or no alteration of the revenue for the current year, because the new contract price of coal, and the normal increase in the consumption of gas, would about make up for the lessened receipts. Irrespective of this, however, his feeling was that it was quite time that gas was made, like other things, cheap. It was about the only thing in the town that remained dear at the present time. Looking at the great advance in the improvement of other modes of lighting, and the consequent serious competition, he thought the Council would be justified in feeling that it was high time they adopted this resolution. He only hoped they had not delayed too long before taking the step.

Alderman BARON seconded the motion. He said he was glad the reduction was made at twice instead of at once; and he hoped it would be the last they would have for some years to come. An article was cheap or dear according to comparison; and he did not think that Rochdale gas was very dear. The net price when this reduction was made would be 2s. 7d. or 2s. 7½d. In Accrington the net price was 3s. 1d.; Barrow, 3s. 6d.; Blackburn, 2s. 9½d.; Brighton, 3s. 1d.; Chester, 3s. 4d.; Coventry, 3s.; Dewsbury, 3s.; Huddersfield, 2s. 7½d.; Macclesfield, 3s.; Norwich, 3s. 4d.; Southport, 2s. 10½d.; Swansea, 2s. 10d.; St. Helens, 2s. 10d.; Preston, 2s. 9d.; Wigan, 2s. 9½d.; and Manchester, 2s. 8d. (A VOICE: Bury.) He had painted one picture; if they wanted another, let them paint it themselves. (Laughter.) There were as important places in that list as any that could be brought against them; and there was no borough in the kingdom situated like Rochdale with reference to one department (water). They were a trading community so far as gas and water were concerned; and he hoped it would be a long time before they again reduced the price of gas while they were supplying water to thousands of householders in Rochdale at considerably less than cost price. Thousands of people were having water at about 7d., 8d., or 9d. per 1000 gallons, while it cost him 3s. or 4s. But while they were having water at less than cost price, it was now proposed to let them have gas at less than cost price, too. ("No.") Certainly it was so. Taking the receipts for gas in hundreds of houses, that commodity was supplied at an absolute loss.

Alderman PETRIE: Is Alderman Baron going to vote against the resolution?

Alderman BARON: I shall vote for it, because the proposition was made in such a modest way that I thought I would not do battle with it. I am now opposing the Chairman's statement that he thinks we have deferred it too long. I hope this motion will be carried; but if the Committee propose another reduction, I will combat it to the last inch.

Mr. ROBINSON asked if the Committee had considered the case of outsiders? If the price was reduced for borough consumers, outsiders would feel badly used if they did not get a reduction as well. According to what the Chairman said on a previous occasion, it was possible for outsiders to have a meter inside the borough, and have gas at borough price.

Alderman PETRIE: That is so. We have considered outsiders. I did not think fit to mention them as I had nothing good to offer them; and I thought if I sympathized with them, they might not think my sympathy honest. One of the objections hitherto urged against a reduction in the price of gas has been the fact that outsiders, while getting water at less than cost price, would have gas at too low a rate. The Committee have removed that very reasonable objection by not proposing a reduction of the outside price. We think the price for outsiders is very reasonable.

Alderman SIMPSON said if there was danger of the electric light succeeding, what would become of the capital invested in the gas-works? He agreed with Alderman Baron as to gas being sold to some thousands of people at a loss. In the absence of a cheapening of other illuminants, he thought the price of gas should be maintained so long as there was such a large loss on the water-works. He would not, however, vote against the resolution.

Alderman PETRIE said he need not reply. Alderman Baron's remarks would bear a very strong replying to; but the proper time would be when the next reduction was proposed.

The resolution was then carried.

The reduction will come into operation with the new year. On and after Jan. 1 the prices will be, for prompt payment, under 10,000 feet, 2s. 9d. per 1000 feet net; 10,000 and under 50,000, 2s. 8d. per 1000 feet net; 50,000 and under 100,000, 2s. 7d. per 1000 feet net; over 100,000, 2s. 6d. per 1000 feet net.

THE GAS SUPPLY OF OLDBURY.—The Gas Committee of the Oldbury Local Board reported at the last meeting of that body that it had been decided to pay off £25,000 of the gas-works loan; also that they had determined to supply gas for motive power at the following rates:—Under 100,000 feet per quarter, 2s. 6d. per 1000 feet; and 100,000 feet and upwards, 2s. 3d.

DEATH OF A PLUMBER FROM GAS POISONING.—Last Thursday a plumber named Joseph Oldfield, of Honley, 43 years of age, met with a sad death. It appeared that on the day in question he was engaged in coupling a branch with the gas-main at Neilly Mill, Honley, when he complained of being very ill, having inhaled some of the gas. He was removed to his home; and death ensued before the arrival of the doctor.

THE DISPOSAL OF THE RESERVE FUND OF THE NEWPORT (MON.) WATER COMPANY.—A special meeting of the Newport Water Company was held last Wednesday, to consider a scheme propounded by the Directors for the disposal of the reserve fund (£4000); the undertaking, it will be remembered, having been purchased by the Corporation. The Chairman (Mr. J. Lawrence) submitted the scheme, in which it was proposed that £500 should be given to the Newport Infirmary; £1000 to the Company's Secretary (Mr. Callum); £350 to the Chief Collector (Mr. Shepherd); and £461 to be divided among the clerks, collectors, and employes. The balance of £2000 the Directors (seven) proposed should be allotted between themselves. Mr. Cartwright moved, and Colonel Hair seconded, the adoption of the scheme. After a little discussion, the motion was agreed to.

AN EXPERIMENTAL LECTURE ON FLAME AND SMOKE.

By THOS. FLETCHER, F.C.S.

Last Tuesday a Lecture was delivered before the Manchester Noxious Vapours Abatement Association by Mr. Thomas Fletcher, F.C.S., of Warrington, who took for his subject "Flame and Smoke."

Mr. Fletcher commenced his lecture by a lengthy quotation from a recent editorial in the JOURNAL, entitled "Invisible Fog" (see ante, p. 793); remarking that the quotations, if not agreeable and reassuring to the Association before whom he was appearing, were at least sound common sense, and they must be faced thoroughly if the Association is to do the work it is intended to do, and to justify its existence. Proceeding, he said: In new processes and new adaptations, it is best to make haste slowly; and those who have any real interest in the abatement of noxious vapours may well be asked to be saved from their friends. As an example, in the *Manchester Courier* for Nov. 16, is a very well written letter, in which the writer states plainly and clearly that "the firing of steam-boilers by gas from a gas generator is the most economical way of producing steam." Now I take it for granted that the writer, from his profession, is not a steam-user, and that he does not speak from actual knowledge. On the contrary, Mr. J. Emerson Dowson, who is a maker of generators, whose business it is to push the use of generators for his own profit, stated at the Bath meeting of the British Association, on Sept. 8 last,* that he was aware "that several attempts had been made to heat boilers with gas of this kind; but so far as his knowledge went, none of them had been successful from a commercial point of view." I myself know of three cases where plant has been put down specially to produce gas for boiler heating. Two of these were failures of the most decided kind. One is, I believe, still working. But it is on a small scale, in the works of a public company paying very large dividends; and although repeatedly promised the figures as to work done for the fuel consumed, I have never been able to obtain them. I examined the whole arrangement carefully, and should be surprised if the same work could not be done by direct firing, with half the fuel used.

Another point in which the advocates for change are doing us a doubtful service is by pressing the claims of generator or water gas as a fuel for domestic purposes. This has been done in America to a limited extent; and the result, as given in *Industries* for Nov. 16, is anything but reassuring.

Both generator gas and water gas are extremely poisonous, owing to the large quantity of carbonic oxide they contain. According to Pettenkofer, air containing one five-hundredth part of its bulk of carbonic oxide is fatal to human life; and that this is an element in the question is proved by the figures given in the above-mentioned periodical, in which it is stated that the deaths from poisoning by water gas, in New York only, in the three years ending December, 1887, were 80, whereas from coal gas only one death occurred in the same period.† One curious and very misleading argument used by the advocates of water gas is that plants will live and thrive in a room lighted and heated by water gas, whereas, they will not do so where coal gas is used. This is simply a special pleader's argument. The requirements are entirely different. Some plants will live and thrive in a cold wet bog during winter, but human beings will not; the fact being that water gas contains rather less sulphur, and produces a larger proportion of moisture than coal gas whilst burning, both of which points are favourable to plant growth. The fact that the burnt gas is not injurious to plants does not affect the deadly nature of these gases to human life in case any escapes unburnt.

Whilst on this subject we may dispose of another wild statement of the anti-smoke agitators—i.e., that "carbonic acid is poisonous," a statement often repeated by many who ought to know better. If carbonic acid were in itself poisonous in the smallest degree, animal life would be a simple impossibility, as the lungs of all breathing animals contain always a large quantity. It exists in a large proportion in the air exhaled from the lungs; and as this is not expelled entirely from the air passages, it must of necessity be re-inhaled at the next inspiration.

As with smoke and noxious vapours, the agitators have not taken the trouble to separate and distinguish between the action of carbonic acid, which is *nil*, and that of the objectionable and dangerous germs which accompany it when exhaled from the lungs of living beings. If anything is to be done worth the doing, the actual facts and difficulties must be faced properly, with a full and practical knowledge of what really can be done, and what is necessary.

THE JOURNAL OF GAS LIGHTING says: "The gas-stove does good no doubt, so far as it goes." This, although literally correct, is rather disposed to cause a false impression as to how far it does go. The production of gas-heating appliances, since the manufacture has been conducted on something like a scientific basis, has become a large and important industry; and, from my own knowledge, I can safely say that the gas cooking and heating appliances in daily use in this country can be counted by millions, and the demand shows no sign whatever of falling off, but very much to the contrary. As regards the abatement of noxious vapours, if we exclude these gas-heating appliances, it is a very great question whether any real good has been done. Probably the result has been the other way, as it has led popular attention to black smoke only as being the cause of all our evils; the fact being that pure black smoke, uncontaminated with other products of imperfect combustion, does very little harm, except so far as it interferes with cleanliness. Being visible, it has become connected in the popular mind with other and far greater evils, which are in reality not necessarily connected with it in any way; and a broad and very positive line should be drawn between black smoke and other products of imperfect combustion and noxious vapours.

To illustrate this, I have here an ordinary type of regenerator burner for lighting purposes, which, under ordinary and satisfactory conditions, gives a clear light without the formation of any solid or offensive products of combustion. If the gas supply is increased slightly beyond the quantity the lamp is designed to burn, we obtain a large quantity of dense black smoke. Now, this smoke is simply pure carbon. It has no more objectionable features than ordinary fine dust, except that it is more visible on account of its colour; and owing to its extreme fineness, it is rather more difficult to remove with a duster. It is perfectly free from smell; and is no more objectionable in a room than a similar quantity of dark dust. I have been quietly working in a room with a regenerator lamp which suddenly began to smoke, without perceiving any change whatever, until the light appeared to fail. On looking up, I found the room filled with dense black smoke; the effect other ways being quite inappreciable.

This is one of many illustrations which could be given that pure black smoke is, apart from its colour, for all practical purposes unobjectionable. We will now take the other side, and see what may accompany black smoke, or what without smoke may arise from imperfect combustion; and for the sake of fair illustration, I will take the same fuel—i.e., coal gas—and change the conditions under which it is burnt. Those who wish to test this matter at home may do it in several

* See ante, p. 802.

† See ante, p. 934.

ways. If only an ordinary lighting burner is available, it will be sufficient to suspend in the flame by a wire a rather large block of pumice-stone. If this is placed low enough to break up the form of the flame, it will cause imperfect combustion, and the formation not only of black smoke, but also of carbon monoxide (which is a poisonous gas) and some most offensive smelling hydrocarbon compounds. A still more powerful demonstration may be made by an ordinary atmospheric boiling-burner, which, when properly lighted, gives a clear blue smokeless flame, free from any objectionable odour. If a light is applied inside the tube, the combustion becomes imperfect, and the products are similar to those in the previous experiment, but much larger in quantity; in fact, with the burner I have here, I could render the air of this room most offensive in a short time, with the result that probably more than half the audience would leave the room with a severe headache, although the actual smoke produced would be much less than that given off by the regenerator burner. Another familiar instance is that of a common tallow candle, which, if burning with a smoky flame, simply causes what may be called mechanical smoke. But blow the candle out and let the wick smoulder; and from this little speck of red will be evolved a smell which is anything but pleasant, and this with an entire absence of smoke. Here then is the difference between the comparatively innocent but much abused smoke, and the invisible but offensive noxious vapours. If the latter can be efficiently dealt with, the former will at the same time almost disappear. I do not wish you to think I have any desire to speak in favour of smoke, but simply that it shall be credited with its own evils only.

Black smoke is very objectionable, as is any other form of mechanical dirt; and it should therefore be avoided. But we must bear in mind that legislation on this matter is a very difficult thing; and it is quite possible to "jump out of the frying-pan into the fire," by stopping smoke, and causing in its place the production of carbon monoxide and other poisonous and offensive compounds of carbon. There is a good deal of truth in the remarks of an old gardener of my acquaintance, who had worked in the same place for some thirty years, that before smoke-consuming furnaces were used his plants got dirty, but since the manufacturers on the windward side had commenced to consume their smoke, they did not dirty his plants, but only killed them. The smoke was replaced by vapours which killed his plants and ruined his garden.

First amongst the evils is the sulphur which is contained in all ordinary coal. This is the most destructive, and the most unmanageable evil we have to contend with. It combines with the oxygen of the air, forming sulphurous or sulphuric acid; and this all-pervading nuisance can be detected instantly (by litmus test-papers) in the air of any large town, on damp walls, in the gutters, and, in fact, everywhere. So universal is this powerful acid, that I have hunted London over in winter to obtain a book of blue litmus test-paper which had not been coloured red by the sulphur in the air, and failed to obtain it. A book was sent to me direct from the makers in a corked and sealed glass bottle. This I opened whilst in a carriage on the Underground Railway, and in a few seconds the paper turned bright red. I tested the mud in the street, the damp on bricks and carved stone, the moisture on the trunks and leaves of trees in the parks; and the result explained the rapid destruction of stone carving, metal, and everything which could be destroyed by dilute acids. There is, I believe, only one remedy, or rather method of reducing the evil, and that is by reducing the total coal consumption in the country; and there is hope in this because a reduction in coal consumption means a saving in money. It is useless to talk about the reduction of smoke, or of noxious vapours, unless we can show the offenders very clearly that a profit is to be made by their prevention. All methods of fuel saving are steps in the right direction—provided, of course, the production of noxious vapours is not increased, as it certainly may be under some circumstances.

Take, for instance, some gas-engines. Their great economy in fuel is undoubted; but note the care with which the users lead the burnt gases outside, for the benefit or otherwise of their neighbours. The poisonous stench evolved by some of them is not easily forgotten if once encountered; and this serious question has been quietly ignored by the makers of gas-engines, who have the commercial tact to know that if their customers get the power, it is a matter of indifference who gets the stench evolved. As regards sulphur, gas-engines are a great improvement. In the first place the quantity of fuel used is very much less for the same power; and the gas is almost entirely free from sulphur. But really perfect combustion is difficult if not impossible in a heavy metal cylinder; and it is probable that the gas-engine of the future will be very different to the present type. That coal gas can be burnt without nuisance we all know; otherwise it would not exist for lighting purposes. That it can be made offensive I have shown you; and, therefore it would not be unfair to insist that all gas-engines should to a great extent be free from the objection which certainly now exists with many of them. With regard to steam-boilers and furnaces, there is no doubt whatever that they can be made smokeless, either by using gas coke as a fuel, as we ourselves do, or by a proper system of firing, such as may be seen on any ordinary locomotive; and there is no doubt, also, that either method can be made profitable. But, on the other hand, there are industries which apparently cannot be carried on without the production of smoke and noxious vapours.

As an instance of this, the manufacture of puddled iron may be taken, which requires to be kept during the whole process in an atmosphere containing a large proportion of uncombined carbon. Possibly, as a total, the greatest offenders are ordinary kitchen chimneys; and in this opinion I am confirmed by many observers who have closely studied the question. The fire is more or less surrounded with metal, the cooling effect of which prevents perfect combustion in its vicinity; and the same objection exists to a greater or less extent with all fire-grates which are not entirely lined with fire-clay. It is only necessary to look over a closely-built town or village on a clear, bright morning to see where a very large proportion of the nuisance arises, or to visit a hilly district, where we can get above the level of a number of ordinary house chimneys, to appreciate the very unpleasant nature of the products of imperfect combustion which arise, and which always must arise, from slow and imperfect combustion. But the tide in favour of the use of coal gas for ordinary domestic heating and cooking purposes has set in so persistently, and on so large a scale, that what has been already done must have a decided effect on the general cleanliness of the atmosphere. It may safely be said that coal gas is not by any means at its lowest ultimate price, and that every reduction in price will cause a large increase in the demand for heating purposes and uses other than lighting. In this respect we are decidedly behind some of our own colonies. For instance, in Melbourne one-third of the total gas made is used during daylight.

There are many points and peculiarities about the combustion of coal gas which are little known; and there are yet many things which remain to be discovered. One important point, which is usually overlooked, is that the size of a flame has nothing whatever to do either with the gas consumption or with the amount of work which can be obtained from it; and I will give you some illustration of this with different burners, each consuming approximately the same quantity of gas. In the first place, I will take a quantity of gas unmixed with air, and burning on a broad surface

of gauze. I must apologize for introducing what is now an old experiment; but it is necessary to illustrate the subject properly. The flame obtained is large and luminous, but as a heating agent it is almost useless; as, if we place any vessel over it, a deposit of carbon would take place (as you see), preventing the passage of heat to the vessel. If I mix a small quantity of air with the gas, the flame increases in bulk, but not in temperature; in fact, there is only an outer film of flame, which is very deceptive in appearance. I can prove that the flame is cold in the centre, by protecting my hand from the outer film of flame, and putting my bare fingers inside it; and again, by putting a parcel of gunpowder inside, which, as you see, remains unburnt. Not only does no flame exist inside, but flame is not even possible; as a burning paper is actually extinguished, and I cannot carry a light into the flame. The fact is that a mixture of coal gas with a small quantity of air will neither explode nor burn, nor will it even support combustion; the flame being caused and supported entirely by the external air surrounding it. That the unburnt mixture exists is easily proved by leading a part of it out of the centre of the flame by a tube; and igniting it at the top of the tube; thus forming a separate and independent flame. That this flame is also hollow, and contains an unburnt mixture, I will prove by leading it out with another smaller tube; making thus a third independent flame from the unburnt gases existing in the first flame. If I increase the proportion of air, I obtain a mixture which will burn without assistance from the surrounding air; the flame becomes at once smaller and solid to the centre, and explodes the gunpowder.

It is possible to produce, with another fuel—*i.e.*, ordinary proof spirit—a much colder flame than can be obtained with coal gas. This I will show you, by saturating a cotton handkerchief and setting fire to it. The flame, although large and important-looking, is so cold that it has not the power even to scorch the handkerchief, which comes out of the trial unharmed. We will test this flame further, and take a ball of explosive gun-cotton, saturate it with the spirit, and set it on fire. As you see, the spirit burns away without having the power to ignite the gun-cotton.

Returning to gas, I will now burn the same quantity as before, in a blowpipe supplied with air under pressure. You see that the flame is again greatly reduced in size; and you can at once judge of the greater intensity of the heat evolved by the ease with which I fuse this mass of iron wire.

In using gas and air as a fuel, we have always to contend with the inert nitrogen which forms four-fifths of the bulk of the ordinary atmosphere. A simple and cheap method of removing this nitrogen is now being worked by the Brin Oxygen Company; and carrying out experiments to the highest limits yet attained in practice, I will show you the same quantity of gas burning with air under pressure, from which this nitrogen has been removed by the Brin process—nearly pure oxygen alone being left. Note, again, that the flame is much smaller even than before; but this aggressively noisy little flame is a power before which few things will stand. Thick copper plates flow before it like water; strong steel boiler plate is fused and perforated in less than a minute; refractory fire-clay is fused into a glass; and a block of lime—one of the most refractory and infusible substances in Nature—although it will not fuse, emits a light of blinding intensity, which gives a fair idea of the actual heat of this insignificant-looking flame.

In flames, as in many other things, we must not judge by appearances, but only by results; and my experiments have very clearly proved that in coal gas we have a source of heat at command which is capable of filling all requirements, and has the special advantages—which are peculiar to itself—of being cleanly, ready for instant service at any time, capable of being used with proper arrangements without the slightest nuisance, and (what is of the utmost importance) costing absolutely nothing except in direct proportion to the service required at the time. We have here a fuel at command for our workshops and our houses which will do perfectly all the heating required in ordinary domestic service, including fires, cooking, bath heating, washing, ironing, clothes drying, and at the same time will light our houses brilliantly; whilst, for workshop purposes, brazing, soldering, small furnaces, and other work, it is a fuel unequalled by any other known. With proper but very simple arrangements, it will do the whole of this work without any nuisance whatever. In fact, both as regards the inside of the building and the outside, it is beyond all comparison cleaner and sweeter than any other known fuel; and it does away with the greatest evil, the sulphur which destroys our buildings and metal work, and renders the air of any large town so offensive—this result being attained partly by the greatly reduced quantity of fuel necessary when coal gas is used, but principally by the removal of sulphur from the gas in the process of manufacture.

That failures occur occasionally in the application of coal gas to domestic and workshop purposes, can only be expected so long as its application is so comparatively recent. But these failures are very rare; and they may be set down to the want of experience in the men who have the responsibility of fixing the apparatus, and also to want of practical acquaintance with the nature of the fuel on the part of the users. The knowledge of what is required is now becoming pretty general; and the failures and difficulties are very rare indeed.

My own house and works are, and have been, practically smokeless from the time they were built; and this result has been obtained from the first at a lower cost than if we had used coal. We will allow that no radical change must be made if general success is to be obtained; and taking as a necessary evil the fact that the kitchen fire is in many houses a necessity in winter for other than cooking purposes, we have allowed it to remain in my own house instead of entirely removing it, as was originally intended. It is burning, probably, for about half of each day during about five months in winter. We tried gas coke; but, like many others who have tried it, we gave it up as a failure, owing to several inherent objections to its practice. In its place we now use a mixture of coal and coke; the fire obtained being brighter, cheaper, and cleaner than when coal alone is used. In the hothouse and conservatories we use coke exclusively; and these are the only fires burning solid fuel. For our cooking, washing, ironing, bath heating, and other fires, we use coal gas exclusively. By this arrangement we not only save money, but we carry out in practice the desires of the Noxious Vapours Abatement Association, by using a much smaller quantity of a purer fuel; and, what is of still greater importance to the small household, the dirt and labour in the house are reduced to less than one-half. So great is the saving that the expenditure on the necessary appliances for the complete service of an ordinary house would nearly or quite be repaid in the first year by saving in cost of labour and wear and tear alone.

Let it be distinctly borne in mind that I do not come before you as a special pleader for the use of gas as a fuel because I am a manufacturer of the necessary appliances. The fact is that for more than ten years before I made any appliances for sale for domestic use, I had the same fuel in daily use for every purpose for which it could be economically applied; and during the last 25 years I have made no change whatever, except in adopting more modern and more economical apparatus. Further than this, the whole of the appliances have been from the first, and are now being used in an ordinary house designed for the use of coal fuel;

absolutely no alterations have been made in fittings or arrangements, except as regards laying the necessary gas-pipes where required. In fact, we could return to the complete use of coal, to the exclusion of gas, at five minutes' notice; and we could remove the whole of our apparatus to any other house with equal facility.

I will now, as a final experiment, heat a small crucible full of broken steel files with the blowpipe previously used, and will fuse both crucible and steel—showing you the enormous power of the fuel we have at instant command; the actual weight of fuel used in this experiment being about 1 oz. Those of you who have had to deal with the production of high temperatures by the use of solid fuel will fully appreciate the value of the servant you have at hand, night or day, at any moment, in every place in which coal gas is to be obtained. In the household we may take an equally representative case as a bedroom fire. Who amongst you has not desired that practically unattainable luxury in the absence of gas, a good bedroom fire every night and morning? And yet this can be obtained with gas without the slightest trouble for less than 3d. per day. The people who would go out of a warm sitting-room to undress in a cold bedroom, for the sake of saving 3d., are few and far between. The value of coal gas for this and endless other purposes requires no special pleading; it simply requires to be known, and the necessary information is spreading rapidly. As the knowledge of its value spreads, so will the demand for all purposes.

SALES OF GAS STOCK AND SHARES.

On Friday last, at the Mart, Tokenhouse Yard, Mr. G. A. Wilkinson sold by auction £50,000 of 5 per cent. perpetual debenture stock of the *South Metropolitan Gas Company*. In opening the sale, the Auctioneer referred to the uninterrupted prosperity of the Company, as proved by the steady annual increase in the quantity of gas sold. In 1877 the consumption was 2,928,123,000 cubic feet; and last year it had reached 5,297,054,000 cubic feet—being an increase in the ten years of 2,368,926,000 feet. He also stated that the capital of the Company amounted to £1,991,500; and the debentures, to £550,000. There was a somewhat small number of bidders present, owing, no doubt, as the Auctioneer remarked, to the fact that several large sales of gas stocks had lately taken place, and that consequently many people had bought all they desired of that class of investment. The prices realized were as follows:—£500 sold at £137 per cent.; £500, at £136 10s.; £500, at £136; £500, at £135 10s.; £500, at £134 10s.; £1000, at £134; £500, at £133; £500, at £132 10s.; £500, at £132; £500, at £131; and £44,500, at £130.

Messrs. Graham, of Newport (Mon.), recently sold by auction a small parcel of stock in the *Newport Gas Company*. £180 of "A" stock, bearing a dividend of 10 per cent., was sold at £205 per cent.; and £350 of "B" stock, earning a dividend of 7½ per cent., produced £154 per cent.

On Monday last week, a few of the old £20 shares in the *Grantham Gas Company* were disposed of by public auction—realizing £45 7s. 6d. and £45 5s. per share.

THE CORPORATION OF DUBLIN AND THEIR ELECTRIC LIGHTING SCHEME.

One outcome of the discussion on this subject at the recent meeting of the Dublin City Council (*ante*, p. 1033) has been the publication of the report of an interview that a representative of the *Freeman's Journal* had with the Town Clerk (Mr. Beveridge) as to the precise effect the resolution adopted by the Council would be likely to have.

Mr. Beveridge said it would not affect the general question at all. The proposed loan of £6000 was for the procurement of plant, &c., and had nothing to do with securing all the necessary authority to the Council for lighting by electricity. Provision had been already made by the Corporation for the expenses incidental to obtaining the Board of Trade Licence and other powers; and a moderate provision had also been made to enable the Committee to put in operation a scheme for public lighting. Had the proposal of the Lighting Committee been adopted at the meeting in question, the Corporation itself would be in a position to undertake the establishment of the installation. He believed the proposal to obtain the loan of £6000 was not known to the Council until the day of the meeting; and it originated with the Committee. With regard to private electric lighting, the Provisional Order could not, owing to legal preliminaries, be obtained until next spring is well advanced; and when obtained it will be of no validity until affirmed by Act of Parliament. The Corporation will not therefore be in possession of powers to undertake any scheme of private lighting until August or September next year. The scheme of public lighting, however, can be arranged by specification, which will provide that the capital outlay in the first instance shall be met by the company contracting for the work. The disadvantage of dealing with contractors in this manner will be that the company will charge a larger amount in order to recoup themselves and leave a profit over, within the limited period of seven years allowed by Act of Parliament for the Licence. But he was enabled to say that a substantial instalment of public electric lighting would be undertaken before next winter; and they will in the first instance carry out the lighting through O'Connell Street, Westmoreland Street, Grafton Street, College Green, Dame Street, Parliament Street, Capel Street, Mary Street, and Henry Street. Referring to the general question of the lighting, Mr. Beveridge told our contemporary's representative he had been informed that the Gas Company are losing by their operations up to the present in electric lighting; but he did not think that possible, unless it were due to the limited field of operation. It is for this reason that the Gas Company are striving so energetically to obtain an extension of the area of operation, in order thereby to create a profit. They are not making any effort, however, for extension of powers; as they claim to have powers under the statute which regulates the proceedings of the Company. But the exercise of any such powers would be subject to stringent regulations by the Board of Trade, presuming that the Board recognized any right whatever in the Company to supply electricity except for their own actual premises. Everyone has, of course, power to light his own premises with electricity; but the construction of wires extending the lighting can, however, only be carried on subject to the usual restrictions. The Town Clerk further remarked that it is plainly laid down in the provisions of the Electric Lighting Act that no application for a Licence to supply electricity will be entertained by the Board of Trade unless consented to by the Local Authority. The Gas Company, knowing that the Corporation would hesitate to give this consent, had based their claim to the necessary powers upon a vague provision in their Private Act of Parliament, although that Act was granted at a date when electric lighting as a financial speculation was not thought of. The Gas Company had endeavoured to obtain permission of the Board of Trade to cut up the streets; but the Board had declined to interfere with the Local Authority on that point. The General Electric Lighting Act provides very plainly that in case a Licence be applied for to the Board of Trade, if the Local Authority also applies for a Provisional Order, the Local Authority will obtain preference. Finally, Mr. Beveridge said the whole question was very tersely put by the Lord Mayor in a

recent speech, in which he said that the entire difference lay between having the scheme dealt with by a Company whose sole object was to make a large dividend and by the Local Authority, who only sought to save itself from loss.

THE ELECTRIC LIGHTING EXPERIMENT AT IPSWICH.

At a Special Meeting of the Ipswich Town Council last Wednesday—the Mayor (Mr. J. H. Josselyn) presiding—the Paving and Lighting Committee submitted a report, in which they stated—referring to their report on the subject of electric lighting presented to the Council on Oct. 24 last, and to the resolution passed by the Council thereon, to the effect that they were prepared to comply with the application of Messrs. Laurence, Paris, and Scott, Limited, for permission to lay cables for electric light and power purposes under the footways along the streets and places specified in the report, on an agreement being entered into by the applicants in such form as Counsel might advise—that on the papers being placed before Council, with instructions to prepare the necessary agreement, he advised that it should not be proceeded with, and that it would be better, and in the end less expensive for the promoters to obtain and carry out their works under a Licence or Provisional Order, as provided in the Electric Lighting Acts. The opinion of Counsel was placed before the promoters, who acquiesced in the views expressed in it; and they had now applied to the Committee for the consent or approval of the Council to an application which they propose to make to the Board of Trade, as early as possible, for a Licence or Provisional Order enabling them to supply electricity within the borough. The Committee were of opinion that the Council should give their approval or consent to this application; but as it was necessary that the approval of the Local Authority to the application to the Board of Trade for a Licence must be given by a resolution passed at a special meeting of the Authority, held after one month's previous notice of the same had been given, no resolution, the report stated, could be passed with regard to it until the meeting which, at the request of the Committee, the Mayor has convened for the 9th of January next. The report concluded by saying: "It is obvious that, under the most favourable circumstances, many months must elapse before the promoters can obtain a Licence or Provisional Order; and as their arrangements will enable them to supply the public with electricity at once, if they are permitted temporarily to put up overhead wires, they have applied to your Committee, under section 14 of the Electric Lighting Act, 1882, for the consent of the Council to their placing electric lines above ground along, over, or across any of the streets of the borough. Under the circumstances, your Committee recommend that this application be acceded to, the permission to be for twelve months only; the wires to be carried over any street at such height as your Committee may in each case approve; the promoters undertaking in the meantime to take all necessary and proper steps to obtain a Licence or Provisional Order."

Mr. GRIMSEY, in moving the adoption of the report, said he might perhaps mention that some few years since an application was made by one of the then numerous electric lighting companies for permission to bring the light into the town of Ipswich. The assent of the Council was asked to making the necessary application for a Provisional Order; and it was ultimately given under certain conditions. Their conduct on that occasion, he thought, might be taken as an indication that they were anxious to give every facility for the introduction of the electric light. The first attempt, however, came to nothing—the Company failing to provide the light within the time allowed; and the ground was left entirely free for any other person to make application. Messrs. Laurence, Paris, and Scott were ready to go on with the work forthwith; and the substance of the report before the meeting was that the Company should be granted temporary permission to put up overhead wires. Thinking that some observations might be made with respect to overhead wires, he had read the report of the Select Committee of the House of Commons in 1885; and this body came to the conclusion that the risk of danger to the public from overhead wires had been greatly exaggerated—the accidents having been few and insignificant.

Alderman NICOLSON, in seconding the motion, expressed the hope that the Council would offer every facility to their fellow-townsmen for obtaining the electric light at the earliest possible date. He did not think that any danger would arise from the mode in which the Company proposed crossing the streets.

Mr. JEFFRIES said he presumed, in giving the required permission, it did not embody a consent for the erection of posts for carrying the wires. While they all wished to see the town well, efficiently, and cheaply lighted, it behoved the Council to be very careful what permission they gave.

Alderman WRINCH remarked that they could not dissociate the resolution before the Council from the question they were to consider on Jan. 9 next, with reference to the application for a Licence or Provisional Order. He was entirely in accord with the opinion that the Council should give every facility for bringing the electric light into Ipswich; and what he wished to learn, at an early stage of the proceedings, was whether, by giving their approval or consent to the present Company to apply to the Board of Trade, the Council would be granting a monopoly to that Company, or whether it would be open to any other company to compete with them.

The MAYOR replied that he was advised by the Town Clerk that it would be open to any other company to compete.

The TOWN CLERK: Except so far as the Board of Trade might otherwise direct. But that, of course, is beyond our control.

Mr. D. FORD GODDARD remarked that it was undoubtedly open to two or more companies to compete before any one of them had obtained a Licence or Provisional Order; but he was not sure whether the same freedom existed afterwards. Was he not right in supposing that both the Licence and the Provisional Order conferred a right to the sole supply of the electric light—the one for a limited, and the other for a longer period of years.

The TOWN CLERK said that it was open to two companies to have each a Licence or Provisional Order. He did not think that either necessarily conferred a monopoly.

Mr. GODDARD observed that there were no cases in which two Provisional Orders or two Licences had been granted for the same town.

The MAYOR said he was sure it would be to the advantage of the town if the Company were given the required permission. The town had very good gas at present; but competition with the electric light would probably result in the supply of still better gas.

The resolution was carried unanimously.

Mr. GODDARD, at a later stage of the proceedings, said that the Council would be asked, on Jan. 9, to give their approval or consent to an application to be made to the Board of Trade by a certain Company. Did that mean that the Council would withhold opposition; and if so, would the form of Licence or Provisional Order be laid before them previous to the meeting? Would they have an opportunity of opposing any clause?

The TOWN CLERK said he had no doubt the Council would have every opportunity of examining the form of Licence or Provisional Order before it was granted. The consent of the Local Authority was a preliminary step which the Company were compelled to take in order to obtain *locus standi* for making an application; but proper notices must afterwards be served upon the interested parties, including the Local Authority, who would, of course, be heard upon the merits of the Licence or Provisional Order. It was difficult for him to say whether a monopoly would be created. The whole thing was in the hands of the Board of Trade, who had certainly the power, as he read the Act, to grant Licences or Provisional Orders to two companies for supplying the same area. Whether or not they did so, would probably depend upon the special circumstances of the case—how the first company were fulfilling their obligations, and so forth.

Alderman MASON asked whether in giving permission to apply for this Licence or Order, it would necessarily apply to the whole of the town, or be confined to a certain portion? In the latter case, the Council would not be giving any person a monopoly of the whole town.

The TOWN CLERK thought the area could be limited. The same question was mooted when the electric light application was considered before; but it was pointed out that it would only pay to light the centre of the town, and that, even if limited to that area, it might have the effect of shutting out any other company.

THE ELECTRIC LIGHTING EXPERIMENT AT LEAMINGTON. GROWING DISSATISFACTION IN THE COUNCIL.

At the Monthly Meeting of the Leamington Town Council last Monday—the MAYOR (Alderman S. Flavel) presiding—an animated discussion respecting the electric lighting of the town ensued on the presentation of the minutes of the Watch Committee. These stated that the “Committee were strongly of opinion that a decision should be at once arrived at on the subject of the recent experiments by the Electric Lighting and Power Company, and that the Council be requested to ascertain immediately the cost of the three alternative systems used, and bring to an issue forthwith the question of adopting one or the other, or rejecting all of them.”

Alderman WACKRILL moved the adoption of the report. In regard to the electric lighting experiments, he said that the Committee thought there had been time for everyone to judge of the effect of the various kinds of lighting tried. This being so, the Committee considered the Council should take steps to endeavour to ascertain the cost of the three systems; so that they might be able to discuss them on their merits. At present he had no estimate of the cost of the systems; and the Surveyor informed the Committee that, as yet, no estimate had been sent in by the Electric Light Company. He therefore thought it would be well to wait until they knew the actual cost of the different systems.

Alderman GILBERT, in seconding the motion, said the town was anxiously waiting to know what was going to be done with respect to the electric lighting experiments which had been carried on in the main thoroughfare of the borough. He happened to be the member of the Watch Committee who moved the clause which suggested that the Council should be urged to at once put in action any powers they possessed for bringing the Electric Light Company “to book,” as to what terms they were going to offer for the three alternative systems which had been tried. He was glad that he succeeded in getting this clause embodied in the Committee’s report, because it would give every member of the Council an opportunity of saying what they pleased on this important question. He believed that there was a Committee appointed, before the 9th ult., to take into consideration this matter. Nothing, however, appeared to have been done; and he thought it desirable that this question should come before the Council immediately. If some of them lived on the Parade where he did, and saw the continual flickering of the arc light, they would think it was quite time that the Electric Light Company were asked what they were going to do. The “Sunbeam” lights appeared, so far as he could judge, to be the most steady light, and one that the Council might accept if the terms suited the ratepayers’ pockets. The arc lights gave a splendid light when they were all right; but, at varying intervals, they gave very little light at all, and then suddenly there would be a brilliant glare. In Bath Street there were what might be called double burners; but the ratepayers in that locality were not at all satisfied with them. He thought it desirable they should at once appoint a Committee to ask the Electric Lighting Company to tell them, in a very short time, the cost of the three systems of lighting, and also what they purposed doing in the future.

Mr. FELL agreed with a good deal that Mr. Gilbert had said; but he did not think it would be wise to discuss the matter until they had before them statistics as to cost.

Mr. CROWTHER DAVIES said he was very glad to see the recommendation of the Watch Committee. It had always been a great grievance with the Electric Light Company that those who criticized their system of lighting, according to Mr. Chamberlain, went out of their way to reflect upon their ability as electrical engineers. He should hesitate very much, either in his seat on the Council or elsewhere, before he made a public reflection upon a man, or a firm, acting in a business capacity. He thought there was a very glaring comment upon that grievance of Mr. Chamberlain’s in the front of the Town Hall. It was expressly stipulated, and it was distinctly promised, that the arc system exhibited by the Company should be as good as it could be—that was to say, there should be no doubt it should be presented as perfect as the arc system could be. He was not reflecting upon the electrical skill of the Electric Lighting Company; but he asked the members of the Council to see the exhibition of it night after night, outside the Town Hall. There, one of the four arc lights was invariably unsatisfactory; two, frequently; three, sometimes; and four, occasionally. (Laughter.) Would anybody think he was speaking too warmly, or with too much emphasis, when he protested, in as firm a manner as he could, against it being assumed that the exhibition of these four arc lights was any real exhibition of what the arc light could do. He thought there was a pretty general consensus of opinion that the system in force in the Upper Parade afforded a very beautiful light. He had gone out of his way to ascertain informally what the “Sunbeam” light would cost if adopted on the Parade. The estimate was approximate only; but he was assured that it came from head-quarters. If then the Parade was efficiently lighted by the “Sunbeam,” it would cost the ratepayers very close upon £600 a year. This was the only one of the three systems that was likely to be adopted; and he was convinced the ratepayers would not stand it at that price. He was sure they would not adopt the arc system, which was one of the worst he had seen; and he was certain they would not stand the old single light, or the inefficient double one in Bath Street. It was ridiculous to suppose that the little glass globes, with a little bit of red-hot wire inside, would ever be such an advertisement as would attract people to Leamington. Why they would not attract a moth, much less a visitor. (Laughter.) He hoped the Electric Light Company would be able to quote such a price for the “Sunbeam” light as the Council could accept. But he was afraid from what he heard of the cost, and the frequent renewals of the filament (which, he believed, had to be renewed

every three months) that the Company could not name a price which would pay properly, and which the Council would be willing to give.

Mr. B. WHITE said that, about two months ago, he made the same suggestion that had now been made by the Watch Committee, that the Town Clerk should ascertain the relative cost of the three different systems of electric lighting; and he was laughed at then. Messrs. Chamberlain and Hookham undertook that the experiments should not for a month be regarded as a breach of their contract. He wished to ask what was now the position of the Council, as that month had long since expired.

The SURVEYOR stated that the month’s experiments agreed upon would not end until the following Thursday night.

Mr. FELL complained that some of the electric lamps were not giving a light of even 6 candles. He held that there should be power in the contract for the Corporation to clean the lamps, and charge the cost to the Company, if they neglected to do so. Some of the lamps were simply disgraceful.

Dr. THURSFIELD agreed with Mr. Davis that the arc light exhibited was very bad indeed; and he thought that there were very much better arc systems. If Messrs. Chamberlain and Hookham could supply a better arc system, he should like to know what would be the cost, particularly as he was given to understand that the “Sunbeam” had this defect, that the longer it was burnt the dimmer it got, as the filament of carbon burnt deposited on the glass, and so a portion of the light was obscured. He understood the life of a lamp was very short, which made maintenance and renewals very costly.

Mr. JOHNSON inquired what would be the position of the Council on Thursday, when the experiments would end.

The TOWN CLERK: You will have to revert to the contract; and they will have to give you 16-candle electric lights.

Mr. JOHNSON: The sooner notice is given to stop that the better.

Alderman WACKRILL, replying on the discussion, agreed that the arc light was a most miserable failure. They were all apparently pretty well agreed as to which gave the best light; but, before they could decide upon anything, they wanted to know definitely what would be the cost.

The report of the Committee was then adopted.

ALLEGED LEAD-POISONING BY THE BRADFORD CORPORATION WATER.

A number of cases of lead-poisoning have occurred recently in some of the out-districts supplied with water by the Bradford Corporation. In addition to those referred to at the meeting of the Birstall Local Board (noticed below), cases of lead-poisoning have occurred in the district of the North Bierley Local Board. Dr. Whitterton, the Medical Officer to the latter authority, states that he has had several cases reported to him by other medical men in his district; and not being thoroughly satisfied, after examining the cases so reported, that they were due to lead-poisoning, he recently sent to local analysts two samples of water drawn from mains in different parts of his district. In each case the result has proved the presence of lead in small quantities. Many complaints of the condition of the water have recently been made to medical officers in the out-district; and in almost every case where such is practicable, people are ceasing to use the water. Complaints will be made shortly to the Bradford Corporation by several local boards in the out-districts.

At the meeting of the Birstall Local Board yesterday week the Medical Officer (Dr. Forsyth) reported that during the month he had had many complaints as to the quality and purity of the town’s water; and some that he had examined contained slight traces of lead. He recommended the Board to have some water taken direct from the mains and examined by a public analyst as to its purity and fitness for use. Mr. Lister said that in the lower parts of the town the water was filthy and quite unfit for man or beast to drink. He had an idea that the Bradford Corporation were not sending them the high-level water at the present time. Mr. Mason remarked that the Board had spent much money in appliances for cleansing the mains; but for nearly three years those appliances had not been used. If they were used oftener, the water would be improved. Mr. Senior said it was time the Board took action in the matter. He had knowledge as to one serious case in Birstall of lead-poisoning. The man had been in Leeds Infirmary for a month; and on Saturday the Infirmary officials wished to remove him in order to make room for thirty like patients from Pudsey, which was being supplied with the same water as Birstall. There were also a few cases in Gomersal and Drighlington of the same character. He moved that samples of the water be taken before it entered the Board’s reservoir, and also from the mains in other parts of the district, and analyzed; the Water Committee to take such further action as they thought necessary. Mr. Lister seconded the motion. Mr. Lawrence (Chairman of the Water Committee) said he had not heard of any cases in Birstall; but he had from Howden Clough. He had been informed that in the case referred to by Mr. Senior, the man’s illness had been caused by his practice of leaving water in a copper kettle all night in readiness for the morning. The motion was carried.

The record of the proceedings of the Water Committee presented at the meeting of the Bradford Town Council last Tuesday contained an item to the effect that the Town Clerk had made arrangements for another visit to the Bradford watershed by Dr. Tidy, in order that this gentleman might prepare another report on the state of the water. The visit had been arranged for the 17th inst.; and it had been decided that the deputation which had joined him on the former occasion should again accompany him. Alderman Holdsworth, the Chairman of the Committee, in moving that the minutes should be adopted, said that no doubt many of the members had seen a report in the newspapers of that morning with regard to lead-poisoning from Bradford water in some of the out-districts. So far as the Committee were concerned, they had had no complaint whatever from these districts. Further than this, the water discharged out of the mains contained no lead whatever. As to the statement that the water was filthy, the Committee did not send out the water in such a condition. He thought that if the cases of alleged poisoning had been serious, some report would have been sent to the Council. He considered that it was only right to allay any uneasy feeling that might have arisen because of the complaints made. Mr. Hope seconded the motion; and the minutes were then adopted.

DISPUTED WATER-RATES AT SKIPTON.—At the Skipton County Court last Thursday, the Rural Sanitary Authority of the Skipton Union sued Mr. John Coulthurst, a Skipton magistrate, for £21 7s. 6d., for water-rates for three half years. The defence was that the plaintiff had not had the supply of water to which he was entitled. The Judge ruled that there was no case to go to the jury; and a verdict was accordingly entered for the amount claimed. A counter-claim was then heard, in which Mr. Coulthurst sued the Sanitary Authority for the sum of £25 damages for the needless expense and inconvenience to which he had been put consequent on the Authority not giving him a proper water supply. In this case also his Honour ruled that there was no case to go to the jury; and a verdict for the Authority was given.

METROPOLIS WATER SUPPLY.

According to the returns furnished to the Registrar-General by the London Water Companies, the average quantity of water supplied daily to the Metropolis during the past month was 157,969,825 gallons, against 154,782,305 gallons in the corresponding month of 1887. The number of houses served last month was 745,662, or 212 gallons per house, and 27·2 gallons per head of the population. In November, 1887, the number of houses supplied was 732,120; and the quantity of water allowed for each person 27·1 gallons. Of the entire bulk of water supplied last month, 78,048,405 gallons were drawn from the Thames, and 79,921,420 from the Lea and other sources.

In his report to the Registrar-General on the quality of the Metropolitan water supply last month, Dr. E. Frankland observes: "Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies and by the Tottenham Local Board of Health, was: Tottenham, 0·7; Kent, 0·8; Colne Valley, 1·4; New River, 2·3; Grand Junction, 3·6; Southwark, 4·1; East London, 4·4; West Middlesex, 4·6; and Lambeth, 4·7. The Thames water sent out by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies contained, as is usual at this season of the year, a markedly increased quantity of organic matter, as compared with that in the samples of some months past. The increase was least conspicuous in the case of the Grand Junction Company's water. Notwithstanding this increased proportion of organic matter in the river water, all the samples were clear and bright on delivery. The water principally derived from the River Lea, and distributed by the New River and East London Companies, exhibited a corresponding increase of organic matter; the actual proportion present in the New River Company's water was, however, less than in any of the other river supplies. Both samples were clear and bright. The deep-well waters of the Kent and Colne Valley Companies and of the Tottenham Local Board of Health contained, as usual, only a very small proportion of organic matter. The Colne Valley Company's water was softened by treatment with lime before delivery, although the softening had not been carried as far as usual."

THE QUALITY OF THE SOUTH-WEST SUBURBAN WATER COMPANY'S SUPPLY.

In the House of Commons on Monday last week, replying to a question on this subject by Mr. Pickersgill, the terms of which appeared in our issue of the 11th inst. (p. 1023), Mr. Ritchie said: Two complaints have been received by the Local Government Board with reference to the quality of the water distributed by the South-West Suburban Water Company, who supply a very considerable area. The last of these complaints was made by the Staines Local Board in June last. The Local Board admitted that the Company's water was periodically analyzed on behalf of the Company by Professor Atfield, who certified it to be pure; and the Local Government Board have been furnished by the Company with these analyses, which, it appears, are taken monthly. The analysis for October certifies that the sample taken is a most excellent sample of water for drinking, cooking, washing, and steam purposes generally, and for manufacturing operations. The Board have no control over Water Companies outside the Metropolis similar to that exercised by them under the Metropolis Water Acts. I am not aware that a Local Authority has power to claim the right of inspecting the works of this Company. But it is the duty of the Company under the Water-Works Clauses Acts to keep in their pipes a supply of pure and wholesome water; and I presume that the Company would be liable to indictment for failure to comply with this statutory requirement. I cannot give any undertaking that the Government will propose that they should appoint water examiners for the Water Companies in England and Wales outside the Metropolis; but it may well be a question whether, when County Councils have been constituted, it may not be desirable that some such powers should be conferred on them.

THE NEW WATER-WORKS AT RIPON.

The ex-Mayoress of Ripon (Mrs. Baynes) yesterday week performed the ceremony of turning on the new supply of water for the city of Ripon, the works for which have been in construction at Lunley Moor, 6 miles from Ripon, during the last two-and-a-half years, at a cost of £25,000. For several years the city has been supplied with water pumped from the River Ure to a service reservoir at Lark Hill. The Ure water is fairly pure, and has about 11° of hardness; but the cost of pumping has been a constant source of expense and annoyance by the breakdown of the machinery, to save renewal of which the new works were undertaken. The construction of these, which are on the gravitation principle, were entrusted to Mr. R. Carter, C.E., of Harrogate, and comprised the building of an embankment across the Holborn Valley to intercept the water of the Holborn Beck. This, with the filter beds and service reservoir at High Cross, 2 miles from Ripon, was estimated to cost about £15,000; but the great difficulties met with in making the puddle-trench involved additional outlay to the extent of £10,000. The works, as completed, are of a very durable and permanent character; and the reservoir at Lunley Moor contains at the present time quite twelve months' supply of water. The works were entirely carried out during the three years' mayoralty of Alderman Baynes, whose term of office expired in November last; and it was thought a fitting compliment that Mrs. Baynes should be asked to turn on the new supply. As already mentioned, the ceremony took place yesterday week, at the west entrance to the city. There were present the Mayor (Mr. H. M. Thirlway), the members of the Corporation, Mr. Carter (the Engineer) and a large attendance of the public. The ex-Mayoress turned the valve; and afterwards offered her congratulations on the completion of the scheme. The ceremony of presenting a silver key to the ex-Mayoress took place in the Town Hall; the Mayor officiating. Alderman Baynes, in acknowledging the gift on behalf of the ex-Mayoress, reviewed the subject of the water supply of Ripon and the establishment of the present works. The old pumping-works, he said, were carried out in 1864-5, at a cost of £10,000; and they were further improved in 1877-8, under Mr. Hawksley, at a cost of £8320. Pumping from the River Ure was found to be unsatisfactory, owing to the liability of the water to pollution, and the uncertainty of supply; and in June, 1886, Parliament gave powers for carrying out a gravitation scheme. Lord Ripon and other land-owners granted the required facilities; and a permanent reservoir was established, which, if anything, erred on the side of capacity and strength. It had a drainage area of 660 acres. The land purchased was 48 acres, of which the reservoir occupied 27 acres when full, and contained 92 million gallons of water at a depth of 32 feet. The discharging capacity of the pipes was 750,000 gallons per day; while the actual daily supply was 200,000 gallons. The reservoir was 420 feet above the city; and with the breaking of the pressure at High Cross, Studley, 70 feet additional pressure over the old supply was obtained. The estimated annual charge during the next seven years, including payment of the old debt, was

£2406; the income being £1800, and the amount to be charged on the district rate £606. The average charge on the district rate for the last ten years for the old works had been £544. There would be a great saving to the citizens in the softness of the new water (3·4°); while there would be a daily surplus of 200,000 gallons for distribution among fourteen outlying townships (if required) at 6d. per 1000 gallons, which would increase their income largely. At the close of the proceedings, the Mayor and members of the Corporation were entertained to tea by Alderman and Mrs. Baynes.

THE BRADFORD CORPORATION AND THE SUPPLY OF WATER IN THE OUTSIDE DISTRICTS.

Some correspondence has recently taken place between the Clerk of the Liversedge Local Board (Mr. T. Mitcheson) and Mr. W. T. McGowen, Town Clerk of Bradford, relative to the water supply furnished by the Corporation to the Local Board district. In answer to a letter Mr. Mitcheson wrote to Mr. McGowen, asking whether the Bradford Corporation were prepared to release Liversedge from the limits of their water supply district, the Town Clerk of Bradford wrote to the effect that the Water-Works Committee had repeatedly warned the Liversedge Local Board of the fact that their water supply could not be satisfactory so long as the Board was content to accept the leavings of prior takers of water on the same line of service; and that the Committee had as constantly suggested to the Board several alternative means by which Liversedge could have a supply direct from the Bradford works. It was for the Board to determine which of these courses would best suit them; but up to that moment they had never favoured the Committee with their wishes. The Bradford Corporation were not willing to part with any of their customers, as they were pressed to undertake water-works far larger than their own immediate requirements, so as to assist their neighbours; and having incurred such heavy costs and responsibilities, in yielding to such pressure, they thought it most unreasonable that they should be asked to allow a portion of their district of supply to be withdrawn without any default on their part, whilst all their liabilities were to continue. In answer to this, Mr. Mitcheson wrote, on the 16th ult., stating that the Board could obtain a better supply of water at a cheaper rate than Bradford could supply them at. In a letter dated Nov. 20, Mr. McGowen pointed out that the water supplied by Bradford was exceptionally pure; and as to price, possibly some authority having surplus water at the moment might sell it at a loss in order to get a customer. That would soon cease; and the Halifax people, ready as they appeared to invade their neighbour's district, required the Liversedge Board to construct a storage reservoir at their own expense to eke out the supply. He stated also that Bradford supplied Liversedge with water when the latter were in utter destitution as to water, and that it was not usual when one party had undertaken costly responsibilities to assist another, that the latter should seek to evade its fair reciprocal obligations merely because somebody else made an offer proffering to afford temporary advantage. When this correspondence was read at the Local Board's meeting last week, it was resolved to discuss the matter in private; and no intimation has been given as to the conclusion arrived at.

THE CHARGES OF THE SOUTH STAFFORDSHIRE WATER COMPANY.—At the meeting of the Walsall Town Council yesterday week, reference was made to the defeat of the South Staffordshire Water-Works Company's Bill in Parliament last session; and Mr. Beddows asked if it was true that the Company were raising their rates. The Town Clerk said that he had heard so; and so far as he could learn, they were putting up the price a few pence per quarter on many houses. The Council could not interfere; and any private person who went to law might be "landed" in some hundreds of pounds cost over perhaps 1s. a year. He believed the Company were taking advantage of that. In the course of the subsequent proceedings, it transpired that the outlay incurred by the Council in opposing the Company's Bill amounted to £1148.

THE PROPOSAL TO SUPPLY WATER GAS AT HAWES.—Last Saturday week a meeting was held at Hawes, to hear the report of the delegates appointed by a previous meeting (*ante*, p. 943) to visit Leeds Forge, and report upon the practicability of lighting Hawes with water gas. The report was summed up as follows:—"In conclusion we give it as our opinion that on the following points water gas has a distinct advantage over coal or any other gas with which we are acquainted:—(1) Less labour is required in its manufacture, on account of the less complicated nature of the producing apparatus and the rapidity with which the gas is produced; (2) the absence of all bad smells about the gas-works, which would allow them to be placed in any position without creating a nuisance; (3) the quality of the light is much better—it is steadier and purer than that of ordinary coal gas, while there are no bad smells given off in a close room; (4) by reason of the above absence of smell and the greater heating power of water gas, we are of opinion that it is admirably suited for heating and cooking purposes, and we think that in this direction it will be much more extensively used than coal gas; it is also claimed for it that it is superior to coal gas for use in gas-engines. The only disadvantage we notice in the water gas as compared with coal gas is the requirement of the magnesium combs, which are necessary to be removed at periods of about 100 hours of actual burning. But as they are so very cheap and so easily adjusted, we do not attach much importance to it as against the above advantages. On the whole, our conclusion is distinctly in favour of water gas as compared with coal gas."

MR. S. R. OGDEN ON GAS MAKING.—By invitation of Mr. S. R. Ogden, the Engineer of the Blackburn Corporation Gas-Works, the members of the Blackburn Literary Club last Friday week visited the Addison Street station of the Corporation. The party were conducted round the works by Mr. Ogden and his son, who afforded ample explanations of the part played in the manufacture of gas by the different portions of the plant. After the inspection, the company were entertained to tea by Mr. Ogden, who subsequently delivered a lecture in the Literary Club Rooms, on "Gas and Gas Making." The first part of the lecture was devoted to a historical narrative of the progress of gas lighting—from the time of Murdoch down to 1818, when gas-works were established in Blackburn by a private Company, with a capital of only a few thousand pounds. At the present time, said Mr. Ogden, the capital of the Corporation gas-works amounts to £340,000. The Company made no profit for six years. There were no meters then; and the price of gas was fixed by the number of jets used, and the number of hours it was agreed the gas should burn. When meters were first put into use, the price of gas was fixed at 12s. per 1000 cubic feet. Mr. Ogden then pointed out how gas was made—tracing the manufacture of the gas from the retorts until it entered the mains for distribution to the consumers. He said it is calculated that there are about 100,000 gas-jets in use in Blackburn, and remarked that consumers sometimes lost 20 and 40 or even 50 per cent. of the illuminating power through the use of ill-contrived burners. At the close of the lecture, votes of thanks were given to Mr. Ogden for his kindness and hospitality, and to the Chairman of the Gas Committee (Alderman Thompson) and the members for granting permission to visit the works.

THE DETECTION OF WATER LEAKAGE AND WASTE.

THE EDINBURGH WATER TRUST AND WASTE-WATER METERS.
The Edinburgh Water Trust, at their meeting on Thursday last, received a report from their Engineer (Mr. R. Coyne, C.E.) embodying the results obtained in some experiments with waste-water meters. The report stated that test meters had been put on some street service-pipes which supply various individual houses, and also on the main-pipes which supply certain small districts. Before doing so, a careful inspection of the water-fittings was made in the various houses, with the view of having any faulty apparatus repaired; so that there should be no waste from defective apparatus when the meters were fixed. The meters were afterwards inspected at midnight, and were found standing still; clearly proving that there was no waste from either the pipes or the apparatus. A meter was connected to a house in Douglas Crescent (having ten inmates, including servants), for a period of 27 days. The daily average consumption per head was 42 gallons; and the maximum consumption per head in one day was 57 gallons. A meter was connected with a house in the Eglinton Crescent district (having 17 inmates) for twelve days. The daily consumption per head on an average equalled 30 gallons; and the maximum consumption in one day was 36.47 gallons per head. On another house in this district (having twelve inmates) a meter was put on for 20 days; and the average consumption per head per day was 46 gallons; and the maximum daily consumption per head was 75.83 gallons. To a house in the Drumsheugh district (having 21 inmates) a meter was put on for 31 days. The daily average consumption per head was 46 gallons; and the maximum daily consumption per head was 72.38 gallons. In the Dean district, for a house having nine inmates, a meter was put on for 30 days. The average daily consumption per head was 31.8 gallons; and the maximum daily consumption per head was 46.6 gallons. A meter was connected with a house in the Charlotte Square district (having eleven inmates) for 20 days. The average daily consumption per head was 55 gallons; and the maximum daily consumption per head was 61.8 gallons. For another house in the same district (having six inmates) a meter was put on for 20 days. The average daily consumption per head was 85.2 gallons; and the maximum daily consumption per head was 97.5 gallons. In regard to the district meters, one governed for 20 days the north section of Magdala Crescent, containing a population of 76. The average daily consumption per head was 46 gallons; the maximum daily consumption per head, 54.2 gallons. In the Eglinton Crescent (population, 197), a meter was fixed for 21 days. The average daily consumption per head was 44.2 gallons; and the maximum daily consumption per head, 52.4 gallons. In a trial in the Belgrave Crescent district, with a population of 672, the average daily consumption per head was 48.8 gallons; and the maximum daily consumption per head, 52.5 gallons. In the course of the discussion which followed, it was stated that there was absolutely no waste brought out in Mr. Coyne's report—the water was all consumed within the houses. In moving the adoption of the report, Bailie Archibald explained that one of the reasons why they did not accept the offer of the Deacon Meter Company to provide certain meters free of charge was that they wished to be independent. Another reason was that they had plenty of water just now—millions of gallons—running over, obviating the necessity of their going in for any large expenditure in the checking of waste. He did not think they should run away with the idea that, because there had been excessive waste detected in other towns, the same waste existed in Edinburgh. There was waste, no doubt, in even the best regulated supply; but he could not believe for a single moment that anything like half of the supply was absolutely wasted. They had been told that Manchester and Liverpool had done great wonders with this meter; but these towns brought themselves to a water famine by trusting too much to the Deacon meters. However, these large towns such as Manchester, Liverpool, and Glasgow, were not now trusting to the Deacon or any other meter. Glasgow, with their experience of the Deacon meter, had deemed it expedient to go to Loch Katrine for an additional 50 gallons per head, and at an expenditure of one million pounds. There the supply was 50 gallons per head per day, of which 15 gallons were used for trade purposes. The city was at present bringing in a new supply at a cost of £100,000. As near as they could estimate, the Edinburgh supply for public sanitary purposes amounted to 10 or 12 gallons per head. Manchester (which last year, and even this year up till the summer, experienced a water famine) was now making provision for an additional 50 million gallons per day from Thirlmere, at a cost of about 4½ million pounds sterling. Liverpool was also providing an additional supply of 40 million gallons daily, at a probable cost of two million pounds. Comparing rates, the rate in Edinburgh was 6½d. in the pound; while in Manchester it was 9d., and the public water-rate 3d. He thought Edinburgh had great reason to be thankful for the abundance and purity of its supply of water; and they need not be alarmed or believe that one-half of it was going to waste. The report was adopted.

THE "SCOTSMAN" AND THE USE OF THE DEACON METER.

Concerning the utility of the Deacon meter for the detection of water waste and leakage, additional letters to those already published (*ante*, p. 993) have appeared in the *Scotsman*.
Brief but satisfactory testimony of the usefulness of the system is afforded by the General Superintendent of the East London Water-Works Company (Mr. H. A. Hebler), who states that in the districts governed by the meters, the consumption of water per day per head of the whole population was, before the application of the system, 26.53 gallons; and after a thorough inspection by means of the meters, 16.14 gallons—a saving of 10.39 gallons per head per day. The area treated had a population of 68,808.
Mr. J. M. Restler, M. Inst. C.E., the Engineer of the Southwark and Vauxhall Water Company, has also communicated his experience with the Deacon meter. He says that for the last five years his Company had been gradually introducing the constant supply to their districts; having during that time transferred nearly 50,000 houses, and at the present time have 110 meter districts controlled by waste-water meters. The quantity of water supplied by the Company averages 30 gallons per head per day for the whole of their district; but for the month of November, the average daily supply per head for the 103 meter districts working on constant supply was 18.87 gallons. For the same month of 1887, the average daily supply per head to the 65 meter districts working on constant supply was 21.73 gallons; and for November, 1886, the average for the 34 meter districts working on constant supply was 22.32 gallons. He is of opinion that if the constant supply had been given to those districts without the aid of the waste-water meter, it could only have been done by there being a great increase on the average of 30 gallons per head per day, instead of the decrease as shown. He mentioned that the Company propose to transfer 18,000 more houses during next year, and that waste-water meters will be fixed for the whole of these.
Mr. W. de Normanville, Assoc. M. Inst. C.E., the Borough Engineer of Leamington, describes the invention as "most valuable," and the results obtained at Leamington support this assertion. He says that the meters were fixed early in the year; but they have only been used intermittently—practically for about six months. They have been especially useful in

pointing out defective ball hydrants, the waste from which was running away underground, and was thus unknown. More than 100 cases have thus been detected. The following table shows the comparative consumption of water in the town before and after the application of the meters. Half the meters were fixed November, 1887; the rest in February, 1888:—

Consumption of Water in Gallons per Head per Day.

	1886.	1887.	1888.
January	23.7	23.4	18.8
February	23.9	21.1	17.5
March	21.5	22.2	16.1
April	21.3	22.3	17.0
May	20.6	21.3	18.0
June	24.9	27.6	18.1
July	23.5	26.6	16.5
August	24.2	24.0	17.7
September	23.0	24.4	19.4
October	22.0	24.2	17.0
November	23.6	19.7	15.8
December	22.0	20.2	—
Average	22.8	23.3	17.4

In the middle of the current year the meters were not used, nor any inspection carried out.
A marked decrease in the quantity of water supplied per head of the population since the Deacon system has been in use in Penzance is reported by the Borough Surveyor (Mr. G. H. Small). This gentleman gives a table showing—(1) The average rate of supply per head per day for first seven days of testing in the borough; (2) the average rate of supply per head per day for the first seven days in May, 1888; and (3) the rate of supply per head per day on Nov. 21, 1888. With respect to the last column, the records are generally higher than usual; but, as accounting for the excess, he says the Water Inspector has reported sufficient defects in services to cover it, and these are in process of being remedied.

Total Supply in Gallons per Head per Day.

District.	Popula- tion.	Date of First Testing.	Rate per Head per Day (average of first 7 Days).	Rate per Head per Day, May, 1888 (average of first 7 Days).	Rate per Head per Day, Nov. 21, 1888.
Market Jew Street .	1453	Dec., 1885	47.14	24.58	24.89
Alverton	1200	May, 1887	35.45	16.39	18.25
Folly	1500	May, 1887	44.73	17.96	21.40
Queen Street	1530	May, 1887	32.23	17.24	18.56
Bread Street	590	May, 1887	67.38	26.88	36.27
Clarence Street . . .	150	May, 1887	27.55	20.87	30.60
Windsor Terrace . . .	290	May, 1887	38.00	15.66	17.82
Taroveer Road	2750	May, 1887	38.06	16.34	19.25
Chapel Street	1450	Nov., 1887	28.25	11.29	14.91

REDUCTIONS IN PRICE.—The Directors of the Oxford Gaslight Company have decided to reduce the price of gas on the 1st prox. from 2s. 8d. to 2s. 6d. per 1000 cubic feet.—The substantial reduction of 6d. per 1000 cubic feet (from 3s. 6d. to 3s.) is announced as from the end of the current quarter by the Directors of the Bromley Gas Consumers' Company.—The price of gas in the Cranbrook Gas Company's district has recently been reduced to 3s. per 1000 cubic feet.

PROPOSED EXTENSION OF THE COLNE LOCAL BOARD GAS-WORKS.—Yesterday week, at the meeting of the Colne Local Board, a report was presented by the Gas and Lighting Committee, from which it appeared that negotiations had been entered into for the purchase of the Spring House estate for gas-works extensions; and the Clerk read a letter from Messrs. Hitchen, Son, and Lancaster offering the property for £2000. It was decided that the Clerk should reply agreeing to the price, subject to the Board procuring the necessary powers to effect the purchase.

READING CORPORATION WATER SUPPLY.—At the meeting of the Reading Town Council on the 6th inst., it was reported that the revenue for the last half year showed the balance of surplus profits to be £1816 16s. 2d., after payment of all charges; and this sum was carried to the district rate account. Alderman Andrewes, who had just previously been re-elected Chairman of the Water Committee, in proposing the adoption of the minutes, said the profits this year were something abnormal, owing to decreased expenditure in several departments, and an increased source of revenue.

SUGGESTED ACQUISITION OF THE BRIERLEY HILL GAS-WORKS BY THE LOCAL BOARD.—At the last meeting of the Brierley Hill Local Board, Mr. J. Skidmore moved the following resolution:—"That the Clerk be instructed to write to the Clerks of other Boards, who, not long ago were similarly situated to our own, in regard to the gas supply, and who have now built or purchased gas-works for their towns, and solicit information as to the working thereof, either probable or otherwise, and whether the building or purchase had been the means of reducing rates out of the profits, and giving consumers better gas at a cheaper price, together with any further particulars they may be disposed to give." He said that the motion was simply one for inquiry, and hardly needed to be supported by statistics or argument. It was well known that in many places the gas-works were the property of the local governing bodies, and that they produced revenue which went in the reduction of the rates. It was the duty of the Board to do anything they could to lighten the public burdens; and an inquiry such as he proposed might enable them to take some further step which would tend to this object. Mr. M'Millan seconded the resolution, which was unanimously agreed to.

NORTHERN COAL TRADE.—The demand which usually sets in before the holidays is giving greater activity to the coal trade, especially of Durham. Steam coal promises better for the next year; and one of the chief collieries is asking 9s. per ton, f.o.b. in the Tyne, for large contracts. Second-class coals do not sell freely, however; and small steam coal is very abundant. For gas-coal the demand is now at its highest point; and as the range of freight for steamers is easier, there has been advantage taken thereof, and much more coal has been sent out—indeed, it is years since the shipments of gas coal from Durham have been as heavy as they were last week. Prices vary; but an idea of how they are going may be gained from the fact that a large contract for an Italian town is now under discussion, and there have been tenders sent in which vary from 7s. 6d. to 8s. for best gas coals f.o.b. in the river. It is, however, for shipment during the next few months. Household coals are in moderate demand; but the seasonable weather will improve the demand. In the next week or so, the production of coals generally will be very heavy, as usual before the end of the year; and afterwards it must be expected that there will be a declension in demand for gas coals, for the period of the largest consumption will have been passed locally at least.

NOTES FROM SCOTLAND.
(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday.*

Although Mr. Defries's extraordinary statements in his comparison between gas and oil have been sufficiently exploded by the article in this week's JOURNAL, I am anxious to show how the question is affected by the state of matters in this district. Mr. Defries said "he was not going to prove his case by theories, but by absolute facts which he was prepared to verify." In what I write, I shall only rely upon "absolute facts, which I have verified." He "took it for the purposes of his demonstration" that public gas-lamps cost £3 10s. in large towns, and that the average cost all over the kingdom was £3 12s. 6d.; the price including the supply of gas and the necessary labour to light, extinguish, and clean the lamps. To similarly furnish oil-lamps, he "found the cost to be as nearly as possible £2 7s. per lamp per annum." Now the facts with regard to Edinburgh are that there were, during the year from May 15, 1887, to May 15, 1888, 9183 public lamps in use, for the supply of gas to which the Edinburgh Gaslight Company were paid £7519; and for the same period the charge incurred in lighting, extinguishing, and cleaning the lamps was £3464—making together £10,983. This works out at 23s. 6d., or exactly half what Mr. Defries admits is the cost of oil lighting. I do not wish, however, to draw an unfair comparison between the two systems of lighting; and so I admit that one-half of the lamps in Edinburgh are extinguished after midnight. Adding on that account one-fourth more to the charge for gas which would have been burned had the lamps remained alight till sunrise, the total charge for gas would be £9398 18s., which would work out at 25s. per lamp per annum, or still 19s. less than the sum which Mr. Defries considers a very moderate one for oil lighting. This means that in Edinburgh, if oil were adopted for lighting the public streets, the charge would be raised from £10,983 to £18,436. Leaving the domain of "absolute facts" for that of reason, if Edinburgh be taken as a typical case, and Mr. Defries's estimate of £822,500 to light the whole public lamps in the United Kingdom with oil be correct, then, to retain gas lighting would not entail a charge, as he puts it, of £1,266,750 per annum, but only of £492,127; or a saving, as compared with oil, of £330,373, instead of, as he says, an annual loss of £446,250. The quality of the two lights, I do not refer to, because we have no public oil lighting in this neighbourhood; but I may say, before closing this paragraph, that the advocates of oil lighting can scarcely object to Edinburgh being taken for the purpose of illustrating the value of the two methods of lighting. In the first place gas is dear in it—the rate for public lighting being 3s. 3d. per 1000 cubic feet, less 2½ per cent. discount; and thus no advantage is gained by gas lighting in the comparison. In the next place, the city lies close to the largest oil-producing district in Britain; and therefore oil has all advantages possible.

Since writing the above remarks, I have learned that a beginning is to be made with oil lighting in my district. At a meeting of the Alyth Police Commission on Monday, it was stated by Mr. Lowe, the Convener of the Lighting Committee, that he had been unable to effect some suggested alteration in street lighting, because the Gas Company declined to make the necessary connections. This was supplemented with the information that in Dunoon, 17 out of 245 public lamps are lighted with oil; and Mr. Lowe, at his own request, was allowed to put up "one good oil-lamp, in order to test the result." If the lamp be no better than those in use at Dunoon, which were stated to cost 4s. per lamp, it is not difficult to foretell that the result cannot be very satisfactory.

Regarding the use of Deacon meters for the discovery of waste and leakage of water, as readers of the JOURNAL are aware, the *Scotsman* has strongly urged the adoption of the system in Edinburgh, and has characterized 41 gallons per head per day as a "monstrous consumption." A little touch of humour has been introduced by the Water Trustees into the experiments they have been making with these meters. One of them was fixed on the service-pipe supplying the house of one of the proprietors of the *Scotsman*; and the result has been to show an average daily consumption in that dwelling of 46 gallons per head; and a maximum consumption of 72·33 gallons. In reply, the *Scotsman* impugns the accuracy of the report, contending that the consumption attributed to the house was well high four times the actual consumption, and that the number of inhabitants had not been ascertained and the number given was misleading.

Montrose has just added an addition to the resources of its water supply, which renders the town one of the most desirably situated in that respect. The supply is obtained by pumping; and the new apparatus consists of the substitution of a turbine for an ordinary water-wheel to furnish the motive power for the three pumps employed. It gives 50-horse power, or three times the power of the old water-wheel. A supply of 500,000 gallons per day is provided for, or about double the present requirements of the town.

The Peebles Police Commission have been strongly urged by Professor Veitch, of Glasgow, to oppose the Edinburgh proposal to take in the Manor water supply. The burgh of Peebles is supplied from the Manor; and the Professor is afraid—unnecessarily, I think—that the interests of the town would suffer by the abstraction of a large quantity of water for Edinburgh. The Police Commissioners, while not appearing to share his alarm, have instructed their Clerk to make inquiries, so that they may make up their mind as to whether they should endeavour to secure the whole of the Manor supply to themselves.

The proposal to extend the water supply of Kinghorn, which I mentioned last week, is threatened with opposition at the hands of the Burntisland Oil Company, who are proprietors of the ground required for the new reservoir. The Company wrote to the Town Clerk, asking if the Council would grant them certain concessions, including water free of charge for their works and workmen's houses. To this the Town Clerk replied that he could not recommend the Council to grant the concessions, because it would be, in effect, handing over their water rights to the Company. Thoroughly the Directors of the Company resolved to give the most unqualified opposition to the scheme in all its stages. The Town Council are, however, to proceed with the undertaking.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday.*

Last Monday was at times the foggiest day known in the Glasgow district for a number of years; and the consequence was that a very great demand was made upon the supply powers of the three gas-works belonging to the Glasgow Corporation Gas Commissioners. The amount of gas delivered into the city and suburbs over a period of 24 hours was 16,071,000 cubic feet; whereas, for the corresponding period of last year, it did not exceed 14,788,000 feet. But yesterday's delivery even exceeded this enormous total; and it really "beats the record," in respect of the largest days' deliveries in recent years; inasmuch as it amounted to 16,447,000 cubic feet. The greatest consumption on any one day in 1887 was 16,287,000 feet; and the date was the 21st of December—the day immediately preceding the shortest day. In the year 1886, the largest amount of gas delivered in a 24-hour period was 16,266,000 feet; and in the preceding year it was 14,718,000

feet. It is somewhat difficult to account for the enormous delivery yesterday. The morning remained dark for a long time, but there was practically no fog; and had it been a really cold December day, instead of a mild one, as was the case, it is probable that the consumption of gas would have been decidedly greater. The whole week has been characterized by a large daily consumption—15,282,000 cubic feet on Tuesday, 15,523,000 feet on Wednesday, and 15,514,000 feet on Thursday. For the production of the gas represented by the five days' figures just given, there have been in use rather over 1700 retorts, many of which at the Dawsholm works, however, are much above the average size. At the three works there are available for gas making nearly 2300 retorts, and the total producing power may be set down at about 17,400,000 cubic feet, or scarcely a million feet more than the maximum daily consumption. The gasholder capacity, on the other hand, is only about 12,000,000 cubic feet; so that on that matter, it is quite evident that the Corporation Gas Committee have got some work before them to be done. In connection with the large daily deliveries of gas to the consumers, it is worthy of mention that the illuminating power has been decidedly higher than what some persons would have us to believe. Instead of being down at 22 standard candles, it has been registered this week at 23·3, 23·7, 24·5, and 24·6 candles; indeed, taken over all, and when used with really good burners, the gas now available for consumers is of excellent quality, giving a very fine white light. Of course, the production of gas of such high quality involves the use of a certain proportion of rich cannel coal.

It might here be worth while to mention a few statistics as to the recent monthly consumption of gas in the Glasgow area of distribution. In September, the deliveries amounted to 189,138,000 cubic feet, as compared with 173,965,000 feet in the corresponding month of 1887. This was an increase of 15,173,000 feet. In the succeeding month (October), the consumption amounted to 235,959,000 feet, against 253,165,000 in October, 1887. Thus showing an increase for the month of 32,794,000 feet. Last month the deliveries reached the grand total of 366,751,000 feet; whereas in November of last year, the total was 341,596,000 feet—the increase for the month amounting to 24,855,000 feet.

Referring to ex-Bailie Crawford's remarks about "the tyranny of a ring of coalmasters who were possessed of the coal necessary for the production of the higher quality of gas," which were included in the opening paragraph of my last budget of "Notes," I am assured, by a gentleman who ought to know, that no such "ring" has ever existed amongst those coalmasters; and that so far from any such combination existing, the coalmasters who deal in the richer cannels are hardly on speaking terms with each other. Mr. Crawford may not deem it worth his while to say anything in support of the statement which he made on this matter last night week.

On Thursday night no little surprise was caused in the town of Falkirk on account of the comparative weakness of the gas supply, more especially in the northern portions of the burgh. In almost every case jets were reduced to nearly single-candle power; and in some places the lights went out entirely. As a natural consequence, a considerable amount of inconvenience was felt. It is stated that the deficiency in the supply of gas was due, not to any actual scarcity, or to fault on the part of the management, but to the fact that the main gasholder at Canalside failed to sink as the gas left it; thus preventing the supply getting into the distributing plant. From some unknown cause, the chains and pulleys had got out of gear. After some considerable trouble this state of things was rectified; and the supply of gas was continued as usual. It may be added that before the gasholder was righted, a large quantity of gas had escaped, and had the East-end works not been in operation at the time, the town would have been temporarily in total darkness.

I have pleasure in stating the vacancy in the gas examinership at Paisley, caused by the death of Dr. Wallace, was filled up last Tuesday morning, by the appointment of Mr. R. R. Tatlock, one of his former partners. The salary attached to the office is, I believe, £50 a year.

At Johnstone the men employed in the gas-works have just had their wages increased to the extent of a shilling per week. At their monthly meeting on Monday, the Johnstone Gas Commissioners were informed by the Gas Committee that the highest offer received for the secondary products was that of the Glasgow Gas Residual Products Company. It was £290 for the year; being an increase of £50 over last year's price. The offer was accepted.

In consequence of the fire at the Glasgow General Post Office, through some defect, it is believed, in the electric light fittings, about 150 Defries oil-lamps have been introduced—each of about 100-candle power. These are to remain in use till the electric light is again put in thorough working order. It may be remembered that the Glasgow Post Office was the first establishment of the kind to be lighted with electricity; but the so-called "light of the future" has not been an unalloyed success during the seven or eight years it has been in use.

Quietness has been the rule in the Glasgow pig iron warrant market this week; and very little change in prices has taken place. For Scotch iron, the close yesterday was 41s. 8½d. cash buyers.

No particular change falls to be recorded in reference to the local coal trade. Prices keep steady at about 7s. 3d. per ton for main coal, which usually guides the price for other qualities.

TYNEMOUTH WATER SUPPLY.—On Tuesday last a deputation from the Tynemouth Corporation—consisting of the Mayor, Town Clerk, and others—waited on the Directors of the Newcastle and Gateshead Water Company, and asked them to entirely supply the borough of Tynemouth with water. They stated that already the Company supplied five-sevenths of the quantity used; and it was thought it would be better for the inhabitants generally if the whole of the supply came from the Company's reservoirs. The proceedings were strictly private; but it is understood that the Company intimated that they could not see their way to accede to the request of the deputation.

BANKRUPTCY OF A SALFORD ALDERMAN.—A meeting of the creditors of Mr. T. H. Jenkins, an Alderman of the borough of Salford, and an ex-Deputy Chairman of the Gas Committee, was held at the chambers of the Official Receiver (Mr. C. J. Dibb) last Friday. The statement of affairs which the debtor had scheduled showed liabilities amounting to £922 5s. 10d., and assets nil. He attributed his insolvency to "want of employment and losses in shares." At the outset a resolution was proposed adjourning the meeting for a week; and, no objection being raised, this was agreed to. The public examination of the debtor was conducted at the Salford County Court later in the day. He stated that the creditors who served notice upon him were the Grosvenor Building Society, who brought an action against him for a large sum of money, and obtained judgment, which he had allowed to go by default. His principal liabilities had been caused by his unfortunate good nature in joining in a transaction with a person who had received the whole of the money advanced, and left him responsible for it. He had also lost largely in shares. The examination was adjourned to yesterday.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Dec. 15.

Sulphate of Ammonia.—The state of the market since the beginning of the month makes one doubt whether, after all, the previous upward movement has not been purely artificial; and that it has been greatly provoked by the excitement in nitrate, and by "Bull" speculation, cannot be questioned. To-day prices are down again to the level of the values at the end of October; and it is foretold in some quarters that the lowest point has not yet been touched. The tendency of the market during the rest of the month will, however, much depend upon the quantity which makers intend to place on the market of the balance of their make, on the re-sales of parcels held in second-hands, and the demand from consumers. Sulphate did not advance as much as nitrate, and it has fallen more; hence to anticipate any further serious decline would be unreasonable. The margin between the two is now reduced to below £1 per ton. There appear to be sellers at Hull and Leith at £12.

LONDON, Dec. 15.

Tar Products.—The prices ruling during the week have practically been those of the previous week. If anything, pitch and benzoles have been in better demand; but without much change in price. Crude carbolic is firm at 3s. 10d. and 3s. 11d. Anthracene shows little change. Prices may be taken as follows:—Tar, according to position, 18s. to 23s. per ton. Benzole, 90 per cent., 3s. 1d. per gallon; 50 per cent., 2s. 5d. Toluol, 1s. 6d. per gallon. Solvent naphtha, 1s. 3d. per gallon. Crude naphtha, 30 per cent., 1s. 2d. per gallon. Light oil, 3d. per gallon. Creosote, 2½d. per gallon. Pitch, 18s. to 21s. per ton. Carbolic acid (crude), 3s. 10d. per gallon. Cresylic acid, 10½d. per gallon. Tar salts, 15s. per ton. Anthracene, 80 per cent., "A" quality, 1s. 4½d. per unit; "B" quality, 1s. 2½d.

Ammonia Products.—Sulphate has eased off slightly during the week; and to-day's price is about £12 to £12 2s. 6d. per ton. Prices of other products may be taken as follows:—Gas liquor (5° Twaddell), 8s. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 2d. per lb. Carbonate of ammonia, 3½d. per lb. Muriate of ammonia, brown, £18 per ton; white, £25. Sal-ammoniac, £30 per ton.

[From the Chemical Trade Journal, Dec. 15.]

Tar Products.—The tar product market remains unchanged, at least in so far as benzol is concerned; 90's are still quoted at 3s. 2d. and 50/90's at 2s. 5d. This is usually considered the quietest time of the year for this product; and there does not seem to be much business doing even at these prices. Solvent naphtha continues in request at former prices; and makers are now asking 2d. per gallon for good fluid creosote. Crude carbolic acid continues firm, and fairly in request for forward delivery. Anthracene remains as stated in our last report; whilst pitch is, if anything, a shade firmer, as it is rumoured the price is likely to be advanced within a short time. The prices named in our last report may be said to rule to-day.

Sulphate of Ammonia.—There is not much change to report in sulphate. Dealers would have us believe that the tendency is to lower prices; and this may be so, although £12 2s. 6d. has been accepted at Leith, and £12 is about the figure to-day for Hull sales. Stocks at Hull are very light; and many makers have shown the disposition not to embarrass the market by pushing parcels upon it which are not required. After all, it is doubtful whether very much is available; and it is therefore probable that, if makers stand well together, we shall not see any further depreciation in value.

DEATH OF A COLLIERY MANAGER.—We regret to learn that Mr. William Clark, Manager of the Teversal and Plesley Coal and Cannel Pits, Mansfield, fell down the Butcherwood Pit last Wednesday, and was killed.

THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED.—This is the title of a Company registered with a capital of £20,000, divided into 20,000 shares of £1 each, of which 2000 are founders' shares, and the remaining 18,000 ordinary shares. The object of the Company is "to adopt, ratify, and confirm a certain provisional agreement of Dec. 4, 1888, made between Hiram Stevens Maxim of the one part and George Stanley Sedgwick, on behalf of the Company, of the other part, for the sale by the said Hiram Stevens Maxim to the Company of a certain invention of 'Improvements in apparatus for naphthalizing or carburetting illuminating and other gas;' and to do such other things as the Board may consider desirable."

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 1064.)

Issue.	Share	When ex-Dividend.	Dividend of Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.					£ s. d.
GAS COMPANIES.								
590,000	10	12 Oct.	10½	Alliance & Dublin 10 p. c.	10	18½-19	..	5 10 6
100,000	10	7½	7½	Do. 7 p. c.	10	12½-13½	..	5 11 1
900,000	100	2 July	5	Australian (Sydney) 5½% Deb.	100	110-112	..	4 9 3
100,000	20	29 Nov.	10	Bahia, Limited.	20	24-25	..	8 0 0
200,000	5	14 Nov.	7½	Bombay, Limited.	5	6½-7½	..	5 3 5
40,000	5	7½	7½	Do. New.	5	5-5½	..	5 9 1
880,000	Stock.	29 Aug.	11	Brentford Consolidated.	100	223-228	..	5 3 1
125,000		8	8	Do. New.	100	164-168	..	5 4 2
220,000	20	13 Sept.	10½	Brighton & Hove, Original.	20	43-45	..	4 13 4
320,000	20	28 Sept.	11½	British.	20	43-45	..	5 0 0
50,000	10	13 Sept.	11	Bromley, Ordinary 10 p. c.	10	19-21	..	5 4 9
39,000	10		8	Do. 7 p. c.	10	13-14	..	5 14 8
328,750	10	14 Nov.	8	Buenos Ayres (New) Limited	10	13½-14½	..	5 10 4
200,000	100	2 July	6	Do. 6 p. c. Deb.	100	110-112	..	5 7 1
150,000	20	10 Aug.	7	Cagliari, Limited.	20	26-28	..	5 0 0
550,000	Stock.	12 Oct.	13½	Commercial, Old Stock.	100	257-262	..	5 4 11
130,000		10½	10½	Do. New do.	100	209-214	..	5 0 5
121,234		28 June	4½	Do. 4½ p. c. Deb. do.	100	123-128	..	3 10 3
557,320	20	13 Dec.	13	Continental Union, Limited	20	43-45	..	5 15 6
242,680	20		13	Do. New '69 & '72	14	29-30½	..	5 19 4
200,000	20		10	Do. 7 p. c. Pref.	20	36-38	..	5 5 3
75,000	Stock.	28 Sept.	10	Crystal Palace District.	100	205-215	..	4 13 0
234,060	10	27 July	13	European, Limited.	10	25½-26½	..	4 18 1
120,000	10		13	Do. New.	7½	18-19	..	5 2 7
354,060	10		13	Do. do.	5	12-13	..	5 0 0
5,468,600	Stock.	29 Aug.	13	Gaslight & Coke, A, Ordinary	100	249-253	..	5 2 9
100,000			4	Do. B, 4 p. c. max.	100	100-105	..	3 16 3
665,000			10	Do. C, D, & E, 10 p. c. Pf.	100	257-262	..	3 16 4
30,000			5	Do. F, 5 p. c. Prf.	100	125-130	..	3 16 11
60,000			7½	Do. G, 7½ p. c. do.	100	182-187	..	4 0 2
1,300,000			7	Do. H, 7 p. c. max.	100	167-172	..	4 1 4
463,000			10	Do. J, 10 p. c. Prf.	100	255-260	..	3 16 11
1,061,150		13 Dec.	4	Do. 4 p. c. Deb. Stk.	100	118-121	+2	3 6 1
294,850			4½	Do. 4½ p. c. do.	100	122-127	+2½	3 10 10
650,000			6	Do. 6 p. c. do.	100	172-177	+3	3 7 18
3,600,000	Stock.	14 Nov.	10	Imperial Continental.	100	204-207	..	4 16 6
75,000		13 Dec.	6	Malta & Mediterranean, Ltd	5	5-5½	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	113-115	..	4 6 11
541,920	20	29 Nov.	6	Monte Video, Limited.	20	19-20	..	5 0 0
150,000	5	29 Nov.	10	Oriental, Limited.	5	6½-7	..	5 8 1
60,000	5	28 Sept.	7	Ottoman, Limited.	5	6-7	..	5 0 0
166,870	10	27 July	4	Pará, Limited.	10	5½-6½	..	6 3 1
420,000	100	2 Nov.	6	People's Gas of Chicago—				
500,000	100	1 Dec.	6	1st Mtg. Bds.	100	104-107	..	5 12 1
100,000	10	12 Oct.	10	2nd Do.	100	92-97	..	6 3 9
500,000	Stock.	29 Aug.	15½	San Paulo, Limited.	100	15½-16½	..	6 1 2
1,350,000			12	South Metropolitan, A Stock	100	297-302	..	5 2 7
141,500			13	Do. B do.	100	253-257	..	5 1 3
600,000		28 June	5	Do. C do.	100	245-257	..	5 11 3
60,000	5	29 Aug.	11	Do. 5 p. c. Deb. Stk.	100	135-140	..	3 11 5
				Tottenham & Edm'tn, Orig.	5	11-13	..	4 4 0
WATER COMPANIES.								
717,467	Stock.	28 June	9	Chelsea, Ordinary.	100	260-265	..	3 7 11
1,720,560	Stock.	12 Oct.	7	East London, Ordinary.	100	199-202	-1	3 9 9
700,000	50	13 Dec.	9	Grand Junction.	50	121-125	..	3 12 0
708,000	Stock.	10 Aug.	10½	Kent.	100	275-280	..	3 15 0
1,043,800	100	28 June	9	Lambeth, 10 p. c. max.	100	255-260	..	3 9 3
406,200	100		7½	Do. 7½ p. c. max.	100	200-205	..	3 13 2
200,000	Stock.	28 Sept.	4	Do. 4 p. c. Deb. Stk.	100	117-120	..	3 6 8
500,000	100	27 July	12½	New River, New Shares.	100	350-360	..	3 7 4
1,000,000	Stock.		4	Do. 4 p. c. Deb. Stk.	100	123-127	..	3 3 0
902,300	Stock.	13 Dec.	6	S'thwk & V'xhall, 10 p. c. max.	100	168-173	+1	3 9 4
126,500	100		6	Do. 7½ p. c. do.	100	158-163	+1	3 13 7
1,155,066	Stock.		10	West Middlesex.	100	261-265	..	3 15 6

GWYNNE & CO., ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS & ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

Exhausters of nearly all sizes in Stock.

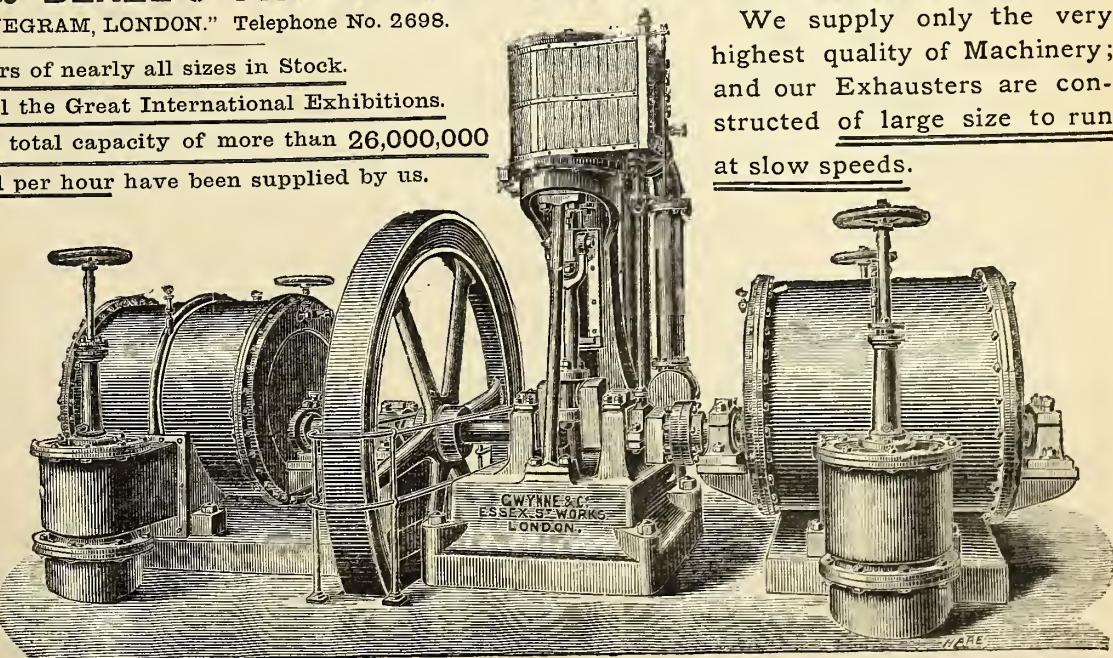
Prize Medals at all the Great International Exhibitions.

Exhausters equal to a total capacity of more than 26,000,000 cubic feet passed per hour have been supplied by us.

Our new Patent Non-Fluctuating Exhausters, to work without the slightest oscillation or variation in pressure, are strongly recommended.

MAKERS OF EVERY DESCRIPTION OF HYDRAULIC AND GAS MACHINERY.

Gwynne & Co.'s New Catalogue and List of Testimonials can now be obtained on application.



Exhausters and Vertical Engine as supplied for both the Fulham and Bromley-by-Bow Stations of The Gaslight and Coke Company.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.

JOHN Wm. O'NEILL, Managing Director.

ANDREW STEPHENSON, Agent for the GAS PURIFICATION and CHEMICAL COMPANY, Limited, Palmerston Buildings, Old Broad Street, London, E.C.

CANNEL COAL, &c.

JOHN ROMANS & SON, EDINBURGH. Gas Engineers, supply all the most approved SCOTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.

Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.
No. 54, BERNARD STREET, LEITH, }

WANTED, A Second-hand Combined ENGINE and EXHAUSTER, Rotary preferred; capacity 5000 cubic feet per hour.

Apply to the DINSMORE GAS COMPANY, LIMITED, Batavia Buildings, LIVERPOOL.

FOR SALE—A Tar and Ammonia Works in Yorkshire. Well situated for obtaining Tar and Liquor. Terms easy.

Address Box 25, Post Office, HECKMONDWIKE.

FOR SALE—The British, American, and all the Continental PATENTS for an excellent CARBON (Naphthalene) GAS-LAMP, either all together or separately.

Address A. Z., 2140, Haasenstien and Vogler, VIENNA.

FOR SALE—As a going Concern, a Small FACTORY in London for the Manufacture of Gas and Electric Light Fittings. Has good connections. Capital, £1000. Exceptional opportunity for a young man or two friends wishing to start.

Apply to E. D., 2, CORTHALL BUILDINGS, E.C.

WANTED, by a young Man (age 27), a Re-engagement as FITTER, &c., in a Gas-Works. Well used to Main and Service Laying, Meter Fixing, and Meter Reading, and would not object to make himself generally useful.

Address FITTER, No. 3, Derby Road, LONDONBOROUGH.

WANTED, immediately, a Young Man as GAS-FITTER on Small Works. Well up in General Repairs on Works, Meter Fixing and Reading, Main and Service Laying, Smithing, House and Stove Fitting, and Lamp Repairs.

Apply, stating wages, references, age, and when at liberty, to

H. WINHURST, Manager.
Gas-Works, Sleaford, Lines.

DRAUGHTSMAN. **WANTED temporarily, a Draughtsman,** thoroughly experienced in Gas-Works.

Applications, stating remuneration required and previous experience, accompanied by copies of testimonials, should be sent not later than Saturday, the 22nd of December, 1888, addressed to No. 1664, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS ANALYST. **WANTED, by a large Gas Company, a GAS ANALYST** who must thoroughly understand Analysis of Gas, Gas Products, &c., and have had a long experience in testing for Impurities and Illuminating Power of Gas.

Applications to be sent to No. 1665, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

INSPECTOR. **WANTED, by the Richmond (Surrey) Gas Company, a competent Man as INSPECTOR.** Candidates must have had good experience in Main and Service Laying, Inspection and Testing of Meters, and the general outdoor work of a Gas Company.

Applications, in own handwriting (accompanied by not more than three recent testimonials), stating wages required, age, and present employment, to be addressed to the ENGINEER, Gas-Works, Richmond, Surrey.

Dec. 14, 1888.

LITTLEHAMPTON GAS COMPANY. **WANTED, a good, substantial and thoroughly sound, Second-hand SINGLE-LIFT GASHOLDER** with CAST-IRON TANK, of a diameter ranging from 65 to 80 feet, and of a depth from 16 to 20 feet.

Both the Gasholder and Tank must be in first class condition, and not more than ten years old.

Preference would be given to parties able to quote delivered and fixed complete at the new works of the Littlehampton Gas Company.

Prices and full particulars to be sent to the Chairman of the Company, Captain Mills, R.N., not later than Saturday, the 22nd inst.

A. SNEWIN, Secretary.

Gas-Works, Littlehampton,
Dec. 11, 1888.

SHEFFIELD UNITED GASLIGHT COMPANY.

WORKS SUPERINTENDENT.

WANTED, by the Directors of this Company, an experienced and competent Man to act as SUPERINTENDENT at their Easingham Street Gas-Works.

He will be required to reside on the Works; Hense, Coal, and Gas free. The maximum make of Gas at this station is about three-and-a-half million cubic feet per day.

Applications, stating age, previous engagements, and salary required, to be made by letter only, addressed to Sir Fredk. T. Mappin & Bart., M.P., Chairman of the Company, Gas Offices, Sheffield, not later than Monday, the 7th of January, 1889.

Testimonials not to be sent till asked for.

HANBURY THOMAS, General Manager.
Commercial Street, Sheffield,
Dec. 14, 1888.

TIMMIS & CO., of STOURBRIDGE

Make only the best quality of FIRE-CLAY RETORTS, BRICKS, TILES, & LUMPS. Also SPECIAL SILICA BRICKS, to stand great heats. All descriptions kept in Stock.

For Prices apply to JAMES LAWRIE AND Co. 63, Old Broad Street, E.C., Sole Agents for London and District. Telegraphic Address: "EIRWAL, LONDON."

ALEX. WRIGHT & Co., 55, 55a, and 56, MILLBANK STREET, LONDON, S.W.
[Telegraphic Address: "PRECISION LONDON."] Makers of Wet and Dry Gas-Meters, Station Meters and Governors, Photometers, and Gas-Testing Apparatus, Test Gasholders and Meters, Registering and other Gauges, &c., &c.

* See Advertisement on Page III. of the Wrapper of this week's issue.

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gas-holders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.

* See Advertisement p. 1044 of last week's issue.

Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

ACETATE OF LEAD BOOKS.

TEST Papers and Solutions for Gas-Works prepared by R. D. Gibbs, Summerfield Crescent, Birmingham.

Analysis of Coal, Oxide, and all Gas Materials.

TO CHEMICAL MANUFACTURERS & OTHERS. **TO LET—Extensive Premises,** situate between Wrexham and Ruabon, on a Branch of the Great Western Railway, consisting of Large SHED, 167 feet long by 25 feet wide; BUILDINGS, 37 feet by 28 feet; 67 feet by 27 feet; and 25 feet by 20 feet; WHARF, 100 feet long, with Railway Siding running the whole length. Within easy access, by rail, of several large Gas-Works.

Apply to GEO. E. WOOLFORD, RUABON.

HAWORTH LOCAL BOARD OF HEALTH. **THE** above Local Board are prepared to receive TENDERS for the purchase of the AMMONIACAL LIQUOR and surplus TAR from Jan. 1, 1889, to March 25, 1890, delivered at the Gas-Works, Haworth, and similar TENDERS delivered on rails at Haworth Railway Station.

Tenders, marked "Tar and Liquor Tender" may be sent in to me the undersigned not later than Dec. 26, 1888.

By order,
R. H. WHITELEY, Gas Manager.
Haworth, Dec. 6, 1888.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY, D'OLIER STREET.

THE Directors of the above Company are prepared to receive TENDERS from IRON-FOUNDERS, GUN-BARREL MANUFACTURERS, IRONMONGERS, TIMBER MERCHANTS, DRUGGISTS, ROPEMAKERS, &c., for Goods to be delivered in the Company's Works, Great Brunswick Street, in such quantities as may be required from time to time up to the 31st of December, 1889.

Printed Lists of Articles required can be had on application at the Company's Offices, D'Olier Street.

Tenders, endorsed "Tender for Stores," to be lodged in my Office on or before the 31st inst.

W. F. COTTON, Secretary and Manager.
Dec. 11, 1888.

TO GASHOLDER MAKERS. **THE Directors of the Blaenavon Gas and Water Company, Limited, Blaenavon, Mon.,** invite TENDERS for Providing and Erecting One Single-lift GASHOLDER, 50 feet by 18 feet, with Six Cast Iron Columns and Wrought Iron Lattice Girders, complete with Inlet and Outlet Pipes and Valves.

Persons tendering to provide Drawings and Specification; and submit the same, together with tender, to the undersigned, not later than Tuesday, Jan. 1, 1889.

The Directors do not bind themselves to accept the lowest or any tender.

CHAS. WHITE, Manager.
Gas and Water Works Office,
Blaenavon, Mon., Dec. 14, 1888.

TO GASHOLDER MAKERS. **THE Directors of the Sheffield United Gaslight Company** invite TENDERS for RESHEETING A Two-lift GASHOLDER (115 feet in diameter) at their Easingham Street Station; and also for ENLARGING THE SAME by adding a third Lift thereto.

Specifications and Drawings may be seen on application to, and forms of tender, with bill of quantities, obtained from the Company's Engineer, Mr. Fletcher W. Stevenson.

The Directors do not bind themselves to accept the lowest or any tender.

Tenders, marked "Tender for Repairing and Enlarging Gasholder," to be addressed to the undersigned not later than Monday, Jan. 7, 1889.

HANBURY THOMAS, General Manager.
Gas Offices, Commercial Street,
Sheffield, Dec. 14, 1888.

CORPORATION OF LEICESTER.

CAST-IRON PIPE CONTRACT.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the supply of the necessary CAST-IRON PIPES and CONNECTIONS, from 3 inches to 24 inches in diameter, required during the Twelve months ending the 31st of December, 1889.

Specification and form of tender to be obtained from the Engineer.

Tenders, addressed to Councillor Lennard, Chairman, and endorsed "Tender for Cast-Iron Pipes, &c.," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, Jan. 12, 1889, prox.

The Committee do not bind themselves to accept the lowest or any tender.

ALFRED CULSON, C.E., Engineer and Manager.
Gas Offices, Millstone Lane,
Leicester, Dec. 11, 1888.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased. 120 and 121, NEWGATE STREET, LONDON, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID for making SULPHATE OF AMMONIA of high quality and colour.

Highest References and all particulars supplied on application.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitrol. References given to Gas Companies.

CRYSTAL PALACE DISTRICT GAS COMPANY.

NOTICE is hereby given, that the TRANSFER BOOKS of this Company will be CLOSED from the 31st inst. for a period of 14 days.

By order of the Board,
MAGNUS OHREN, Secretary.

Offices, Lower Sydenham, Dec. 14, 1888.

GLASGOW CORPORATION GAS.

THE Glasgow Corporation Gas Commissioners are prepared to receive TENDERS for the Construction at the Tradeston Gas-Works of Two Sets of Four PURIFIERS, each 35 feet square.

The Drawings may be inspected, and copies of the specifications and forms of tender obtained, on application to Mr. William Poulis, the Engineer, 42, Virginia Street, Glasgow, on and after Monday, the 3rd current, upon payment of one guinea.

Sealed offers, endorsed "Tender for Purifiers," and addressed to the subscriber, will be received by him, on or before Monday, the 24th current.

The Commissioners do not bind themselves to accept the lowest or any offer.

J. D. MAHWICK, Town Clerk.
City Chambers, Glasgow, Dec. 1, 1888.

ELLAND GAS COMPANY.

RETORTS AND FIRE-BRICKS.

THE Directors are prepared to receive TENDERS for RETORTS and FIRE-BRICKS required for Twelve months, delivered free at Elland Gas-Works.

Tenders, addressed to the Chairman, and endorsed "Tender for Retorts, &c.," to be delivered at these offices not later than Jan. 4, 1889.

The Committee do not bind themselves to accept the lowest or any tender.

H. S. PIKE, Secretary and Manager.
Gas Offices, Elland, Dec. 13, 1888.

BOROUGH OF DARWEN.

(GAS-WORKS DEPARTMENT.)

TENDERS FOR PURIFIERS.

THE Corporation are prepared to receive TENDERS for the Supply and Erection of Three New PURIFIERS, each 25 feet by 30 feet, with Pillars and Girders complete. Also the REMOVAL of one of similar size, from one building to another.

Plans and Specifications may be seen, and all necessary information obtained from the Gas Engineer, Mr. Thos. Duxbury, Charles Street, Darwen.

Sealed tenders, endorsed "Tender for Purifiers," to be delivered at my Office, on or before Nine a.m. on the 31st of December.

The Corporation do not bind themselves to accept the lowest or any tender.

By order,
CHAS. COSTEKER, Town Clerk.
Town Clerk's Office, Darwen,
Dec. 5, 1888.

FINCHLEY LOCAL BOARD.

TO PUBLIC LIGHTING CONTRACTORS.

THE Finchley Local Board is prepared to receive TENDERS from Public Lighting Contractors to LIGHT by PETROLEUM or other OIL so much of their district as is now supplied with Gas by the Colney Hatch Gas Company.

Plans of the District, showing the number of Lamps required, and the various Roads required to be lighted, may be seen at the Offices of the Board, on application to Mr. Geo. W. Brumell during office hours 9 to 5; and all information necessary will be furnished.

Proposals and tenders to be sent in, addressed to the Finchley Local Board, and marked "Tender for Lighting," not later than Six p.m. on Friday, the 21st of December, 1888.

The Board do not bind themselves to accept any tender.

By order of the Board,
HENRY STEVEN, Clerk.
Offices of the Board, 11, Queen's Terrace,
Church End.

BRISTOL UNITED GASLIGHT COMPANY.

AMMONIACAL LIQUOR.

THE Directors of this Company invite TENDERS for the purchase of the AMMONIACAL LIQUOR to be produced at all or either of their three Stations during a period of One, Three, Five, or Seven years, commencing on the 1st day of July, 1889.

The annual quantities and strengths of the Liquor produced at each of the Stations at present are approximately as follows:—

	Gallons.
Canons' Marsh Station, 1,000,000 of 14 ounce Strength.	
Avon Street " 1,300,000 " 15 " "	
Stapleton " 700,000 " 17 " "	

Conditions of Contract, and forms of tender, may be obtained on application to the undersigned, to whom also tenders, sealed, and endorsed "Tender for Ammoniacal Liquor," must be delivered not later than Ten a.m. on Monday, the 28th day of January, 1889.

The Directors do not bind themselves to accept the highest or any tender.

JAS. V. GREEN, Secretary.
Chief Offices: Canons' Marsh,
Bristol, November, 1888.

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TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion; but as the Advertisement sheet of the JOURNAL is sent to Press the first thing on Monday Morning, Advertisers will please bear in mind that Orders for Alterations in or Stoppages of PERMANENT Advertisements should be received Not Later than Two o'clock on SATURDAYS.

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, DECEMBER 25, 1888.

GAS-WORKS AT CHRISTMAS TIME.

THIS is Christmas Day; and we hope that the appearance of the JOURNAL with its load of technical matter at our readers' residences on this day of feasting and family gatherings will not be regarded as unwelcome. The great festival, which is also the culminating point of the gas manufacturer's busy season, has been approached this year through a long spell of what is commonly called open weather. In London, however, there have been during the past week some sharp frosts, attended by fogs more widely diffused than dense. The darkness has, notwithstanding, been such that the drain upon the gasholders of the London Gas Companies was severe for days together; and it will not be surprising if it should turn out that the greatest known output of gas has already been recorded for this winter. In some years the maximum gas production falls before Christmas; and again, in other years, it comes well into January. So far as gas consumption is influenced by fog, the former should be the rule, because the atmosphere is usually more damp, and fogs are accordingly more frequent, before than after Christmas. It may be commonly observed, however, that there are very few really cold days when in a large town there is not also a marked thickness of the air, which induces

the residents to burn gas all day long. In this country very cold weather, attended by wind sufficiently brisk to keep the air of towns clear, is decidedly uncommon. Consequently the smoke of multitudinous chimneys falls down upon the housetops and streets as soon as it has become sufficiently chilled; and therefore the sharp "seasonable" weather which is so enjoyable outside the town presents a very different aspect among the houses in which gas is burnt. The responsibilities of the gas manager at this time of the year are heavier than are commonly recognized by the rest of the community. He knows, by bitter experience, that if, in the course of the past season of repairs, reconstructions, and extensions, his men have slurred over any portion of their work, now is the time when the effect is most likely to manifest itself. The Nemesis of inconsiderate design is also at his elbow; and the merest trifle of imperfect forethought, which would not trouble the perpetrator in a whole lifetime of summer work, is likely to make gigantic mischief during the short, dark days and long nights of December. Even when the manager has a works entirely to his mind, with ample carbonizing, purifying, storing, and distributing plant, there may be a breakdown at any moment in consequence of something that was done or not done during the summer and autumn. Such a man is at ease, however, in comparison with the poor wretch who knows that his holders are shaky, his purifiers too small, the connections in the yard involved and insufficient, or the retort-house badly equipped. There are few managers who cannot recall their own experience of such circumstances, when they spent days in vigilance over the pressures in different parts of the works, and nights in watching holders running down all too quickly for the gas-making power of the benches. Trials of this description are good for young managers, especially if they happen to have come out of large and well-appointed works, where there is enough and to spare of everything. A little of this sort of thing goes a very long way, however; and such anxieties are more pleasant to talk about afterwards than to endure at the time.

There should not, of course, be any difficulty now-a-days in properly equipping a British gas-works with plant and apparatus that can be depended upon to carry the undertaking through the Christmas pressure of work, without causing the Manager to lose his rest. Things were very different in bygone times, when struggling concerns, chronically short of money, could only be kept going at such seasons by dint of make-shifts and stop-gaps, which would startle out of his composure any staid student of gas engineering in these prosperous times. Then, an examiner in gas manufactures, if there had been such a personage, who wished to ascertain the real capacity of his candidates, would have put some such question as the following in the middle of his paper: "It is 8 o'clock on an evening in Christmas week, with a late market. Your last holder is running out at the rate of two sheets an hour, besides the make; and there are only five sheets left. Your ordinary night pressure has already been cut down to the finest margin which your experience tells you will keep a light in the low-lying parts of the district; and you have been working four-hour charges all day, in the endeavour to get up stock, until the heats are suffering. How would you suggest that the holder can be kept off the ground until the lights are slackened off from 11.30 to midnight?" There was not much time for study of the higher developments of gas engineering during these crises of the industry. Money for permanent extensions was only to be raised with extreme difficulty. The Manager had to go on his knees to his Board for a new holder; and when he did get it, it was often too small. As for mains, purifiers, condensers, and such like smaller matters, he had often to do the best he could out of the resources of the works; and these were bare enough. Yet amid all these distractions, the art of gas making did advance—slowly, perhaps; but yet generally in the right direction. The Manager who half-poisoned his customers with unpurified gas, through a break-down one Christmas, was prepared against a similar mishap the following year. The main that suddenly got blocked with naphthalene, or waterlogged, was put out of danger somehow. Holders were increased in size, retort-houses became airier and loftier, and retort-settings more efficient, until after a time impecuniosity and its consequences gave place to ease and comparative luxury. There was no royal road to successful gas making. The old gas companies got hold of a district somehow, and did their best to light it. They incurred all sorts of troubles and hindrances, made an infinity of blunders, became great nuisances in many ways; but came to affluence at last by dint

of dogged perseverance. The most interesting pieces of the history of gas companies, and the most striking reminiscences of individual engineers, are concerned with these days of struggle and trial.

Let us hope that none of the readers of these lines are in such a case, either at home or abroad. The best we can wish them at this season is plenty of work, and of means to work to good advantage. A gas-works is never so interesting as at this time, with every corner occupied; men swarming in every retort-house and workshop; steam-engines going at their best pace; and the coke-yard like an ant-hill for tippers and dealers. At other times there is much idle plant in a gas-works; unused retort-houses echo to the tread of the visitor; and furnaces seem to glare coldly at him out of their rusty doors and sight-holes. There is no scene so truly desolate as an idle workshop. In the depth of winter all is changed; and the visitor who only saw a gas-works in summer would hardly recognize it at Christmas as the same place. Let him look into a large gas-making station after dark on a raw, sleety December evening; and he will see such a scene of warm, cheerful labour as will not be easily forgotten. There are no sickly-looking factory hands here; and no stuffy, poisonous interiors. The men are all strong, hardy representatives of Labour under severe, but healthy conditions; and whatever may be the state of trade outside, these wiry stokers know they will receive good pay for their work. And as for their chiefs? Well, we cannot conclude this article without remarking, for the benefit of all whom it may concern, that the gas manager is deserving of the best consideration from his superiors, whether Directors of a Company or members of a Public Authority. As Christmas Day succeeds Christmas Day, the volume of his work swells. He has more work to do; more responsibility; more men to look after; greater anxieties to bear. It is only common justice that he should also feel that these consequences of increased business are attended with others to compensate for them; and that better pay and heightened respect from his employers should render him more solicitous for their interest as the opportunities for displaying it are multiplied.

RESIGNATIONS OF THE PRESIDENT AND SECRETARY OF THE GAS INSTITUTE.

THE letter which will be found in another column, in which Mr. Henry Woodall announces his resignation of the office of President of The Gas Institute, is a striking response to our last week's observations upon the condition of the Institute and Mr. Woodall's responsibility in connection therewith. The importance of this action on the part of the President does not require to be accented by any comment of ours; and it is not our intention to prophesy respecting its effect, except to remark that it will in all probability decide those members who have delayed severing their connection with the Institute at Mr. Woodall's request. Now that he has given up in despair, there is nothing to induce any members outside a narrow and local circle to remain. It may be gathered from Mr. Woodall's letter that he has met with something like concerted and insurmountable opposition from one particular group of Members of Council, and being unable through the retirement of others to overcome it, he has relieved himself from an untenable position by leaving his opponents to their own devices. Nobody who knows how proud Mr. Woodall was of his elevation to the presidency of The Gas Institute when he rightly esteemed it as representing the gas industry of the United Kingdom, and even more, will withhold sympathy from him in this disappointment. Ultra-sanguine as is his temperament, affairs must indeed be hopeless for him to quit his post. The terms in which he communicates his decision to his *quondam* colleagues, and through the mediumship of the JOURNAL to the general body of members, are explicit, and unfortunately leave no room for doubt as to the predisposing cause of his retirement. We do not believe that it is the wish of any one District Association to dictate terms to the rest of the country; but Mr. Woodall certainly allows it to be inferred that the disproportionately numerous group of members of the Manchester District Institution who for some time past have constituted the majority of the Council of the Institute, have made excessive use of their accidental power. From what we know of the generality of the Manchester men, we decline to think that they will thank their temporary representatives for precipitating this crisis. Mr. Woodall's allusion to the possible formation of a union of gas engineers belonging to the Southern

counties is not to be passed over lightly, though we sincerely hope, for the sake of the reputation of our northern friends, that there will not be any occasion to blame them for causing any such deplorable split in the fellowship of what has hitherto been a united national industry. Whatever happens, however, we are firmly persuaded that Mr. Woodall has acted throughout as the honourable gentleman he is, and that where he has failed, no other man could have hoped to succeed; for his character is sufficient guarantee that he has done the best that was possible with most unfortunate circumstances.

Mr. W. H. Bennett, the Secretary of the Institute, has also resigned. That Mr. Bennett's long and honourable connection with the Associated Gas Managers of the United Kingdom should terminate under such circumstances is greatly to be regretted; but this is only one, although an extremely unpleasant, incident in a course of misfortunes that have brought a once united and prosperous organization to the imminent brink of ruin.

COLLAPSE OF THE CHARGE AGAINST MR. W. CARR.

MR. WILLIAM CARR, late Manager of the Halifax Corporation Gas-Works, was arraigned on Tuesday last before Mr. Baron Pollock, at the Leeds Assizes, upon the charge of having mutilated one of the books belonging to the Corporation, to which he had access in his official capacity, with intent to defraud. The charge was made by the Corporation, after full deliberation, as the outcome of all that agitation, plotting, and counter-plotting, known to our readers as the "Halifax Gas Scandal." They chose their ground, and prosecuted their action with zeal that can hardly be distinguished from virulence; and the result is a crushing and ignominious defeat. The Judge allowed Counsel for the prosecutors every liberty, permitting him to drag in allusions, references, and insinuations which appear outrageous when compared with the strictness with which the issue between the Crown and the prisoner is limited in ordinary cases; and in the end his Lordship declared that there was no case to go to the jury. Mr. Carr was therefore discharged from custody in the most satisfactory style that his best friends could have desired. The prosecution broke down from sheer weakness, as we have all along suspected that it would, unless fresh matter could be imported into the case. As it was presented to the Magistrates, the case against Mr. Carr was absurdly slight; but there was just enough *prima facie* justification for it to warrant the Bench in committing the accused for trial, although we shrewdly doubt that they would have done so if it had not been for the excitement that had been got up in the neighbourhood on the gas-works question. Mr. Carr is to be heartily congratulated upon the way in which the matter has ended; although, of course, no triumph of the kind can make amends for the undeserved suffering and shame that he has had to endure from the hare-brained action of his old employers. Now that the personal question affecting Mr. Carr has been settled, it remains to be seen what the Corporation will do next. The Mayor has talked very big about his determination to probe the matter of the gas-works administration to the bottom, and it remains for him to make good his boast. For the present, it must be said that the cause of the Corporation looks distinctly worse in the light of this *jiasco* at the Leeds Assizes.

THE COUNTY COUNCIL ELECTIONS.

It is gratifying to observe that in very many instances the candidates for election to the new County Councils are men of standing and repute, in whom the county ratepayers may place full confidence. Notwithstanding the efforts that are being made in some localities to turn the forthcoming elections into trials of party strength, there is a general feeling that character and position are of more account than political colour. Numbers—perhaps the majority—of the candidates are gentlemen either holding the Commission of the Peace or are of the order from whose ranks the Commission is ordinarily filled; so that there is good promise that the tradition of county government will not be altogether broken by the introduction of the elective element. It is really a small matter whether men in authority are nominated from above or elected from below, so long as they are the right men for the duties reposed in them. To hold that any special sanctity attaches to the method of selection would be sheer pedantry. People who read their newspapers with intelligence must learn that neither public virtue nor corruption belong exclusively to any particular system of government. With regard to the selection of County Councillors, the great thing is, as we have already

remarked, to choose men who are capable of rendering the community good service, and who will be above the influences that have made the name of the Metropolitan Board of Works so abhorrent to Londoners. It is only what might have been expected that certain members of the dying Board should try to renew the possibilities which some of them have used so cleverly, by seeking election to the London County Council; but public opinion is dead against them. Newspapers of the most diverse political views unite for once in protesting against the reappearance of the discredited Board of Works elements in the thin disguise provided by the Local Government Act. All agree that the Board of Works must be wiped out, and its constituents relegated to that obscurity from which they should never have emerged. They have had their day; and must now give place to men with cleaner characters. If, as is generally supposed, the question of the water supply of the Metropolis is to occupy the attention of the London County Council, perhaps to be followed in due time by the consideration of the gas supply, men of the most irreproachable integrity, as well as of signal ability, will be needed for dealing with these great matters; and it cannot be said that the Metropolitan Board is rich in members with either of these qualifications.

THE CIRCULAR INQUIRY NUISANCE AGAIN.

THE circular inquiry nuisance is very hard to kill. From time to time we have evidence that our exposures of the practice have discredited it in some places; but it breaks out again elsewhere. From this we conclude that offenders in this way are mainly to be found among people who either never see the JOURNAL, or are too lazy to study it. This view is strengthened by the observation that most of the inquiries with which the culprits plague their correspondents concern matters that intelligent readers can learn all about from our columns; and the remainder are usually of a more or less impertinent character, such as only very ignorant and uncivilized individuals would think of putting to perfect strangers. We have recently seen a remarkable example of the circular inquiry, emanating from a Clerk to a Local Board, who wants to learn something about the administration of gas-works without paying for the advice of a duly qualified engineer. He does not even trouble to ascertain the names of those whom he favours with his attention; but merely addresses his letter to "The Manager of the Gas-Works," and says: "Will you please answer me queries on other 'side hereof,' without unbending so far as to say he will feel obliged by the complaisance of his unknown correspondents. The queries thus flung at the heads of humble gas managers contain, among others, questions as to whether the recipient makes plans and superintends the outlay of new capital, and whether he is allowed a house, fire, and lights. This sort of thing is nothing less than sheer impudence; and the questioned gas managers must have been extraordinarily meek or good-tempered who did not instantly consign the impertinent communication to the waste-paper basket. Men who reply to inquiries of this order have only themselves to thank when they find the same weapon employed to their own detriment; they, in short, "make a rod for their own backs." We have before us another letter of the same class, which although commendably impersonal in its purpose, yet offends by begging for information from strangers to be used for the writer's guidance. We have repeatedly stated in general terms the conditions under which ordinary inquiries may be circulated without offence; but the addressing of these communications to strangers places the interrogator under such a marked, though vague obligation to people whom he can never hope to repay, that men of any delicacy of feeling will shrink from taking the step which to many seems so easy that they rush out their inquiries as though everybody lay under an ordinance to pour out their stores of information to the first comer who chooses to intrude upon them by virtue of the postman's introduction.

MANY of our readers who remember Mr. Henry Hughes, formerly of the Plough Bridge Tar-Works, Rotherhithe, will regret to learn of his death on Sunday, the 16th inst. The deceased gentleman was in his 80th year.

THE course of lectures on cooking by gas, which, as announced in our last issue, Madame Altling-Mees is delivering in Brussels, is, we learn, meeting with rich success. On Monday last week, Madame Altling-Mees had a large and select audience in the new hall of the Gaziers Belges; and she then maintained her high reputation as a demonstrator of the use to which gas can be put in culinary operations by cooking, with a No. 6 (old) Fletcher stove, an entire dinner in one hour.

THE AFFAIRS OF THE GAS INSTITUTE.

RESIGNATIONS OF THE PRESIDENT AND SECRETARY.

By Mr. Henry Woodall's desire, we publish the following letter, which he has addressed to the Council of The Gas Institute:—

Leamington, Dec. 20, 1888.

To the Council of The Gas Institute.

Gentlemen,—It is with very great reluctance that I have permitted myself to be brought to the conclusion that I must relinquish the honoured position of President.

I had felt from my earliest experience in the chair that the secession of so many respected members from the Council had robbed us of much of our representative character. Still, there were at least three districts represented. The subsequent retirement of Mr. Colson accentuated the difficulty; and now I learn to-day that Messrs. Cross and Peaty have also resigned. Of the eight members who remain, one is too far removed to be able to attend our meetings, and especially at this time of the year; and five are members of the Manchester District Association. I feel that, however desirous the latter may be to pursue their duty in an impartial spirit, it is almost impossible for them to realize the feelings of other sections of the members, with whom they have necessarily but limited opportunities of associating. It was on that account that, at our last meeting, I urged the desirability of calling a special meeting of the members, to discuss the two policies which had occupied the consideration of the Council.

I have urged, and I continue to maintain, that unless the voice of the body of members is taken, the inevitable result will be that another Association will be formed, which will attract the great majority of our profession south of the Northern Counties; and that the title of the Institute, and its properties, will become the possession of a section only of our numbers. This I am deeply persuaded would be a very great misfortune. The old feeling of fellowship, which used to be as wide as the world itself, will be narrowed and broken; and it will be remarkable indeed if unworthy jealousies do not take its place.

An Institute which is not representative, can scarcely be an Institute at all. At any rate, it was not such an Institute which elected me to office, nor is it such an one that I can consent to serve; and as I have failed in my attempt to re-establish a representative body, I can no longer have either pleasure or pride in office.

It pains me much to think that by the course I am taking, I am aggravating the troubles which were too embarrassing before; but I can only hope that you may speedily arrive at a happy solution of them, and win the approbation which I had hoped to share with you.

I am, Gentlemen, Yours faithfully,
HENRY WOODALL.

We have also received from Mr. W. H. Bennett the following copy of the communication by which his resignation of the office of Secretary of the Institute will be made known to the members:—

Dear Sir,—I have this day presented a letter to the Council of The Gas Institute, of which the following is a copy:—

To the Council of The Gas Institute.

Gentlemen,—I beg to tender my resignation of the appointment I now hold as Secretary of The Gas Institute, and shall be obliged by being relieved from my duties as soon as possible.—Yours faithfully, W. H. Bennett.

It is with very great regret that I have felt compelled, in justice to myself, to take this step; but as the members generally are not in my opinion fairly represented on the Council—more especially now that the President has resigned, and as the course being pursued by those attending the Council does not appear likely to result in a fair representation for a very considerable time to come, I feel that it would not be honest towards the members to continue to assist in promoting a policy which can only be attended by disaster, and the ultimate wreck of the Institute.

I, therefore, beg to offer to the members my thanks for the confidence reposed in me, and so often publicly expressed, during the last twenty years, and say that I trust the gas profession may not long be without a representative Institution worthy of it.

Yours truly, W. H. BENNETT.

MR. R. C. SMITH, a member of the Bridgnorth Town Council, has been appointed honorary gas examiner for the town.

THE Secretaryship of the Board of Trade (in succession to the Earl of Onslow) has been accepted by Lord Balfour of Burleigh.

MR. JOHN WOODWARD has, we learn, for the present been placed by the Manchester Gas Committee in charge of the Bradford Road Gas-Works.

AMONG the notices on the paper for discussion in the next session of Parliament are two in which our readers are interested. One is by Mr. Craig Sellar, who intends to "call attention to the report of the Joint Committee of the two Houses of Parliament on the subject of Private Bill Legislation, and to move a resolution, urging the Government to legislate upon the subject;" and the other is by Mr. Seager Hunt, who purposes introducing a Bill "to consolidate the Acts relating to the water supply of London."

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1120.)

BUSINESS on the Stock Exchange during the past week has not presented any feature of particular interest; and the markets generally have been rather quiet, as might be expected at the time of year. Dulness was the prevailing tendency at first—the Panama Canal affairs being regarded as likely to upset the Paris Bourse, while there was some apprehension that the Suakim Expedition would bring trouble at home. Later on, however, as the position of the Money Market appeared more satisfactory, a better tendency set in; and there was more strength all round. Still, movements are very slight, and the course of business has not been very interesting. The Gas department has been quiet, and fairly firm. Business has not been abundant; and but few stocks have been dealt in. Gaslight "A" has had its fair share of transactions, and has been very steady—marking much about the same prices every day. The preference and debenture stocks have not been touched; but, of the latter, the 6 per cents. have been put down 2 in quotation. This is a sort of reconsideration of the *ex div.* quotation which had put them up 3; and consequently they still stand 1 to the good. South Metropolitan has been quieter. The "A" is steady; but the "B" is still weak, and has fallen back 1. Commercial continues inactive; a single transaction in the old stock being all the business marked. The Suburban and Provincial Companies offer little for remark. Brentford old has changed hands once or twice at good figures; and one of the rare transactions in Crystal Palace confirms, by its price, some of the figures realized at the recent sale at the Mart. The Foreign undertakings show the only advances in quotation which have been effected in the week. Continental Union has made a further rise, although no business has actually been recorded in it; and Australian (Sydney) debentures, which are now creeping up towards the level of Melbourne, have advanced 1. Of Water, there is little to be said. The tendency on the whole is not quite so good, except in Lambeths. The rest have been done at rather low figures; but none have actually receded in point of quotation, with the exception of South-wark ordinary, off the high *ex div.* quotation of which 2 have been deducted.

The daily operations were: Gas business on Monday was mostly in Gaslight "A," at good middle figures. Of the rest, Brentford old was most conspicuous. The only changes were a rise of 1 in Continental Union fully paid; and $\frac{1}{2}$ in the partly paid. A little was done in Water; but prices were not grand. Business in Gas was rather more slack on Tuesday, principally in the Foreign undertakings; and prices were only moderate. Water was about the same as before. On Wednesday, Gas was very quiet, and offered nothing to remark. The few transactions marked in Water were at very moderate figures. On Thursday, business was again very limited. South Metropolitan "B" were weak; and prices generally were only moderate, except for Australian, which rose 1. Water was dull. On Friday, the only business was in the Metropolitan Companies. Gaslight "A" was pretty firm; but South Metropolitan "B" fell 1. The only feature in Water was an advance of 2 in Lambeth 10 per cents.

ELECTRIC LIGHTING MEMORANDA.

ELECTRIC LIGHT QUESTIONS IN PARLIAMENT—THE AFFAIRS OF WOODHOUSE AND RAWSON, LIMITED—THE DANGER OF OVERHEAD WIRES.

THE subject of electric lighting was among the last things brought under the notice of the House of Commons before the prorogation. On Thursday, Mr. Watt asked the President of the Board of Trade whether the Electric Lighting Act precludes the grant of Licenses to more than one undertaker for the same area, whether the Act prevents the breaking up of streets without the consent of the Board of Trade, whether inquiry is made as to the responsibility of undertakers before Licenses are granted, and whether any Licenses had been abandoned in consequence of the heavy cost of obtaining them in face of the opposition of local authorities. One cannot help thinking that questions of this kind would be answered just as well if addressed to the Editor of a technical newspaper as when put to the head of a Government Department. Sir M. Hicks Beach dealt with his questioner categorically; the answer to the first query being in the negative, to the second in the affirmative, to the third the same, and as to the last the Department has no information. After this elementary exercise, Sir Henry Roscoe more usefully engaged the Minister's attention by pointing out the fact that four Electric Light Companies have given formal notice of their intention to make application for statutory privilege to supply electricity in the same district of Kensington, and asking whether the Board of Trade could prevent the objectionable consequence of such competition as regards the breaking up of roadways without waiting for the action of the local authority. To this very apposite reminder of the evils of competition in such matters, the President of the Board of Trade gave a satisfactory answer. A further point was made by Sir George Campbell, who asked Sir M. Hicks Beach to take care that no Licenses or Provisional Orders were granted, except to undertakers who could give substantial guarantees of their ability and willingness to carry out the proposed work. Altogether the putting of these questions—especially Sir H. Roscoe's—served a very good purpose. It brought before Parliament and the public the fact that London

is threatened with competitive electric lighting, which can only be prevented by the exercise of vigilant wisdom by the Board of Trade. We showed last week that it is not sufficient to invoke the activity of local authorities in this emergency. These are for the most part quite ignorant of the true working of competition in matters of this kind, and their instruction would be too dearly purchased at the cost of delivering London over to the tender mercies of the horde of electric light speculators.

An extraordinary general meeting of the shareholders in Woodhouse and Rawson, Limited, has just been held, ostensibly for the purpose of confirming the appointment of Auditors, but really, as it appears, in order that the Chairman might have an opportunity of advertizing the recent progress of the Company's business. At any rate, he improved the occasion by reciting the lighting and other contracts completed and entered into by the Directors since the last ordinary meeting, with the intention of impressing the shareholders and the outer world with a due sense of the value of their property. It is truly remarkable how these electrical concerns ramify. Now we make bold to say that the vast majority of people who hear of Woodhouse and Rawson, Limited, never think of the possible subdivisions of the concern. Yet in the Chairman's speech at the meeting in question, we find allusions to "our subsidiary Company working in Yorkshire;" to the "Woodhouse and Rawson Electric Supply Company of Great Britain, Limited, one of our subsidiary companies which does a merchant's business in buying and selling electrical goods;" and another concern called "the Woodhouse and Rawson Electric Manufacturing Company." Besides this, there is to be a new Company formed to do something in the way of dealing in shares which the original Company cannot legally do; and there are promises of great things in the way of amalgamations with other Companies yet unnamed. This may be all right and proper; but to the unsophisticated spectator, it looks rather too much like attempting to multiply scrip which may be negotiable from bearing a name generally understood to belong to a successful concern. It is the most unpleasant thing we have ever noticed in connection with the administration of the business founded by Messrs. Woodhouse and Rawson.

It is well understood that the Grosvenor Gallery Electric Light Company, and two or three other concerns in the same way of business, are at the present time carrying on their operations in different parts of London by what may almost be called the surreptitious running of wires from their generating stations over the house tops to the premises of their subscribers. Seeing the maze of telegraph and telephone wires which occupy the same "coign of vantage," above the crowded streets, we have repeatedly remarked on the hazard attending this method of distributing strong electrical currents, which, moreover, practically sets at naught the provisions of the Electric Lighting Act for the protection of the public. The practice has grown from small beginnings, until we believe that now there are many arc lamps in use by advertising shopkeepers the current for which—quite strong enough to kill a man, or set fire to a house—is brought by means of wires carried over the tops of houses by the most audacious trespass. It is all very satisfactory to the parties primarily interested, so long as there is no disaster; but the first catastrophe which brings the system under the notice of a coroner's jury will be the signal for its collapse. That such an eventuality is by no means improbable may be gathered from the complaint of a firm of solicitors recently published in a daily newspaper, whose telephone connections were attacked and fused by some agency which they believe to have been accidental contact with an electric light wire. It must have been either this or a flash of lightning; and the latter is inadmissible. Therefore although the complainants wisely disclaim any wish to be regarded as alarmists, they made their case known, in order that the danger in question may be guarded against by the only satisfactory expedient of burying all electric light wires out of the way of telephonic connections. Nothing will be done, however, until somebody is killed outright.

PROHIBITING THE USE OF SACCHARINE IN FRANCE.—The following (says *Industries*) is an abstract of the preamble of the Bill now before the French Chamber, prohibiting the importation of saccharine into France:—"The attention of the Administration has been directed to a new coal-tar product known as saccharine. This substance, which differs essentially in its elementary composition from vegetable sugars, possesses much greater sweetening power, a quality that was sure to lead to its being used as a substitute for sugar in many cases. We learned from our Consular agencies abroad that factories were being established in certain countries for the purpose of bringing saccharine into competition with beet and cane sugar; not only in France, but also in other neighbouring markets. The high cost of that substance seemed to constitute an insuperable obstacle to its general adoption; but lately the situation has changed. It can now be more cheaply produced; and already it is extensively used, mixed with glucose, in the preparation of jams, syrups, and liqueurs. It has, therefore, become an urgent necessity to provide a remedy for the evil, in the interests of the Customs receipts and that of the health of the consumer; for it has been shown by the report of Drs. Bronardel, Poucliet, and Ogier, in the name of the Consulting Committee of Hygiene, that saccharine, and the various preparations derived from it, are noxious to health, and ought to be prohibited. Wherefore the Government has deemed it expedient to prohibit the importation of saccharine and saccharinated substances."

MR. DIBDIN ON STANDARDS OF LIGHT.

ALTHOUGH the paper read by Mr. Dibdin at the Society of Arts on Wednesday last was rather a *résumé* of his conclusions on this subject, as already set forth in the reports presented to the Metropolitan Board of Works, in papers read at meetings of The Gas Institute and the Society of Chemical Industry, than a further advancement in respect to this abstruse subject, still it resulted in bringing out one or two new ideas from the reader of the paper, and from Mr. Alexander Siemens and Mr. Williams in the course of the subsequent discussion. Most of our readers must be well aware that Mr. Dibdin objects to candles and to the amyl-acetate lamp as being altogether unsuitable for light standards; that he is more hopeful as regards the "slit" or "screen" as applied in conjunction with carburetted air-gas; and that he considers the Harcourt pentane standard the most suitable of all; also that he has conducted a very elaborate series of experiments in connection with the subject. Anything that he has to say about standards of light is, therefore, worthy of attentive consideration, as coming from an undoubted authority.

Mr. Dibdin commenced his paper on Wednesday by showing the importance of the subject, as illustrated by the amount of money annually expended in London for gas. But this is rather an argument for the necessity of using the best obtainable burners that will develop the highest possible duty from the gas, than for accurate testing, which will never actually save the public money. The value of the gas may be determined to within a fraction per cent., but, unless the public are educated to use better burners, the matter will not affect them; and they will always prefer to form their own opinion as to the value of gas or any other source of light, irrespective of official tests. Gas engineers know well that an irate consumer, prejudiced against the gas by insufficient supply, or by the use of unsuitable burners, has very little respect for photometrical results; and at once sweeps away any argument as to proved candle power with a Pecksniffian flourish of the right arm. The parties who are really most interested in accurate, unvariable testing are the gas companies, who occasionally are subjected to some injustice on account of the vagaries of the candle, or—and we say it with all respect—the vagaries of the gas examiner. The long list given by Mr. Dibdin of attempts to improve upon the sperm candle, and the fact that it is not yet displaced, renders it an open question whether many of the defects ascribed to it are not also common to any source of light. On the question of purity of material, for example, it came out in the course of the evening that the amyl-acetate used for the lamp to which that title has been given must be perfectly pure, if reliable results are to be obtained. If this is so with amyl-acetate, it may also be the case with pentane. The unsettled state of opinion amongst English photometrists is certainly somewhat behind the course pursued in Germany, where endeavours are being made to improve the candle and the amyl-acetate lamp, with a view of rendering them reliable standards.

As regards the colour of the amyl-acetate flame, on which Mr. Dibdin lays so much stress, it should be observed that no difference is perceptible to the eye between the colour of this flame and that of pentane. Both were exhibited side by side; and both gave, to the eyes of the audience, a clear, intense white light. Mr. Alexander Siemens observed that Mr. Dibdin had endeavoured to get a higher duty out of the lamp supplied to him than it was intended to yield, by increasing the height of the flame from 40 to 51 mm., in order to make the light equal to an English sperm candle; and perhaps this is the reason why the German operators seem to have a better opinion of this proposed standard than Mr. Dibdin. Mr. Williams spoke very highly of the amyl-acetate lamp; and, indeed, he appeared to think that, with a few simple improvements in detail—such as the substitution of a platinum wick-tube for the German silver one—it would prove a very useful apparatus. It certainly possesses the advantage of simplicity, portability, and cheapness. Bearing in mind that legal gas testing applies to large towns and also to small undertakings, having perhaps a capital of £4000 or £5000, these are important considerations.

Mr. Dibdin gave an account of the proposed molten platinum standards; but he had very little hope as to their practicability, and this was fully illustrated by the examples exhibited. The great objection to this principle is that it is of an evanescent character. The observation must be taken at the moment of best effect; just as the platinum is on the point of fusing. So that to obtain one reading, a number of trial observations must be made, and all but the highest rejected. The platinum unit requires a skilful operator at the sight-box, and another very carefully regulating the application of heat, which may be furnished either by oxyhydrogen or by electricity. In the first case the oxygen supply, and in the second the current of electricity, must be very gradually increased until the foil melts. The oxyhydrogen worked fairly well. Of the two electric-platinum units exhibited, one required an unparliamentary amount of coaxing to get it to act; and the other one was not in working order. It seems idle, therefore, even to mention molten platinum as a possible standard.

Mr. Dibdin admits that "it would probably not be difficult to formulate a manner of using the candles that would do away with many of the objections and variations found in the course of his experiments; and in this respect he was supported by Mr. Williams. But while in England photometrists are talking about the possibility of regulating the composition, and the number of threads to the wick, in Germany they are actually trying to carry it out, by making the candles much shorter, so as to get a better centring of the wick, &c. Indeed it is evident that there is too

much of what may be called 'red-tapeism' in connection with English photometry. It is simply absurd to suppose that, because the Acts of Parliament specify "sperm candles of six to the pound, burning 120 grains per hour," anything that can be compressed into these conditions will do; and that the examiner has no option even if "they are shut up in a box with insufficient ventilation," or if the wick curls up like a cork-screw or a pig's tail. The Act of Parliament certainly does not provide for these contingencies; but it is only consistent with common sense to suppose that in the first case the apparatus should be properly ventilated, and that in the second a proper candle should be substituted. Whatever may be the letter, it certainly cannot be the sense of the Act that the examiner should knowingly use a candle that is unjust either to the gas or to the consumer. Whether candles or any other standard may be used, the skill and experience of the operator must always be a factor in the experiment.

The author devoted some time to a criticism of the statements made by Messrs. Heisch and Hartley, in their report to The Gas Institute in 1884, as to the unsteadiness of the pentane flame; but the specimen exhibited on the platform rather supported the views expressed by those gentlemen than otherwise. No special draught was observable in the room; but it wavered considerably until protected by an Argand chimney glass. Mr. Dibdin recommended the use of the chimney and cover in all practical work. With respect to chimneys, Mr. Williams raised an important point. He had found that even the best glass chimneys were liable to differences of refraction, and the presence of striæ; so that a different result might be obtained by partially rotating the chimney so as to bring a different part of its surface before the flame. If this is applicable in connection with pentane, it is pertinent to ask what the effect of the Argand chimney, as invariably used with the gas-flame, may be. Mr. King has found that a clear glass globe obstructs 10½ per cent. of light; Mr. Wood puts it at 12 per cent.; while Mr. Storer finds that flat sheets of various kinds of glass have an obstructive effect ranging from 6 to 13 per cent.* In order to overcome this defect, Mr. Williams has tried experiments with plates of thin mica, and has succeeded in obtaining a chimney that has no effect on the photometer. Whether off or on, the lighting effect is the same. According to the results above quoted, the effect of the Argand chimney must be to obstruct a considerable portion of light. It would, therefore, be interesting if Mr. Williams could adopt a similar thin mica chimney to the gas-flame and observe the result.

At the conclusion of his lecture, Mr. Dibdin exhibited examples of different forms of wicks taken in the course of burning, ranging from a stiff-backed upright wick to one curled down nearly to the shape of an O. Alterations in the shape of the wick, or divergencies due to inaccurate centring of it, are doubtless the weak point of the standard candle. Some time ago Mr. Sugg drew attention to this point, and illustrated it by means of a series of photographs, showing the deviation from the plumb-line that gradually took place.† His observations, however, extended over some 45 minutes; and the point of this question is, What extent of deviation would take place in the course of 10 minutes? If accurately adjusted at the beginning of the experiment, how far out of perpendicular would the flame draw over before the end? But besides differences due to the deviation from the perpendicular by the curving of the wick, there is the (as yet) undetermined point as to the effect of the shape of the wick as regards light-giving power. According to Mr. Dibdin, it appears that a straight wick, wholly enveloped in flame, gives less light per grain of sperm consumed than a bent wick with a glowing top. Here, again, Mr. Williams came to the rescue. He said that a skilled photometrist knew well what the proper curve of the wick should be. It should approximate to a parabolic curve.

Altogether, the result of this paper and the subsequent discussion is to show that the much-abused candle is not altogether a hopeless failure as a standard of light; and that, with the exercise of a very ordinary amount of common sense and skill—especially if combined with a few simple precautions on the part of the maker—much better results can be obtained with it than is at present supposed. Some additions to the existing legal conditions are evidently desirable; but whether, as Mr. Dibdin says, it would be as easy to introduce a new standard so as to obtain these is, of course, a matter of opinion.

THE FOURTH DRAWING OF THE SYDNEY GASHOLDER.—With the present number of the JOURNAL we give the fourth plate of the series illustrating the new holder for the Sydney Gas-Works; and, as explained last week, we defer any description of the details until the publication of the fifth drawing in next week's issue.

IMPROVED STREET LIGHTING AT LEITH.—A commencement has been made by the Corporation of Leith in improving the lighting of the public thoroughfares, by fitting the public lamps with governor burners, in accordance with the resolution recently passed by the Edinburgh and Leith Gas Commissioners. The lamps in Hermitage Place have been provided with Peebles's governor burners, consuming 2 cubic feet of gas per hour; and last Wednesday night were lighted for the first time since the change. The improvement in the lighting, it is stated, was very noticeable. At their meeting last week, the Gas Commissioners sanctioned the purchase of 2000 governor burners; and in a week or two all the lamps in the town will be fitted with them.

* See "Newbigging's Handbook," Fourth Edition, p. 234.

† See JOURNAL, Vol. XLV., p. 395.

Technical Record.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

At the close of the discussion on Mr. Dalglish's paper (*ante*, pp. 1067-8) at the recent quarterly meeting of this Institution, the members proceeded to consider the paper read by Mr. Thomas Newbigging at the Doncaster meeting in August, entitled

GASHOLDERS WITHOUT UPPER GUIDE-FRAMING.

The PRESIDENT said they had now to discuss the paper read at the last meeting by Mr. Newbigging, on the subject of "Gasholders without Upper Guide-Framing." He was sorry Mr. Newbigging happened to be away; but he should ask Mr. W. Gadd to introduce the discussion by any additional observations he wished to make.

Mr. W. GADD (Manchester) said he was obliged to the President for calling upon him to introduce the subject. The model which he had brought was not the one seen at Doncaster. It was a larger one with three lifts, and would, he thought, be found a little more interesting than the old one. Since he last had the pleasure of addressing them at Doncaster, he had been engaged upon a great number of experiments with regard to the principle involved in the construction of a gasholder on this system. As they were well aware, there had been considerable discussion on the subject since the paper was read; and it was highly probable that there would be much more discussion until the invention was properly demonstrated. It was his desire to bring the demonstration to the issue; and he had very good reasons for believing that it would not be long before they would have the pleasure of seeing and examining for themselves an actual working holder on this plan. This would set the matter at rest once for all, whether a holder was safe under such conditions. The experiments he had made, instead of contributing in any way to cast doubt on the stability of a holder on this method of construction, had added, he was going to say, almost infinitely to his faith and belief in the final results and success of a holder constructed in this manner. In his paper, Mr. Newbigging said that, as at present constructed and guided, gasholders were capable of resisting the maximum crushing strain that was exerted by the greatest wind pressure upon their exposed side—*i.e.*, a pressure equal to 20 lbs. to the square foot exerted upon a plane represented by 50 per cent. of the area of vertical transverse section of the holder. Well, he thought he would submit the model to an actual strain to try what it would stand. He took the model they saw at Doncaster, and submitted it to an actual strain—not to any supposed reduced strain—of 20 lbs. to the square foot exerted on a plane represented by 50 per cent. of the area of vertical transverse section of the holder. That pressure of 20 lbs. to the square foot took no effect whatever upon the model. He doubled it, and again it took no effect; and he determined to increase the strain until he ruptured the model, or gave it a permanent set-over. He kept on increasing the strain, and both he and Mr. Wilson, who assisted him, were surprised at what took place. They weighted it until they did give it a slight permanent set-over; but it affected it so little that, when the force was removed, the model would work, though imperfectly. The exact force necessary to bring it to the point of injury was a force of 648 lbs. to the square foot. Mr. Newbigging gave 20 lbs. to the square foot as the greatest wind pressure; but it actually required 648 lbs. to the square foot on that little delicate model to give it a permanent set-over in the way of injury—nothing short of that did it. This, he was bound to say, somewhat startled him. He had not expected it would stand so much; and he found it necessary to seek for an explanation of the cause of this resistance. The model, he wished to explain, was simply a cylinder of ordinary thin tin, with a tin top. He was not going to say that this represented exactly the comparative strength of a large holder. The model might be a little stronger, in proportion, than the large holder, because although it had no upright standards whatever round it, still the thickness of the tin might be said to be greater than the sheets would be, in proportion, in the large holder, and this would compensate for the absence of the upright supports. He was free to admit that it might be stronger in proportion; but see the difference! There was a difference in the increased proportionate strength of 648 lbs. to 20 lbs.; yet the model was not this much stronger. It was impossible to conceive of its being anything like so much stronger. Suppose they assumed it to be double the strength—that was 40 lbs. to the square foot; but, instead of that, the model required a strain of 648 lbs. to cause it to set-over. There was therefore something in addition to the construction which had to be investigated; and he determined to inquire into it. They had, no doubt, all read the able articles on the subject of gasholder construction in the JOURNAL OF GAS LIGHTING. He was pleased to contribute his little meed of admiration of those articles, which were very carefully written, and were upon the acknowledged and admitted lines of mechanical construction. But there was a form of structure which, so far as he knew, had not been very carefully examined. It was true that it was many years since he consulted the text-books, and he was speaking from memory; but he did not recollect that Rankine or any of the other authorities had investigated this point, though he had a hazy notion that a French writer had treated of it. However, it was so difficult that he determined to investigate it *de novo*. If they took a base, which might be represented by the bottom curb of the holder, and fixed thereon (say) four upright beams, joined rigidly

at the base, they had a system of cantilevers. The force required to bend one, multiplied by the number would equal the force required to bend the four; but if these cantilevers were joined at the top by another rigid bar, which might be represented by the cup rings of the holder, the actual force exerted transversely would be four times what was required in the first example. The reason of this was that two bends in opposite directions of each upright member took place when they were joined top and bottom; whereas, when they were unconnected at the top, as in the first example, there was only one bend. This accounted for double the force being required. But, as these two bends were in opposite directions, they had to be made about a neutral axis lying midway between the two horizontal members. This halved the length of leverage at which the force took place; and this again multiplied the resistance by two, which accounted for four times its strength in resisting strains. If they had the upright from a bottom curb standing up, and they should then be joined by a rigid ring at the top, the resistance to the overturning of these uprights was multiplied by four, by the rigid ring at the top. He thought it necessary to go into this, to give them the reason why a holder which was held rigidly at the base became very strong indeed. It had been suggested that a great deal of strength would require to be put into a holder built on the plan he proposed; but they would see that there was no reason why this should be necessary. Still, he had always admitted that, if it were necessary, it was easily done; and it would form an infinitesimal addition to the expense, when compared with what was swept away in the guide-framing. He wished to draw attention to the fact that the spiral motion was exceedingly slight. The screw or spiral was of what might be called the quickest possible description. The holder was a structure with an enormous base; and this base was held as firmly as though it rested on the ground. If they had such a structure resting on the ground, they could not conceive that any wind would blow it over. By his plan, the holder was in a really stable position. As long as the bottom curb kept in form, there was no possibility of any accident taking place; nor was there any possibility of jamming. It would not matter if they had 2 or 3 inches of play between the rollers; all that was necessary was for it to be on one set of rollers at one time. They had tried the model under all possible conditions.

The PRESIDENT said that, if he understood Mr. Gadd aright, in taking a pressure of 20 lbs. to the square foot, and applying it to one-half of the complete surface of the holder, they had what Mr. Newbigging considered a fairly heavy wind pressure; but that, in the case of the model in question, it stood a pressure of 648 lbs., as against the 20 lbs. It certainly seemed an enormous difference. One could not, however, help noticing that, in the structure as it was, having the frame of the holder inside, and with a grip on the guide-rails all round, if wind pressure came from one side, that side was held down, while the other side was held up. This was different to a holder with outside framing; inasmuch as in that the bulk of the strain was on the opposite side to that from which the wind came, while in this case it was distributed all round. It was an exceedingly ingenious arrangement. Whether Mr. Gadd was to get the credit for the invention, he did not know. He saw that Mr. Livesey had been reading a paper on the same subject, though he arrived at the same end in a different way. Mr. Gadd took a spiral frame all round the tank; while in Mr. Livesey's it went first one way and then another. Anyway, they had Mr. Gadd's paper before Mr. Livesey's, though both were based on the same line of thought.

Mr. HARRISON VEEVERS (Dukinfield) remarked that when Mr. Newbigging mentioned that he intended to read a paper on gasholder construction, he said it would rather surprise the gas world. It certainly astonished him more than he was led to expect. It certainly surprised him that such a total revolution in gasholder construction should be first brought out at a meeting of their Institution. He had not much opportunity at the last meeting of considering the subject; but, on reflection and studying the paper, he came to the same conclusion as the President, that the holder was fixed by the pressure of the rollers all round. Leaving the scientific part of the subject, he should like to say something as to its æsthetic aspect. Gasholders were not things of beauty. Designed and painted in any way they liked, they were not pleasant to look at. A holder constructed on Mr. Gadd's principle was, in his opinion, more a thing of beauty than if it had a number of sticks standing round it, pretending to hold it up. From this point of view alone, he was inclined to look with favour upon it.

Mr. N. MEIKLEJOHN (Longwood) said Mr. Gadd had shown them that a lever bound at both ends was four times as strong as one with one end free; but he did not gather that anything he said gave a reason for the extraordinary strength of his model. All holders were at present made, as the one proposed by Mr. Gadd was, with a top and bottom curb, and a space of intervening sheeting; and he should like to have heard Mr. Gadd explain the difference between the resisting strength of an ordinary holder and his model. The idea seemed to be that the fixing of the bottom curb would add the extra strength; but as it was to be a floating vessel, which would rise up and down, he had never yet been able to see how this rigidity was to be obtained. He did not for a moment deny that it was as Mr. Gadd represented it; but he had not been able to see how the fixing would add anything to the actual strain it would resist in case of wind pressure coming against the side of the holder. With Mr. Veevers, he thought the æsthetic point of view should not be lost sight of; but granting that the engineering

feat was possible, they ought to know something of the difference in cost. They were to have a total taking away of the guide-framing; but if the cost came anything near that of guide-framing, he should prefer to have the framing. The framing did add to its appearance; and it was certainly useful when the lutes froze and snow gathered on the top. With the holder as it was in the model, it would be a rather difficult thing for a man to go up and clear the ice out of the cups or the snow off the top. There might be a spiral framing for these purposes; but at present the framing answered the purpose, as well as resisting the over-turning pressure of the wind. If the difference in the cost of the two structures was not large, he should certainly prefer to still put up the guide-framing.

Mr. W. W. HUTCHINSON (Barnsley) wished to know how long the actual holder on this plan, to which Mr. Gadd referred, had been erected; and if it had stood the test of any strong winds.

Mr. GADD explained that the holder was not yet erected, but was in contemplation.

Mr. J. DALGLIESH (Glossop) asked if Mr. Gadd could give some idea of the difference in cost of the two arrangements. He had some sympathy with the view expressed by a previous speaker; and if the cost was not very much lower, it would certainly, as far as his experience went, be better to stick to the old form. At the same time he admitted that the new invention gave a perfectly rigid structure. Could they not combine the two things, and have a light framing round a holder on Mr. Gadd's principle? They ought, however, to have some information as to the cost, so that they might be better able to form an opinion. There would certainly be some difficulty in getting to the top of Mr. Gadd's holder without some arrangement like a spiral staircase.

Mr. BALL said he should like to ask just one question. As the framing was to be done away with, the strain it was called upon to bear would have to be taken up somewhere else; and it seemed to him it would be taken by the tank-guides. Would this entail any additional expense in the construction of the tank? Would any additional strain be thrown upon the guides in the tank; and if there was, would it be sufficient to cause any additional expense in the structure?

Mr. J. PARKINSON (Brighouse) assumed that the whole of the weight was taken by the tank-guides to the bottom lift; and when they came to erect a three-lift holder, these would have to be very strong, and bear a great weight. There was free space for the vertical sides of the second lift, and also for the bottom lift. For a single-lift holder, the arrangement might do where the spirals were held to the tank-wall; but when they came to the vertical sides of a second lift, there would, he thought, be a source of weakness there.

The PRESIDENT, referring to Mr. Veevers's remark on the æsthetic side of the question, said that economy with safety were the two main points they had to consider. He did not think there would be any difficulty in making arrangements to get to the top of the holder. The question of cost was, however, one that they ought to know something about; and if, as Mr. Gadd said, it would not be long before a holder on his plan was erected on a large scale, it would be interesting to see what it cost. He was sorry that some gentlemen like Mr. Newbigging, who usually took part in the discussion, were absent that day.

Mr. GADD said he felt as strongly as the President the absence of Mr. Newbigging, who would certainly have been of great assistance in the discussion. With reference to the objection of Mr. Meiklejohn, that there was no provision for climbing on the holder to clear the frozen lutes and so on, he had only to say that this was a matter of detail, which would have, of course, to be provided for. In the illustration which accompanied the paper, a hand-rail was figured round the top of the holder, such as was now common enough. A rail could also be put round each lift, and they would make a firm and safe road; and then a little straight iron ladder could be put up at some convenient point at the side of the holder. This was a little matter of engineering detail, which any engineer could design and carry out. As to the cost, if his plan were not cheaper, he did not know why anybody should be at the trouble to depart from the old lines; but Mr. Newbigging, in his estimate, put the cost of the guide-framing, roughly speaking, at 50 per cent. of the cost of the whole structure. He (Mr. Gadd) would not assert positively that this was a correct estimate. But if it were placed at 40 per cent., or any other figure, it was obvious that there must be an enormous saving by taking away the great weight of guide-framing; and it was on this that the commercial success of the invention must be shown. Whether Mr. Newbigging's estimate was under or over the mark, was a matter of considerable interest; but in itself it was quite immaterial. He thought a saving of 50 per cent. was not very far from the mark; for they not only saved in the framework itself, but they saved all the piers and foundation-stone preparation round the tank for building the guide-framing upon, which in cost of material and labour, must form a very important item. As to the tank-guides, which Mr. Ball referred to, there was no doubt that the strain would have to be taken up by the guides in the tank. It must be taken up somewhere; and the final resistance to the strain was in the spiral-guides round the tank. The strength lay in the fact that the spiral-guides were built into the tank, and could not give way, unless they were torn bodily away; and it would be very easy to design a method of fixing the guides into the tank, by long Lewis bolts, or something of that kind, so that no reasonable force could pull them out. This could be done without adding materially

to the expense, because the guides had to be fixed at present; and there need be no very great addition to the expense. As for the æsthetic question, this, of course, might be interesting; but at the same time it was perfectly true, as the President had said, that it could not be considered in the face of possible economy. But when all this was said, he confessed—though it might be prejudice in favour of his own child—that he saw a simplicity about the structure he had designed which commended itself to him. He compared it to the idea of the structure of the pyramids of Egypt, about which there was a grand simplicity greatly to be admired; and he was inclined to think that when they saw these holders on a large scale without guide-framing, they would admit they had a beauty which was absent from the ordinary structure of sticks and rods. However, this was quite a matter of taste; and for the present, they must adopt the dictum of the President that æsthetic considerations must give way to those of economy. Then he was asked as to the strains, and how the rollers were to grip the guide-rails and keep the holder firm. The explanation was this: In the present holders, if there was any wind pressure, the holder was driven horizontally to the framework on the opposite side to that from which the wind came. In his new holder the bottom curb was gripped and held; and the strain became one of the cantilever type. If they took an imaginary line from the top of the holder downward to the roller on the other side, they had the resistance, so to speak, of a direct strut through the centre. They had no strut, it was true; but they had a circular girder bond all round. The model stood an extraordinary strain; and he did not think the same model would have done this if with guide-framing.

The PRESIDENT remarked that, as in the case of Mr. Dalgliesh, they accorded to Mr. Newbigging a vote of thanks for his paper at the last meeting. They were, however, very much obliged to Mr. Gadd for being present that day.

THE IMPROVED STREET LIGHTING BY GAS IN THE CITY.—Alluding to the fitting within the last few weeks of some improved gas lanterns and burners to the lamp-posts in Cheapside, Queen Victoria Street, and some other City thoroughfares, our contemporary, *Money*, says: "The improvement in the light is very marked; although the new form of lamp-head is not perhaps the best suited to give gas fair play. Still we must be thankful for small mercies. It is a step in the right direction; and in time we may have a perfect form of gas-lamp in our streets. Anyway, it is better than being saddled with the expensive, delusive, will o' wisp electric phantom."

MR. ELLIS LEVER AND THE LEEDS GAS COAL CONTRACTS.—The Special Committee which was appointed to investigate the statements made some time since by Mr. Ellis Lever concerning the coal supplied to the Leeds Corporation Gas-Works (references to which have appeared in the JOURNAL from time to time) had their report—which is said to be a voluminous document—under consideration at a meeting last Thursday. A meeting of the Gas Committee was held later in the same day; and the report was laid before them and adopted. The report has since been published; and an abstract will be given in our next number.

THE "EVENING STAR" LODGE OF FREEMASONS.—It may be remembered that an absurd attempt (which signally failed, as it richly deserved to do) was a short time since made by one of the London daily financial papers, to bring discredit on the members of the "Evening Star" Lodge by commenting upon an anonymous letter published in its columns. We then alluded to the matter in an "editorial;" and no further mention would have been made of it but for a letter from "A Life Governor" of the Masonic Charities appearing in the last number of the *Freemasons' Chronicle*. We have pleasure in reproducing this letter, as it bears out most fully everything that was said about the question by those who had true masonry at heart. It is as follows:—"I had the pleasure of receiving an invitation to the recent installation meeting of the Evening Star Lodge; but, perhaps, at the time it reached me, I had misgivings as to the 'class' of men I was to meet there—I may tell you I had read in a public journal that this Lodge is a hot-bed of jobbery and corruption. Still, I decided to avail myself of the opportunity of personally judging, if possible, whether such a charge was justified. I need hardly tell you, Bro. Editor, that I found the members of the Evening Star Lodge as true gentlemen and as sincere masons as could be desired; and I think it a pity that the name of the Lodge, or any of its constituent members, should have been mixed up with a supposed scandal, or in any way associated with general misdoings in the gas world. Among the members of the Lodge, I found Bro. James Glaisher, an octogenarian, but as genial a craftsman as ever donned an apron. I felt that in such a frame it was impossible for 'treason to lurk.' I gathered that it was in the course of a trip to cloudland that Bro. Glaisher expressed the wish to become a Freemason; and he ultimately induced Bro. Magnus Ohren to propose him. This alone would, I think, entitle Bro. Magnus Ohren to the thanks of the members of the Evening Star Lodge; but he has other claims on their regard—not the least of which is his persistent desire to promote the welfare of the Masonic Charities. His efforts in this respect had a happy issue on the evening of my visit; inasmuch as the services of Stewards for each of the Masonic Institutions were secured at the meetings for the Festivals of 1889. I, for one, should like to see a few more Lodges following the example of the Evening Star; and if their only reward for so doing was to create envy in the outside world, they would at least have the gratification of knowing they had done something to attract attention."

STANDARDS OF LIGHT

At the Meeting of the Society of Arts on Wednesday last—Dr. J. Hopkinson presiding—Mr. W. J. DIBDIN, F.I.C., F.C.S., read a paper on "Standards of Light." The author had many of the standards mentioned in the course of the paper fitted up, and gave full explanations as to their operation.

The great importance attaching to the measurement of light in these days of severe competition between various luminous agents renders it, he said, imperative for the question to be kept well in view, to prevent its being lost in the whirlpool of political changes. To many of the public, the question doubtless appears to be one of those with which scientific men like to amuse themselves, but which can by no possibility have any effect on the practical details of our daily life. To show the immense commercial importance of the question in the City of London alone, it is only necessary to put forward the facts relating to the gas supplied by the three large Companies—viz., The Gaslight and Coke Company, the South Metropolitan Gas Company, and the Commercial Gas Company. In 1887, the amount paid by the public to these three Companies for gas was £3,354,794. Practically the whole of this amount was for 16-candle gas. Therefore £209,674 was paid by the public of London for one candle of light. When this item is added to the whole of the gas supply of the United Kingdom, it will be at once comprehended that in this seeming unimportant controversy, we have one of the most far-reaching questions of the day—one, in fact, which, as soon as it is fairly grasped by the public, will have to be speedily settled. Up to the present, it may be said that, in spite of the repeated inquiries, reports, papers before the various societies, and long correspondence in the newspapers, the question is looked upon as merely pertaining to the laboratory of the professional photometrist.

The keen competition between the gas companies and the electricians (which is but beginning to rear its head, and promises to soon become a serious matter) demands a settlement of the value of our English unit, the sperm candle, and the provision of a substitute for it which will at once be reliable in working, and capable of multiplication and repetition to an unlimited extent. Looking beyond our own nation, we see the question agitating the minds of conscientious workers in other countries. In France, the "Carcel" lamp has held its own since its introduction in 1800, much in the same way as our sperm candles still maintain their pre-eminence here. In Germany, the paraffin candle (used, however, in a far more scientific way than are our sperm candles) still holds the field. In America, in this matter, they try all things, and anxiously watch the older countries for guidance.

When gas was unknown, and oil-lamps and tallow candles ruled the roast, and the electric light was yet unborn, Bouguer, in 1760, proposed candles as the unit of comparison. In those days there were no official testing-stations, and no boards of directors to harass unhappy gas managers. Had Bouguer lived now, it is open to doubt whether he would have been bold enough to have made the same proposition. Sixty-four years later Ritchie proposed wax candles; but does not appear to have worried himself about the rate of consumption. Tallow, paraffin, stearine, and sperm have been all tried, and finally in this country sperm candles, weighing six to the pound, each candle burning 120 grains of sperm per hour, were adopted.

The contradictory results afforded by the various candles and the Carcel lamp gave rise to numerous proposals for substitutes. Amongst these are the four-wick lamp of Potter; Keates's sperm oil lamp; Bunsen and Roscoe's carbonic oxide flame; Crookes's alcohol and benzol flame; Von Wartha's ether flame; Vernon Harcourt's pentane air-gas flame and lamps, Fiddes's aperture; Wolf's screened moderator lamp; Hefner-Alteneck's amyl-acetate flame; Methven's screened Argand flame; Edgerton's screened petroleum reading-lamp; Rüdorff's screened Argand flame; Sugg's 10 and 16 candle tests (screened Argands); Dibdin's pentane Argand; Draper's, Zollner's, Schwendler's, and Violle's incandescent platinum and silver units; and various electric incandescent lamps. For the purpose of ascertaining the quality of ordinary coal gas, various devices have been employed, such as the length of a gas-flame at known pressures—i.e., "jet" photometers; but these cannot be classed under the head of "standards of light."

By a process of the survival of the fittest, only the pentane, the Methven screen, the pentane Argand, and the 10 and 16 candle tests, are now before the public as practical proposals for substitutes for the sperm candle in this country. In Germany, the amyl-acetate lamp of Herr von Hefner-Alteneck has met with great favour; and it would appear to have a good chance of being adopted as the legal standard. The objection of the English experts to the colour of the flame is so strong that there does not appear to be any probability of its being adopted here. In France, the melted platinum unit, in the form proposed by M. Violle, has met with some favour; but nothing practical has arisen from it up to the present. I tried a modification of this proposal in connection with my experiments conducted under the direction of the Metropolitan Board of Works, in which I melted platinum foil by the oxyhydrogen blowpipe flame, and took the light emitted at the moment of its melting as the indicator. This system was followed up by the Standard of Light Committee of the British Association, and elaborated by Mr. H. Trueman Wood, the Secretary of this Society, who arranged the foil so that it could be melted by an electric current. The British Association Committee also tried a suggestion of Professor Dewar, which provided for the end of a thick rod of platinum being kept in a molten condition by the

oxyhydrogen flame, and, while in that condition, being used as a standard after the manner of the Methven—a screen with a small circular aperture being placed immediately in front of the molten bead of platinum. None of these methods, however, gave reliable results; and there does not appear to be much hope of such a standard ever finding favour in this country. The Standards of Light Committee of the British Association for the Advancement of Science reported this year that, in their opinion, Professor Violle's molten platinum standard is not a practical standard of light, although they were quite prepared to agree to the adoption of the light emitted by a square centimetre of molten platinum as a unit, but not as a standard of light.

As it would be a work of supererogation to enumerate in detail all the work of the various official inquiries which have been made on the standards of light, I propose to discuss their results generally. The present official candles were described in the Metropolitan Gas Act of 1860 as "sperm candles of six to the pound, each burning 120 grains per hour." If, in fact, each candle would confine its rate of combustion to that quantity, doubtless a great part of our difficulties would never have arisen; but as it is a matter for remark when we do get a candle to burn this precise quantity, we have to fall back upon an experiment for correcting the variations due to variable rates of combustion—i.e., we weigh the candles before and after the experiment, and calculate the volume of light from the actual weight of sperm consumed in a given time. This method introduces the assumption that the luminous energy of a burning candle is always in proportion to the weight of sperm consumed in a given time. In order to avoid this assumption being too greatly strained, it is provided, however, that when the consumption falls below 114 grains per hour, or rises above 126 grains per hour, the test shall be rejected. The only other provision regarding the proper use of candles is that they shall attain "their normal rate of burning." The casual observer would probably assume that after all these precautions, surely the quantity of light emitted by a candle must be constant, within very minute limits. But by referring to the reports of various experts and committees, we shall see how far this is so. On the 25th of August, 1881, the Committee appointed by the Board of Trade reported "that candles are not of constant composition; that the melting point of the sperm varied; that the number and size of the threads in the wick, its treatment and closeness of plaiting of the strands, &c., affect the light of the candle, and that manufacturers differ in regard to them; that they found a difference of 15 per cent. in the average illuminating power of legal candles, and a maximum variation between two pairs of candles, of 22.7 per cent." In 1883, the Council of The Gas Institute appointed a Standards of Light Committee, and engaged the services of two of the most capable photometrists of the day—viz., Messrs. Heisch and Hartley. These gentlemen, after a most careful inquiry, in which they were assisted by the Committee, reported that—"In our experiments the differences in the indicated illuminating power by candles range from 1.3 per cent. to 16 per cent.; the average difference being 7.05 per cent. The maximum for 16-candle gas equals a difference of 2.56 candles; and the average, a difference of 1.128 candles. Such extremes as we realized are due to our resolve to study the behaviour of candles as sold for photometric purposes, which led us to use some, although they did not burn satisfactorily, specimens which in ordinary operations we should have rejected." The reporters then make a very important statement. They say: "We may here mention what we are convinced to be a fact—namely, that sperm candles generally now develop more light per grain of sperm burned than they did several years ago."

In July, 1884, the Special Purposes and Sanitary Committee of the Metropolitan Board of Works instructed me to report exhaustively upon the important subject of "Standards of Lights" and in the following February, I presented an interim report. [The author here read the section of the report relating to "Candles," which will be found on p. 577 of the JOURNAL for March 31, 1885, and which shows great divergencies in the results he obtained in his tests with candles.] Continuing, he said: In my second and final report, presented to the Committee on the 3rd of May, 1887, I stated that—"As will be seen from the tabulated results of the numerous experiments which have been made—viz., 2120, involving over 20,030 recorded observations—candles, as the only legal standard in this country, have been systematically used, with the result of still more than ever proving their unreliability."

While this repeated condemnation of the candles, when used in the legal manner, admits of no saving clause, it is only right to put again on record the fact that when the operator is allowed to choose his own candles, rejecting those which are obviously incorrect, although falling within the limits of the Act, and to burn them in the open, instead of shutting them up in a closed box with insufficient ventilation, very different results are obtainable. In fact, to such an extent has this been found, that it would probably not be difficult to formulate a manner of using them, and it might seem desirable to try the effect of such regulations. The difficulties that would, however, arise between conflicting interests in making such regulations, would probably be no greater than those in connection with the introduction of a new standard which should at once sweep away any uncertainty; and it is better, therefore, to work for a permanent change rather than for a temporary expedient, however desirable that may be.

Having arrived at the conclusion that the present legal standard is unreliable, it is necessary to inquire into the merits of the various proposed substitutes. Of these the pentane air-gas

standard of Mr. A. Vernon Harcourt undoubtedly holds the highest rank. This was first introduced in August, 1877, when Mr. Harcourt read a paper upon it before the Physical and Chemical Sections of the British Association, at their meeting at Plymouth. On the 8th of April, 1879, Mr. Harcourt forwarded to the Board of Trade a letter accompanied by a statement of a series of tests made with candles and with the new standard. In consequence of this communication, the Board of Trade appointed the Committee to which I have already referred, who, after very careful examination reported that—"Compared with the sperm candle, Mr. Harcourt's air-gas flame is exact and trustworthy as a standard of light." In 1883, the experts of the Committee of The Gas Institute, Messrs. Heisch and Hartley, reported of this standard as follows:—"We feel compelled also to say, although with reluctance, that we cannot regard Mr. Harcourt's standards as convenient, or at all suited for use in general photometry. They demand too much attention from the operator. With an ordinary photometer his attention is divided between the air-gas flame and observations of the disc. For it matters not how carefully either the prepared gas-flame or the lamp flame be adjusted (even when the former is controlled by a governor), the flame length will change, and a little change is sufficient to produce a serious error. Besides this the flames are very sluggish and unstable. The least current of air affects them, and causes them to swerve from the perpendicular; and where this takes place, observations at the photometer are useless. Further, they require a freedom from vibration of the room and of the apparatus which is rarely obtainable. . . . We certainly expected that the experiments would have been favourable to Mr. Harcourt's proposed standards, and regret that the contrary is the case."

In view of this strong condemnation, I was very careful in my experiments; and after most thoroughly trying both the original air-gas flame and the lamp, I was most convinced that the above remarks could not be accepted as applying to the former. In my first report, I stated that—"From the beginning to the end of my experiments, the whole of the tests were made with great facility; in fact, I was agreeably surprised at the simplicity and convenience experienced." And again: "The important statements made by Messrs. Heisch and Hartley as to the unsteadiness of the pentane flame have received great attention. I have tried all that is possible to vary the height of the flame by any means likely to accidentally affect it. I have let heavy weights fall on the floor of the testing-room; shut both inner and outer doors violently; the wall of the room has been struck—in fact, everything has been done, short of damaging the premises, to test the steady burning of the flame. Beyond a momentary leap at the instant of concussion, no effect whatever was produced; the flame burnt steadily; and the readings were the same after the experiment as they were before. I am not aware that my photometer-room is of peculiarly solid construction, or subject to less vibration than those at the testing-stations. The only conclusion I can therefore come to is that the results obtained by Messrs. Heisch and Hartley are not of the nature of those which might be looked for in practice." In my second report, after more extended trials, I stated that—"The pentane air-gas has completely borne out my former experience of it. . . . I have found the pentane air-gas to comply with every demand made upon it, and to answer to the full all the claims made for it by the inventor. The facts brought out by this inquiry have shown that the method of preparing the air-gas is at once easy and safe; that the measurement of the volume of gas used is simple and reliable; that the adjustment of the height of the flame is a matter of certainty; its steadiness all that can be desired, when due care is taken and proper apparatus employed; and that the colour of the light afforded is precisely the same as that of the standard comparison flame. . . . Should it be desired to use the flame in an unsuitable position as regards draught, the use of a chimney, as arranged by the inventor, entirely obviates all difficulty as regards steadiness, and renders the flame absolutely steady and free from the slightest sign of vibration and swaying."

This last point I consider of the greatest importance; and, where necessary, I should recommend the use of the chimney and cover in all practical work, as the use of an absolutely rigid flame, such as is thus obtained, renders the readings of the photometer infinitely more definite and sharp. In conclusion, I recommended the adoption of the pentane air-gas flame as a standard in the place of candles. As, however, many practical photometrists are of opinion that a standard of light of more than one candle is desirable for most purposes, and absolutely essential in some, I further recommended that, when the legal substitution of the pentane unit for the present candle be made, the Board of Trade should be empowered to sanction and authorize the use of such other standards and substitutes as that Board may deem fit and proper to be used in place of, and after comparison with, the pentane air-gas flame. The conclusions as to the fitness of the pentane air-gas as a desirable unit, arrived at by the Board of Trade Committee in 1887, and by myself in 1885 and 1887, have since been confirmed by the Standards of Light Committee of the British Association, who this year recommended its adoption.

In view of the possible adoption for practical work of a standard of higher value than the 1-candle pentane air-gas, it will be interesting to discuss the position of those proposals which seem to most nearly comply with the requirements of the photometrist. I have elsewhere stated that in my opinion it is most desirable that whatever standard may be used, it is advisable to avoid the use of common coal gas as a standard combustible; and therefore I have rejected the plain gas 2-candle unit of Mr. Methven and the coal

gas 10-candle test of Mr. Sugg. Fortunately, however, in so doing, it is not necessary to reject the principle of these convenient units, as the vapour of the pentane used by Mr. Harcourt supplies the means of providing a flame to each of these systems, independent of coal gas, or as an auxiliary to it. The now well-known "carburetted Methven" gives admirable results when the height of the flame is constant. Unfortunately, however, my experience of this standard is that various operators may disagree as to the height of the flame; and a little over-discretion or carelessness, as the case may be, will cause very different results. At the time of the Board of Trade Committee, in 1881, Mr. Methven used the original pattern, in which simple coal gas was burnt; and that Committee condemned the system in consequence of the variability due to differences in the quality of the gas used. To obviate this objection, the inventor enriched the ordinary gas by causing it to take up the vapour of pentane on its way to the burner, and altered the form of the slot to suit the enriched gas.

In speaking of these two forms of Mr. Methven's proposal, Messrs. Heisch and Hartley, in their report already referred to, said: "It will thus be realized that the range in the qualities of gases with which the Methven plain gas standard can be safely used, is much wider than is generally supposed; as in our experiments the extremes are 13.65 and 22.4—a range of 8.75—candles. . . . The Methven standards are simple in construction, not liable to get out of order, and extremely easy to use. They do best (like candles) in an open photometer; but can be readily used in a closed one, if due care is taken to freely ventilate the photometer, and avoid violent air-currents—conditions which are extremely difficult to fulfil with closed photometers. . . . The only conclusion which can be drawn from such a mass of evidence is that the Methven units are not only perfectly reliable instruments in ordinary gas testings, but are suitable for use in photometric investigations of a much more refined character." This is strong evidence, and leads to the conclusion that at all events we have here a valuable substitute for candles; the main objection to the method being the uncertainty as to the height of the flame. Were there no other proposal equally simple in character, and free from the same objection, it would be conclusive. But in view of the fact that in the modified form of the 10-candle test, which I have called the "Pentane Argand," we have a most reliable standard, free from all objection from the height-of-the-flame point of view, as I shall be able presently to show; independent of coal-gas, and atmospheric influences, such as temperature or pressure; possessed of the advantage of being a decimal factor (viz., ten candles); and furthermore being a desirable unit to use in coal gas testing during foggy weather, as the distance of the opposing lights from the photometer disc is for that purpose practically equal—the Methven would seem to have been distanced in the race by so formidable a competitor.

The arrangement possessed of these advantages is very simple; no meter, governor, or other measuring or controlling adjunct, beyond a simple tap, being necessary. It is merely a small Argand burner suited for burning air-gas. Supported 2.3 inches above the steatite burner, is a screen to cut off the light emitted from the top of the flame, and indicating rods to assist in regulating the flame to a height of 3 inches. The standard combustible is the vapour of pentane. This is driven forward to the burner by a current of air from a holder or pressure-bag, as may be convenient—about $\frac{1}{2}$ cubic foot of air per hour being required. The pentane is contained in a carburetter precisely similar to that of Mr. Methven—in fact, I used one of his pattern; and the air is carburetted with the pentane in the same way that he carburettes the coal gas for his later form of standard. A variation in the temperature of the carburetter makes no difference, as I obtained the same result when I filled the trough of the carburetter with water at 90° Fahr., and then with ice and water. The flame should be adjusted to a height of 3 inches, for uniformity; but if from accident the flame falls to 2½ inches or rises to over 4 inches, no difference is observable in the volume of light emitted under the screen. I have ascribed this remarkable result to a compensating action in the blue portion of the flame, which is reduced in size when the luminous portion is lowered and contracted in bulk, and thus causes a greater length of the white flame to be seen under the screen; and inversely, when the flame is raised and expanded in width, the blue portion is also increased, and thus compensates for the otherwise greater intensity of the white portion. From the manner in which this proposal has been received, I am in hopes it may form a neutral ground on which, for a time at least, conflicting interests may meet to their mutual advantage.

The statement of Messrs. Heisch and Hartley already quoted, to the effect that candles develop more light per grain of sperm now than formerly, is a most important one, and cannot be passed over in silence, as such a proposition will doubtless afford scope for serious contention. [Mr. Dibdin here quoted at length from his first and second reports on this point. See p. 578 of the JOURNAL for March 31, 1885; and p. 291 of the JOURNAL for Aug. 9, 1887.] Proceeding he said: That the average results by candles were too high is shown by the fact that, out of 81 averages, no less than 14 were above 17.5 candles, and 37 above 17 candles—results admittedly too high for an Argand flame only 3 inches in height—while, on the other hand, the average results by candles were under 16 candles only on six occasions, and on three of these the low result was confirmed by the other standards; so that on only three days did the candles indicate results lower than would appear to have been the true value of the comparison flame.

The report of the Standards of Light Committee of the British Association fully confirmed these results, and explained them upon the following grounds. Manufacturers endeavour to remove the liquid portions of the spermaceti (sperm oil); and thus obtain the "dry" spermaceti as free from it as possible. The resulting product has a higher melting point; and therefore burns with less facility. The manufacturers have now so far succeeded in this direction, that candles have to be made with larger wicks; the result being that they give less light for a given consumption than candles with smaller wicks. Thus the effect in the improvement in spermaceti candles has been that standard candles give less light than they gave ten years ago, and probably still less than they gave at earlier periods, when the average consumption of candles of six to the pound was 140 grains per hour.

Having now arrived at the point at which candles are shown to be untrustworthy, and a suitable substitute found in the pentane air-gas flame, aided, for practical purposes, by the pentane Argand, it may be of interest to glance at the position of the question on the Continent. In presenting a report of the Committee on Candles to the twenty-eighth annual meeting of the German Gas and Water Society, in September last, Dr. Krüss stated that the Committee thought to have fulfilled their instructions by establishing the German Society's paraffin candle, which had for the last year been manufactured under the Society's direction at the works in Waldau; and that the Society had determined no longer to issue six to the pound but ten, in order to obtain a length of candle more suitable for practical use. Each single candle was provided with a wick in a perfectly central position, which is more easily accomplished in the shorter candle than in the long one. Care had been taken that the new candles have exactly the same photometrical value as the former ones. While the work of the Committee had been devoted to the control of the production of the standard candles, and to supplying these to the consumer, they had occupied themselves with the amyl-acetate lamp, and had already come to the conclusion that it was an extremely comfortable standard for every-day use. This decision has been subsequently confirmed. From the results of a number of tests made by members of the Society generally, it was agreed that for daily use for the present there was no better, more practical, and comfortable, and less time-consuming means for light measuring. It appeared, however, that the proportion of the intensity of the lamp to the different candles had not been accurately determined. The intensity of the German Society's candle was variously stated to be 1·2, 1·234, 1·21, 1·26, 1·12, and 1·20 amyl-acetate lamps with 40 mm. height of the flame. Still greater differences had been found when comparing the English candle with the lamp. It was evident that further close and continuously systematic trials were necessary to determine its exact value. From a series of experiments conducted by Dr. Liebethal, of Hamburg, it appeared that the measurements of the wick tube, and consequently the diameter and length of the wick, need not be adjusted with extreme accuracy, but that the height of the flame was very important, and that the mean variations between two amyl-acetate lamps come within 1 per cent. The Committee had, therefore, resolved in conformity with the experience up to the present, that the steadiness and easy application of the amyl-acetate lamp, even in its present form, recommends it as a suitable means of comparison for light measurements, and that further trials are necessary to determine the proportion between the intensity of the amyl-acetate lamp and that of the candle. It was therefore proposed to constitute the Committee on Candles a Committee on Light Measurements, to make these trials together with suitable experts, and that the Physical and Imperial Technical Institute of Charlottenburg be requested, through the Imperial Board of Home Affairs, to lend their co-operation in the investigation.

This decision is of great importance. From the results of the very numerous tests made by myself and others with the amyl-acetate lamp, it is evident that its convenience and steadiness are all that can be desired; but, as I have stated, its colour is against it in the opinion of the English experts. Could this be overcome, it would be a very convenient standard; but all efforts up to the present have failed to produce a light of the character of that given by the pentano and candles at their best. From my experiments, I found that the 40 mm. height of flame was too low; but on raising it to 51 mm., or 2 inches, it gave results identical with the average English candle as determined by both the pentane and Methven screen. I am informed by Dr. Krüss, of Hamburg, that while they agree that the colour of the amyl-acetate lamp is very unfavourable, they did not know of anything better; and therefore had to put up with it. They are now trying the improved pentano lamp of Mr. Harcourt; but the experiments are not yet concluded.

One of the objections put forward to a change of standard in England is that no general desire has been expressed to that effect. It has already been shown that the authorities of the Board of Trade—the controlling authorities for gas-testing purposes in London—the gas interest generally, as represented by The Gas Institute, and the British Association, have all joined in one condemnation of the existing candle, and in demanding an alteration; and, with one exception, that such alteration should consist in the adoption of Mr. Harcourt's pentano air-gas flame. It has also been said that no alteration can be made in London without affecting the country generally. If the regulations applying to the candles were general, that would be a strong argument; but at the present moment there are virtually two different standards

in use. In the Metropolis Gas Act, the standard candle is defined as "sperm candles of six to the pound, and burning at the rate of 120 grains per hour." In the instructions of the Gas Referees, it is prescribed that the candles shall attain their "normal rate of burning," and no mention whatever is made of their *manner* of burning. In the Gas-Works' Clauses Act, 1871, however, which applies to the country outside the Metropolis, it is specifically laid down that the tip of the wicks shall be glowing and slightly bent; and thus a distinct condition is indicated. True, most photometrists decline to use the candles in any other manner. But it has been repeatedly argued, on behalf of the gas authorities, that an examiner has no discretion, provided the consumption of the sperm is within the prescribed limits; so that a test is a perfectly legal one when the wick is upright, and the candle consequently giving less light, with the result of indicating a higher value to the gas than it otherwise would have. Such a condition of things does not argue well for the maintenance of uniformity in the manner of testing the value of the gas supplied in such enormous volumes to the public. If those outside the Metropolis are satisfied with the better protection they now have, it is no reason why a less sufficient protection should satisfy the inhabitants of London. It cannot be imagined, however, that the general public of the country are aware of the present defective condition of the question. In all other matters affecting the commercial transactions of daily life, the most stringent regulations are in force to maintain almost mathematical accuracy in the various weights and measures used. In the matter of light alone the utmost laxity prevails, and when it is considered that such vast interests are at stake, it seems almost inconceivable that the legalization of an accurate standard of light, such as can now be obtained, should be delayed for a moment longer than that required to take the necessary steps.

At the close of the paper, Mr. Dibdin showed on a screen a number of candles, the wicks of which had assumed a variety of forms in burning, which affected more or less the light afforded.

In the course of the subsequent discussion,

Mr. A. G. VERNON HARCOURT, F.R.S., said that Mr. Dibdin was entitled to the best thanks of those present for the pains he had taken to illustrate the subject which he had brought before them. He had never attended a lecture of this character which had been so well illustrated as this one. The concluding illustration, in which the wicks of different candles were shown to have assumed various forms in use, was particularly interesting. The difficulty of the question which they had before them was that it was not a purely scientific matter; if it were only scientific, it could be very well worked out. For the business of gas testing, the standard that had to be used was unfortunately a variable one; and this was likely to be the case for a considerable time to come, until a larger interest was taken in the matter. It was 8 or 9 years since the Board of Trade appointed a Committee to consider this subject of the standard of light; and the Board went to the trouble of sending round the report of the Committee to those who, they thought, would be interested in the question. The result was very disappointing to them; for hardly anyone took interest in it. In consequence of this, the Board had so far held their hand; and nothing had been done. The matter was really of considerable practical interest; and perhaps the best contribution he could make to the discussion was to relate an example of the unreliable character of candles which had come under his immediate observation. He received a letter from the Town Clerk of Gloucester some time since, requesting him to visit the city in order to find out what was the cause of the difference of opinion which existed in regard to the testing of the gas, and which had created a good deal of unpleasant feeling in the place. The Local Authority had a Gas Examiner, who, in testing the gas, sometimes made out its value to be very near, and at other times greatly below the standard quality. The Company tested the gas at their works; and they were convinced that it was considerably above the standard. They had confidence in their own testing; and considered they were being very hardly used. He (Mr. Harcourt) went down to Gloucester, and tested the gas both at the works and at the testing-station in the town. He satisfied himself that the testing had been made in the most conscientious manner at both places; and that the whole of the dispute which had arisen had been brought about by the difference in the candles. He took candles from one testing-place to the other; and to some extent the difference was the variation, which Mr. Dibdin had alluded to, in the latitude which one gas examiner would allow himself in dealing with the candles as compared with another. The Local Authority Examiner, if he found the candles burning with such wicks as had been shown on the screen by Mr. Dibdin, rejected them until he found one that did burn properly. Of course, the result of the testing was largely dependent upon whether a selection was made of the candles, or whether they were used as they came. He took samples of the candles home from Gloucester, and found that the candles used at one of the testing-places contained more threads in each strand of the wick than in those used at the other. The more threads there were in each strand, the less light would there be given; and in these candles there was a considerable difference in the amount of light obtained. Here a great deal of unpleasantness had arisen, without any blame to either of the gas testers (who had both carefully and conscientiously done their work), but which had been produced by the discrepancies which the candles brought about.

Mr. ALEX. SIEMENS wished to say a few words in favour of the amyl-acetate lamp in spite of Mr. Dibdin's condemnation, because

for practical use—of course, he spoke as an electrician, who had often to make comparisons—the lamp was simplicity itself, and had a very great advantage, which was not wholly done away with by the colour. Mr. Dibdin, in his experiments, had unfortunately increased the height of the flame from 40 mm. to 51 mm., which made the colour of the light all the worse. The amyl-acetate lamp was not, of course, intended to be an English standard equal to the standard candle; but they (Messrs. Siemens) could easily have supplied Mr. Dibdin with a lamp which would have given an exact English candle. Since they had supplied the lamp to Mr. Dibdin with which he had experimented, they had found out that the amyl-acetate should be perfectly pure to give good results. To be quite safe, Mr. Dibdin obtained the oil from his firm; but they found out afterwards that it was a bad consignment. (Laughter.) The conclusion at which the German gas engineers had arrived was that, for a practical standard, the amyl-acetate was the best for measuring gas-light, because the colour of the light was very much like that of gas; and therefore it was all the easier to compare. In this connection he would mention that a great difficulty was also found, when comparing lights, in this—that the eyes of the various observers were affected differently; and therefore it was very difficult to compare two flames that were not exactly alike. To overcome this, Mr. Werner Siemens had designed the platinum lamp which Mr. Dibdin had alluded to. (The speaker briefly described the lamp by the aid of a specimen which Mr. Dibdin had present.)

Dr. DUPRE said he was present that evening to learn rather than to give any information. Of course, the great thing in a standard must be that it could be multiplied—in other words, that the operator could get a test as often as he pleased. He should like to know whether Mr. Dibdin obtained the same results with different pentane flames.

Mr. WILLIAMS remarked that it was some four years ago since Mr. Siemens was good enough to send him an amyl-acetate lamp. He made a considerable number of experiments, which convinced him that the lamp was even superior to any other standard devised up to that time—not even excepting Mr. Vernon Harcourt's pentane standard, although it was right for him to say that up to that period, he had had no particular experience of Mr. Harcourt's pentane lamp. He was quite aware of the fact that this amyl-acetate lamp was not equal to the English standard candle; and he was surprised that Mr. Dibdin should have turned the flame up, so as to make a kind of fog. Messrs. Siemens, he understood, were making this amyl-acetate lamp to equal the English standard candle. The lamp, in his opinion, could be much improved; and he should suggest that it should be made with a double wick, so that two flames could work at one time. He believed that the tube containing the wick in the lamp was made of German silver; and it should, he thought, be of thin platinum foil, as, if the amyl-acetate contained the least trace of acid, the German silver tube became corroded in a very objectionable manner. He also considered the flame should start from a wider base. With regard to the point incidentally mentioned by Mr. Dibdin, about the glass chimneys used in these various standards, he must say they were very objectionable indeed; for notwithstanding however carefully they might be selected, they often contained many faults which affected the testing. He should recommend the use of a chimney which he had employed for a long time, and which was made of an extremely thin strip of mica. With respect to the platinum standard, he had had but little to do in experimenting with it; but he did not think it was one which was very promising. Very little was known of commercial platinum; but a great deal was known as to the differences in the fusing points of this material. If platinaums of various fusion points were used, the light emitted per unit of surface would be different. He considered that solidified platinum was the best for the purpose. In his opinion, before the public would consent to have the present candles condemned, they would demand that some more rigorous attempt should be made to perfect the standard candle than had yet been made. Since the time when candles were recommended for use, they had been improved in many respects; and he felt perfectly certain, if Mr. Dibdin were to invite one or two of the most distinguished candle-makers of London to meet him, that a great deal of advantage could be gained—even in the interim between this and the time when new standards might be adopted. He thought it would be an advantage if, for the time being, they could secure better candles in two respects. In the first place, the wax was now of varying composition; and he believed no particular pains were taken to see that the mixture was constant. Secondly, there was no definition given as to the number of the threads of the wick, the tightness of the plating, or the special tension of that particular thread which caused the twist or curve. The last was the most difficult point to attain, and was the one that gave rise to most trouble in photometry. With regard to the various illustrations of wicks which Mr. Dibdin had shown, skilled photometrists could always tell the proper form the wick should take; it should approximate to a parabolic curve. As to the latitude a gas examiner should allow himself in testing, he thought those who permitted themselves least latitude, were probably the best examiners.

Mr. DIBDIN, in reply, observed that Mr. Harcourt had well illustrated one of the difficulties that were constantly met with in testing with candles; but he did not think it necessary to make any comment upon that, as it was the experience of all gas testers. Mr. Siemens had spoken of the colour of the amyl-acetate lamp being affected as he (Mr. Dibdin) increased the height of the flame.

Now this was not so, though probably he might slightly have increased the colour. They found, however, that the colour of the flame was against it even when turned to the same height as that prescribed by the inventor (Herr von Hefner-Alteneck). But his experience was not singular in this respect, as was evident by the statement of Dr. Krüss, which was mentioned in the course of his (Mr. Dibdin's) paper. In regard to the oil which Mr. Siemens sent him for use in the lamp, he did not confine himself to that, but obtained some from elsewhere, which was sent to him as pure amyl-acetate; and with this they found the colour of the flame still maintained. Dr. Dupré spoke of the multiplication of the standards, and whether he (Mr. Dibdin) could get the same results with different burners. He had used several forms of the pentane burner, and had obtained precisely the same results from them; but he did not see how very slight variations could make much difference. Mr. Williams had touched upon the question of candles, and thought that if they were to invite the candle makers to institute a set of regulations, they would probably get better results. He (Mr. Dibdin) could not agree with him, as, in his opinion, this question had been well thrashed out. He had asked the manufacturers to make him candles in various ways; and yet he always experienced the same difficulties. He did not think many people had taken more trouble than Mr. Harcourt to improve candles; and he had shown that it was impossible to improve them under the legal definitions existing at present. The German Gas and Water Society had issued elaborate instructions for the making of candles; and they also superintended their manufacture, and sent them out. The Society's candles were distinguished by a red thread; and they not only used these particular candles for testing, but they went so far as to say that the height of the flame should be checked as well. This was one of the greatest safeguards that the candles could be surrounded with. But still it was found that they were in the same position as English gas testers in regard to candles; and their Committee on candles had been constituted a Committee to investigate the various standards of light. The Germans were not behind other people in experimental investigations; and they had come to the conclusion that they must have a fresh investigation into this subject, and invite the co-operation of the Imperial Technical Institute.

A hearty vote of thanks was then accorded to Mr. Dibdin for his paper.

THE USE OF WATER GAS AT THE LEEDS FORGE.—An account has recently been published by *Le Martin* of a visit of one of its correspondents to the establishment of Mr. Samson Fox in Leeds, in order to ascertain some particulars as to the adaptation of water gas to metallurgy. In the course of his communication, the writer remarks: "For the welding of tubes of great thickness—30 mm. and upwards—a combustible of a more powerful heating intensity than that of coal or Siemens gas was needed. For tubes of 15 mm., four workmen can only weld 2 metres a day, which brings the price per metre to 22 frs. By the use of gas from water, three men weld 2½ metres in an hour; thus reducing the cost price from 22 to 4 frs. per metre. In Messrs. Fox's works 1000 cubic metres of gas are produced in an hour." It has been said that America is the country of natural gas; but the writer claims priority of discovery for his compatriot Dr. Laffont.

THE MISERY OF OIL LIGHTING AT ERITH.—A local correspondent writes: However much "patting on the back" is indulged in by a few members of the Erith Local Board because they are able to show a "paper economy," so far as the experiment here with oil-lighting has proceeded, as compared with the cost of gas, there can be no possible doubt of the fact that the majority of the residents of this riverside town are anything but pleased with the change. It is, of course, most easy to show a saving on paper; but when one takes into consideration the incidentals (not to say the discomforts), this economy dissolves into the air. For instance, at Erith, the nearness of the town to the River Thames, and its situation in the valley, expose it to the rudest blasts of "Boreas;" and whenever there is a storm off the Kentish Coast, the Erithians do not escape its violence. The sequence to this is that the oil-lights, not possessing such stout and resisting qualities as gas, become extinguished as soon as the wind gets a little high; and men have to be employed to go from lamp to lamp with rekindling torches. It is all very well for the self-satisfied members of the Local Board to make allowances for these vagaries of the oil-lamps, by referring to the force of the tempest; but the singular thing is the absence of all cause for such palliations when the town was illuminated with gas. This, however, appears to be but one of the minor discomforts which are being put upon the people of Erith. A street or road in pitch darkness is decidedly unpleasant when the ratepayer pays for light; but this pales into insignificance when placed alongside the complaint which is now being made to the effect that during the recent boisterous weather the oil itself has been blown out of the reservoirs of the lamps, not only bespattering the foot-paths, but rendering it a difficult matter for passing pedestrians to avoid the splashes of oil thus blown about. Of course, this is due to leaky lamps; and when complaints are made, orders are forthwith given for the defects to be remedied. But those people who are splashed by the oily drippings, and whose clothes become spotted and spoiled, must be forgiven by the Local Board if they cannot recognize the wisdom of the new departure. Neither must members of the Board begin to get angry when pointed to their self-sacrificing characteristics, if in the near future they receive numerous intimations to the effect that gas-lamps do not leak and bespatter pedestrians with foul and noisome messes.

NEW APPLICATION OF GAS.

A patent has lately been taken out by Mr. Bryan Donkin, jun., for a rather novel application of gas for heating the cylinders of steam-engines; and a short notice of the proposal will be of interest to our readers.

Around the cylinder are placed a series of Bunsen burners; so arranged that the flames are in actual contact with the metal of the cylinder. The temperature is thus raised considerably; and the hotter metallic surfaces diminish the initial condensation of the steam, and increase the re-evaporation of steam and water towards the end of the stroke. Instead of hot steam having to come into contact with relatively cold surfaces, they are made much hotter than is usual, and hotter than the temperature of steam. It is, of course, well known to engineers who have actually experimented in this direction, that steam jackets, or engines jacketed with boiler steam, give a considerable economy, varying from 10 to 25 per cent., depending partly upon whether the jackets are efficiently applied, and partly upon size of the cylinder or cylinders. But with such steam jackets the temperature is limited to the pressure of steam in use. With the Bunsen flame, however, there is not the same limit; and a much higher temperature can be generally obtained. Some preliminary experiments have been made by Messrs. Donkin and Co.; and diagrams were taken with and without such hot-cylinder jackets. The economy in weight of feed water or steam per indicated horse power was shown to be at least 25 per cent. Against this, there is to be put the cost of the gas; and the net saving will depend upon the cost of fuel, less the cost of gas, at any place. Of course, more power can be got out of the same sized cylinder with the hot surfaces, as less steam is used for the same power, and the work or evaporation from the boiler diminished. No attempt is made to superheat the steam before its arrival at the cylinder, which has often been done with known results. All that is done is to superheat the metallic surfaces brought in contact with the hot steam, where work and expansion takes place. Work, of course, means that some water is produced; and this probably is partly re-evaporated.

In regard to this matter, we might ask our readers if they know of any exact experiments on the comparative calorimetric value of Bunsen gas-burners against ordinary gas-burners, showing: (1) With Bunsen burners, the number of degrees that 1 lb. of water can be heated in a certain time with a consumption of so much gas and so much air. (2) With ordinary burners of a certain type, the number of degrees 1 lb. of water can be heated without air, for the same consumption of gas in the same time. (In the latter case there would no doubt be some little accumulation of soot.) In other words, the number of thermal units given out per minute per cubic foot of gas burnt in the two cases.

PRIVATE BILL LEGISLATION.—Questioned by Mr. Craig Sellar, in the House of Commons last Thursday, as to whether it was the intention of the Government to introduce a measure next session dealing with the subject of Private Bill Legislation, the Chancellor of the Exchequer said it was impossible for the Government to determine at present the exact course of their legislative proposals next session. It must be remembered that there were several important measures of the present session which would have to be reintroduced, and to which must be assigned a prominent place. He, however, assured Mr. Sellar that the subject of Private Bill Legislation would receive the most earnest attention of the Government when they come to make up their legislative programme, and that they would be very glad if a measure dealing with the matter could be introduced next session.

ELECTRICITY AND ARTESIAN WELLS.—The discharge of water from artesian wells has for many years been employed as a motive power in France. In the city of Tours there is an artesian well which drives a hydraulic wheel 7 metres in diameter, and works the machinery of a silk factory. At Grenelle the heat of the water issuing from a deep well is utilized in warming buildings. A project is now before a Commission of the Municipal Council of Paris, having for its aim the utilization of the power obtainable from the new artesian well in the Place Hébert, at La Chapelle. There are now three important artesian wells in the Paris basin; that of Grenelle being the oldest, and that of Passy the most productive. The new La Chapelle well is, however, situated in an industrial quarter of the Eighteenth Arrondissement; and is thus well adapted for the experiment of producing motive power. Besides these, there are a number of private artesian wells in Paris belonging to manufacturers. The La Chapelle well was finished in March last; having been begun 24 years ago. It reaches a depth of 720 metres, and the water, left to itself, rises to a height of 35 metres above the mouth. It furnishes 6000 cubic metres of water every 24 hours. The proposal is to utilize the power furnished by the well in generating and distributing electricity for lighting and motive purposes. One object mentioned is the lighting of the park of the Buttes Chaumont, which is situated near the well. Before now electricity has been generated in this manner. At Ponce de Leon, in Florida, there is a hotel having a powerful artesian well, which drives a turbine-wheel and dynamo; thus generating the current necessary to light the building and its grounds. At Yankton, in Dakota, there is a flowing well which drives the dynamos of an electric light company. The well is 600 feet deep; and the water on issuing from it is conducted to a reservoir 30 feet above the turbine which is employed to actuate the dynamos.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

THE REMOVAL OF HINDRANCES TO THE CONSUMPTION OF GAS.

SIR,—Some of the papers which are read at Gas Association and other meetings, and afterwards printed in your columns, with reports of the discussions which arise thereon, must be most perplexing to many of your readers, owing to the different and various methods in force under respective Gas Authorities. I refer particularly at present to the payment of deposits, the rent charged for meters and gas-stoves, and the cost of laying service-pipes. There is evidently no uniformity whatever in dealing with any of these matters either in Corporations or Companies; and it is probable that the practice of no two Authorities is alike.

As to the question of deposits. In some towns the rule seems to be to require deposits from all consumers, with exceptions under special circumstances. In other places this rule is exactly reversed; no deposits being required, except in certain well-defined and special cases. It will be manifest, therefore, that any discussion of the subject without this previous explanation as to custom must be pointless and unsatisfactory. I submit that the payment of deposits under the latter rule is perfectly justifiable. The profit arising from the consumption of gas in these special cases, without a deposit, would be more than swallowed up by bad debts. Increase of business may be had at too great a price; and on these terms it is certainly not desirable.

As to the question of charging rent for gas meters and stoves, we are again met with differences in practices and circumstances. In some large towns, many persons prefer to hire their meters or stoves; while a large number prefer to purchase one or both. How are the owners of meters and stoves to be dealt with equitably, if and in case the Corporation or Company decide not to charge meter or stove rents in future? It is contended by some persons that the initial price of gas ought to cover *all cost*, including meter and stove rents, service-pipes, and some internal fittings; but I fear that the proper re-adjustment of the present state of things to the new conditions which would arise when these charges cease to be made would be very difficult, if not altogether insurmountable.

In some towns I understand, it is not the custom for builders or owners of houses or other premises to lay any piping or to supply or fix any internal gas-fittings whatever; whereas, in other places—especially in large towns—the reverse is again the custom. Piping is almost invariably laid to the principal living and bed rooms, and most of the common brackets are also fixed, and in some cases chandeliers and brackets complete. The cost of doing all this is included in the rent of the house; and this to me seems a fair and reasonable arrangement. As well might the price of candlesticks be charged in the price of candles, as the cost of gas-fittings be charged in the price of gas. Such fittings, however, when provided by the owner of a house, become fixtures; and their cost may legitimately be provided for and included in the rent, as in the case of other fixtures.

I do not know what the custom is as to the charge made for service-pipes. In the large town from which I write, the custom is to make no charge at all, except for so much of the pipe as is required to be laid through private property—such as the small gardens or courts in front of houses or other premises through which the pipe has to be taken.

I apprehend that much of the difference in procedure to which I have referred, arises from the different circumstances in which towns are placed as compared with one another; and especially to the fact that, in small towns, the whole of the consumers (and much in relation to their circumstances) are personally known to the gas officials, which is utterly impossible in large towns. Further, that the working-class inhabitants of the smaller towns are much less migratory than those of the larger towns; hence the necessity for more stringent rules in the one case than in the other.

My object in writing is to urge that gentlemen who read and discuss papers on these subjects, and such as these, should let it be clearly known what they really mean and what they condemn or approve.

Dec. 20, 1888.

SELRAHC.

THE POSITION OF GAS ENGINEERS.

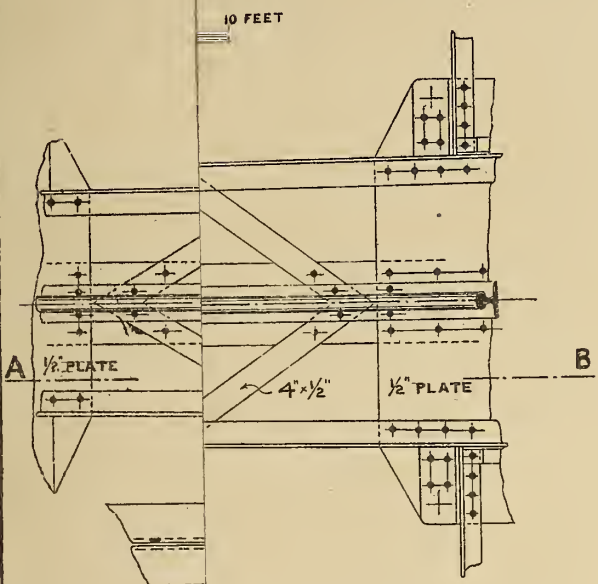
SIR,—As Manchester has figured rather prominently in this discussion, I should be glad if any of your readers could inform me whether the rumour be true that the Bradford Road works—which were erected from designs selected and approved by Messrs. Hawksley, Livesey, and King—have already cost the Corporation of that city a sum of between £400,000 and £500,000, upon a large portion of which commission was paid, in addition to the £1500 mentioned by Mr. Livesey as the cost of the preliminary advice. Also whether the manufacturing and storage capacity represented by that outlay is regarded as so insignificant as to be sufficiently looked after by a Foreman acting under the supervision of the Resident Engineer of another works at a distance.

Dec. 21, 1888.

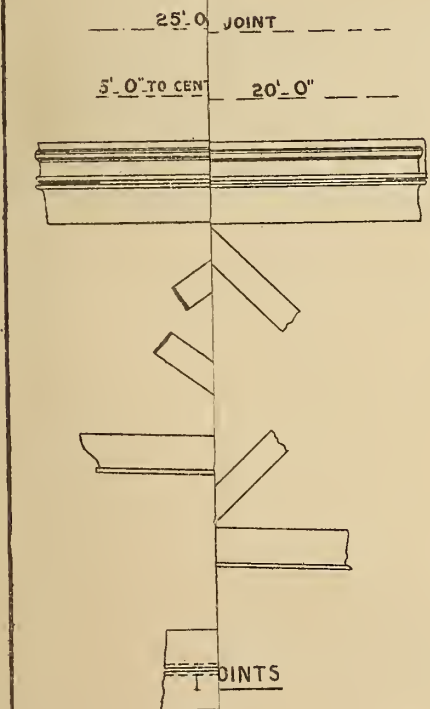
ENQUIRER.

SERIOUS COMPLAINTS AGAINST THE QUALITY OF YEADON WATER.—At the last meeting of the Yeadon Local Board, Dr. Usher attended, and said that as a medical man he had felt it his duty to come before the Board to lodge a complaint against the Yeadon Water-Works Company. It was purely out of regard for the health of the people of the township that he attended. He had discovered that the Company were allowing a very large portion of their gathering-ground to be manured. The night-soil was of the very worst character; and a portion of it was spread, while the other portion was in lumps. Some of the manure was even spread over the pipes which, without any filtration whatever, conveyed the water to the consumers. This was a very demoralizing, filthy, and disgraceful piece of business; and he could not speak too strongly about it—more especially as he had previously had to complain about the very same thing. As there were infectious diseases in the immediate district, it was important that the Board should take the matter in hand immediately. The speaker produced a sample of water (taken from a tap at the top part of the town), which was of a very black and sludgy character. Mr. Smith, one of the members of the Board, said he had himself seen the manure being put on. On the suggestion of Mr. Lees, a Committee of the Board were appointed to view the alleged nuisance.

DRAWING N^o. 4



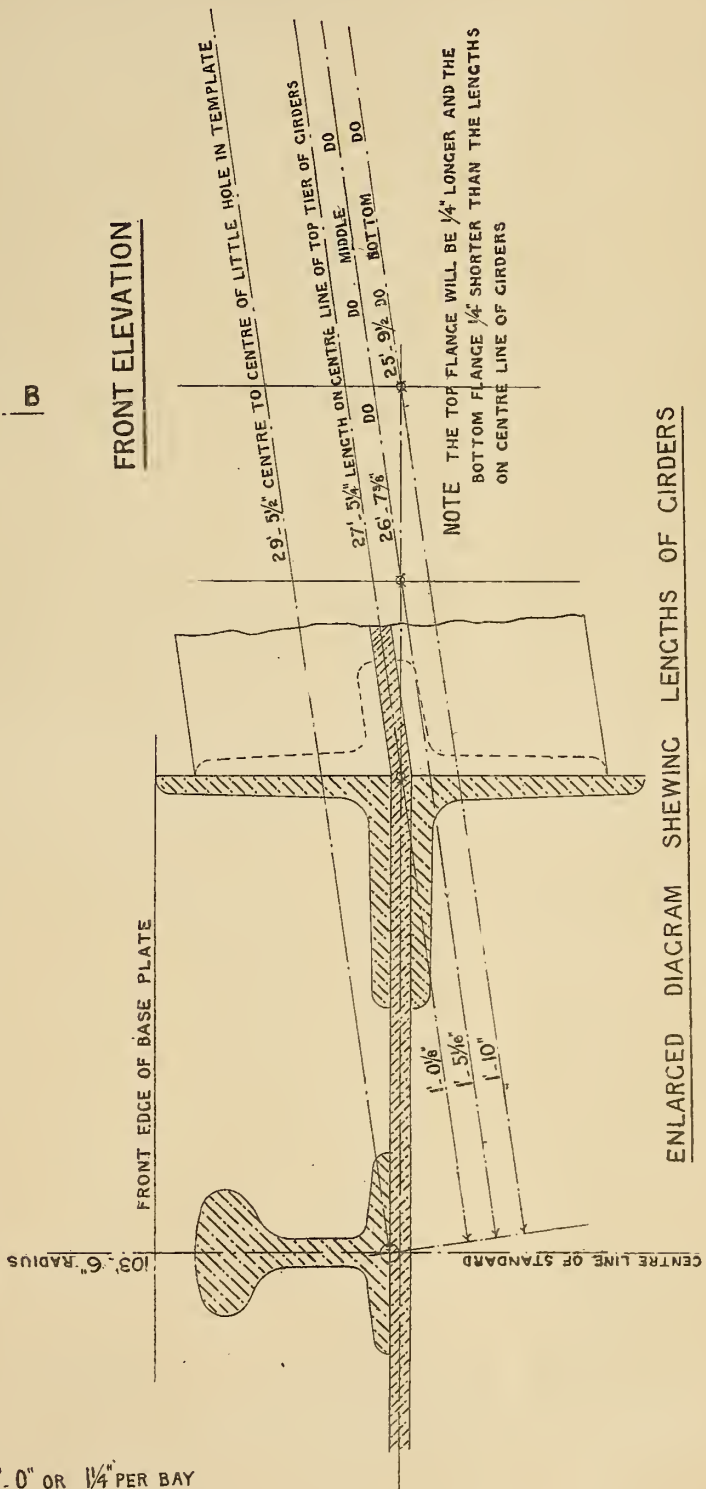
FRONT ELEVATION



SECTIONAL ELEVATION AT A. B.

PER OF FRONT MEMBER = $\frac{1}{4}$ " TO 1'-0" OR $\frac{1}{4}$ " PER BAY

DES



ENLARGED DIAGRAM SHEWING LENGTHS OF GIRDERS

NEW APPLICATION OF GAS.

A patent has lately been taken out by Mr. Bryan Donkin, jun., for a rather novel application of gas for heating the cylinders of steam-engines; and a short notice of the proposal will be of interest to our readers.

Around the cylinder are placed a series of Bunsen burners; so arranged that the flames are in actual contact with the metal of the cylinder. The temperature is thus raised considerably; and the hotter metallic surfaces diminish the initial condensation of the steam, and increase the re-evaporation of steam and water towards the end of the stroke. Instead of hot steam having to come into contact with relatively cold surfaces, they are made much hotter than is usual, and hotter than the temperature of steam. It is, of course, well known to engineers who have actually experimented in this direction, that steam jackets, or engines jacketted with boiler steam, give a considerable economy, varying from 10 to 25 per cent., depending partly upon whether the jackets are efficiently applied, and partly upon size of the cylinder or cylinders. But with such steam jackets the temperature is limited to the pressure of steam in use. With the Bunsen flame, however, there is not the same limit; and a much higher temperature can be generally obtained. Some preliminary experiments have been made by Messrs. Donkin and Co.; and diagrams were taken with and without such hot-cylinder jackets. The economy in weight of feed water or steam per indicated horse power was shown to be at least 25 per cent. Against this, there is to be put the cost of the gas; and the net saving will depend upon the cost of fuel, less the cost of gas, at any place. Of course, more power can be got out of the same sized cylinder with the hot surfaces, as less steam is used for the same power, and the work or evaporation from the boiler diminished. No attempt is made to superheat the steam before its arrival at the cylinder, which has often been done with known results. All that is done is to superheat the metallic surfaces brought in contact with the hot steam, where work and expansion takes place. Work, of course, means that some water is produced; and this probably is partly re-evaporated.

In regard to this matter, we might ask our readers if they know of any exact experiments on the comparative calorimetric value of Bunsen gas-burners against ordinary gas-burners, showing: (1) With Bunsen burners, the number of degrees that 1 lb. of water can be heated in a certain time with a consumption of so much gas and so much air. (2) With ordinary burners of a certain type, the number of degrees 1 lb. of water can be heated without air, for the same consumption of gas in the same time. (In the latter case there would no doubt be some little accumulation of soot.) In other words, the number of thermal units given out per minute per cubic foot of gas burnt in the two cases.

PRIVATE BILL LEGISLATION.—Questioned by Mr. Craig Sellar, in the House of Commons last Thursday, as to whether it was the intention of the Government to introduce a measure next session dealing with the subject of Private Bill Legislation, the Chancellor of the Exchequer said it was impossible for the Government to determine at present the exact course of their legislative proposals next session. It must be remembered that there were several important measures of the present session which would have to be reintroduced, and to which must be assigned a prominent place. He, however, assured Mr. Sellar that the subject of Private Bill Legislation would receive the most earnest attention of the Government when they come to make up their legislative programme, and that they would be very glad if a measure dealing with the matter could be introduced next session.

ELECTRICITY AND ARTESIAN WELLS.—The discharge of water from artesian wells has for many years been employed as a motive power in France. In the city of Tours there is an artesian well which drives a hydraulic wheel 7 metres in diameter, and works the machinery of a silk factory. At Grenelle the heat of the water issuing from a deep well is utilized in warming buildings. A project is now before a Commission of the Municipal Council of Paris, having for its aim the utilization of the power obtainable from the new artesian well in the Place Hébert, at La Chapelle. There are now three important artesian wells in the Paris basin; that of Grenelle being the oldest, and that of Passy the most productive. The new La Chapelle well is, however, situated in an industrial quarter of the Eighteenth Arrondissement; and is thus well adapted for the experiment of producing motive power. Besides these, there are a number of private artesian wells in Paris belonging to manufacturers. The La Chapelle well was finished in March last; having been begun 24 years ago. It reaches a depth of 720 metres, and the water, left to itself, rises to a height of 35 metres above the mouth. It furnishes 6000 cubic metres of water every 24 hours. The proposal is to utilize the power furnished by the well in generating and distributing electricity for lighting and motive purposes. One object mentioned is the lighting of the park of the Buttes Chaumont, which is situated near the well. Before now electricity has been generated in this manner. At Ponce de Leon, in Florida, there is a hotel having a powerful artesian well, which drives a turbine-wheel and dynamo; thus generating the current necessary to light the building and its grounds. At Yankton, in Dakota, there is a flowing well which drives the dynamos of an electric light company. The well is 600 feet deep; and the water on issuing from it is conducted to a reservoir 30 feet above the turbine which is employed to actuate the dynamos.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

THE REMOVAL OF HINDRANCES TO THE CONSUMPTION OF GAS.

SIR,—Some of the papers which are read at Gas Association and other meetings, and afterwards printed in your columns, with reports of the discussions which arise thereon, must be most perplexing to many of your readers, owing to the different and various methods in force under respective Gas Authorities. I refer particularly at present to the payment of deposits, the rent charged for meters and gas-stoves, and the cost of laying service-pipes. There is evidently no uniformity whatever in dealing with any of these matters either in Corporations or Companies; and it is probable that the practice of no two Authorities is alike.

As to the question of deposits. In some towns the rule seems to be to require deposits from all consumers, with exceptions under special circumstances. In other places this rule is exactly reversed; no deposits being required, except in certain well-defined and special cases. It will be manifest, therefore, that any discussion of the subject without this previous explanation as to custom must be pointless and unsatisfactory. I submit that the payment of deposits under the latter rule is perfectly justifiable. The profit arising from the consumption of gas in these special cases, without a deposit, would be more than swallowed up by bad debts. Increase of business may be had at too great a price; and on these terms it is certainly not desirable.

As to the question of charging rent for gas meters and stoves, we are again met with differences in practices and circumstances. In some large towns, many persons prefer to hire their meters or stoves; while a large number prefer to purchase one or both. How are the owners of meters and stoves to be dealt with equitably, if and in case the Corporation or Company decide not to charge meter or stove rents in future? It is contended by some persons that the initial price of gas ought to cover *all cost*, including meter and stove rents, service-pipes, and some internal fittings; but I fear that the proper re-adjustment of the present state of things to the new conditions which would arise when these charges cease to be made would be very difficult, if not altogether insurmountable.

In some towns I understand, it is not the custom for builders or owners of houses or other premises to lay any piping or to supply or fix any internal gas-fittings whatever; whereas, in other places—especially in large towns—the reverse is again the custom. Piping is almost invariably laid to the principal living and bed rooms, and most of the common brackets are also fixed, and in some cases chandeliers and brackets complete. The cost of doing all this is included in the rent of the house; and this to me seems a fair and reasonable arrangement. As well might the price of candlesticks be charged in the price of candles, as the cost of gas-fittings be charged in the price of gas. Such fittings, however, when provided by the owner of a house, become fixtures; and their cost may legitimately be provided for and included in the rent, as in the case of other fixtures.

I do not know what the custom is as to the charge made for service-pipes. In the large town from which I write, the custom is to make no charge at all, except for so much of the pipe as is required to be laid through private property—such as the small gardens or courts in front of houses or other premises through which the pipe has to be taken.

I apprehend that much of the difference in procedure to which I have referred, arises from the different circumstances in which towns are placed as compared with one another; and especially to the fact that, in small towns, the whole of the consumers (and much in relation to their circumstances) are personally known to the gas officials, which is utterly impossible in large towns. Further, that the working-class inhabitants of the smaller towns are much less migratory than those of the larger towns; hence the necessity for more stringent rules in the one case than in the other.

My object in writing is to urge that gentlemen who read and discuss papers on these subjects, and such as these, should let it be clearly known what they really mean and what they condemn or approve.

Dec. 20, 1888.

SELRAHC.

THE POSITION OF GAS ENGINEERS.

SIR,—As Manchester has figured rather prominently in this discussion, I should be glad if any of your readers could inform me whether the rumour be true that the Bradford Road works—which were erected from designs selected and approved by Messrs. Hawksley, Livesey, and King—have already cost the Corporation of that city a sum of between £400,000 and £500,000, upon a large portion of which commission was paid, in addition to the £1500 mentioned by Mr. Livesey as the cost of the preliminary advice. Also whether the manufacturing and storage capacity represented by that outlay is regarded as so insignificant as to be sufficiently looked after by a Foreman acting under the supervision of the Resident Engineer of another works at a distance.

Dec. 21, 1888.

ENQUIRER.

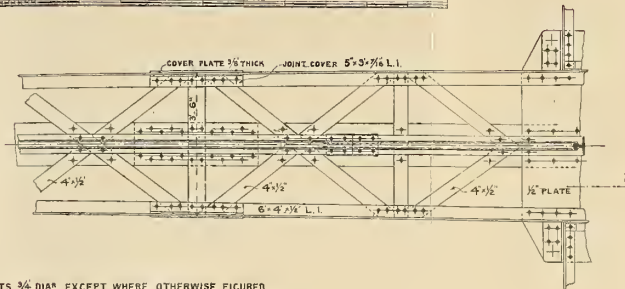
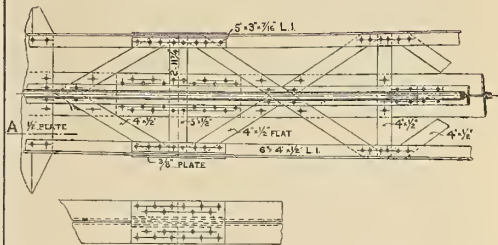
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SYDNEY GASHOLDER

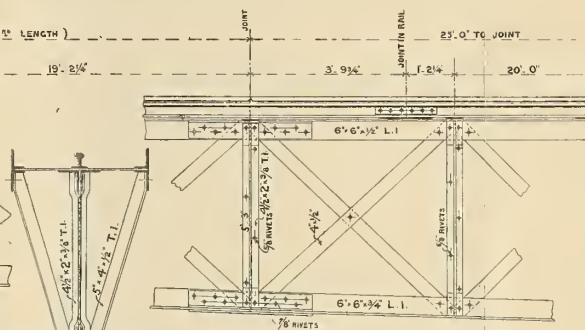
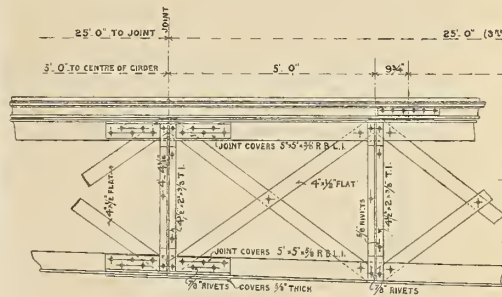
- DETAILS OF STANDARDS MIDDLE PART

DRAWING N^o4

SCALE OF FEET



ALL RIVETS 3/4" DIA^R EXCEPT WHERE OTHERWISE FIGURED



SECTION AT DIAGONAL STRUTS

THESE STRUTS OCCUR OPPOSITE THE 2 LOWER TIERS
OF GIRDERS & 1 PAIR BETWEEN ALL THE GIRDERS SEE
DRAWING NO 2.

SEE FULL SIZE DETAIL OF ALL JOINTS

TAPER OF BACK MEMBER = $\frac{3}{16}$ " TO 1'-0" OR $2\frac{3}{16}$ " PER BAY

TAPER OF FRONT MEMBER = $\frac{1}{4}$ " TO 1'-0" OR $\frac{1}{4}$ " PER BAY

DESIGNED & CONSTRUCTED BY
C. & W. WALKER.

FRONT ELEVATION

SECTIONAL ELEVATION AT A. B.

ENLARGED DIAGRAM SHEWING LENGTHS OF CIRDEBS

— 100% IN TEMPLATE —

29-5 1/2 CENTRE 12

27'-5 1/4" LENGTH ON CENTRE LINE OF TOP OF

26. 7 1/2 00 25. 9 1/2 00. MDY (00)

NOTE THE TOP FLANGE WILL BE $\frac{1}{4}$ " LONGER AND THE BOTTOM FLANGE $\frac{1}{2}$ " LONGER WILL BE $\frac{1}{4}$ " LONGER

FRONT EDGE OF EACH PAGE

103-6 RADJUS

CENTRE LINE OF STANDARD

KING, SELL & RAULTON Ltd., Printers, 12, Gough Square, Fleet Street, London, E.C.



Legal Intelligence.

YORKSHIRE AUTUMN ASSIZES—WEST RIDING DIVISION.
LEEDS TOWN HALL.—TUESDAY, DEC. 18.
(Before Mr. Baron POLLOCK.)

THE CHARGE AGAINST MR. WILLIAM CARR.

To-day, Mr. W. Carr, the late Manager of the Halifax Corporation Gas-Works, surrendered to his bail to answer the charges preferred against him, at the instance of the Corporation, of fraudulently taking certain leaves from a letter-copying book belonging to that body. There were three counts in the indictment—viz., (1) That on the 28th of September, being a servant of the Corporation, the defendant feloniously stole 79 sheets out of a foolscap press copying-book; (2) That, being the Gas Manager, he mutilated the book by abstracting the leaves; and (3) that, being a public servant, he committed the same act. To all the charges Mr. Carr pleaded, "Not guilty."

Mr. TINDAL ATKINSON, Q.C., with Mr. BANKS appeared for the Corporation; Mr. WADDY, Q.C., and Mr. KERSHAW represented Mr. Carr.

Mr. ATKINSON said the indictment was preferred under an Act of Parliament which made it a felony for anyone in the position of a servant to mutilate, destroy, or falsify, with intent to defraud, any book or document belonging to his employers. The facts he should lay before the jury would, he thought, satisfy them that a book which belonged to the Corporation was undoubtedly mutilated by the prisoner; and he expected that the real question which they would have to deal with would be the intent with which this was done.

Mr. WADDY said that was so; and that had all along been the question.

Mr. ATKINSON thought the facts would satisfy the Court that prisoner was actuated by the intention either to actually defraud the Corporation, or, what was quite sufficient in point of law, to prevent further enquiry. The prisoner was appointed Gas Engineer and Manager to the Corporation as far back as the 2nd of June, 1875. His salary which at that time was £250 a year had increased at the time he sent in his resignation, on the 12th of September last, to £500 per annum. His duties were not defined by the resolution which appointed him; but the duties that he did carry out included those of the general superintendence of the production of gas, and of Gas Engineer to the Corporation. It was his duty when contracts were entered into from time to time for coal to be used for gas making, to make tests of the character and quality of the coal, in respect of the illuminating power of the gas to be obtained from it, and also with regard to the value of the residual products and the quality of the coke. The instruments by which the tests were made were the property of the Corporation; and the salary which the prisoner received was in consideration of the duty of making the tests as well as of other duties which he had to perform. In May last, 13 tenders were sent in for coal required by the Corporation during the year 1888-9. Six of these were from firms from whom the Corporation had previously had coal; and in respect of this coal tests had been made by the prisoner, and should have been in his possession at that time. These tenders we partly accepted at a meeting of the Gas Committee on the 18th of May. There were seven other tenders from firms whose coal had not up to that time been accepted; and the Committee instructed Mr. Carr to make tests, to ascertain the character and quality of this coal. The tests were made; and the document in which they were entered was in the hands of the prisoner on the 1st of June, when an adjourned meeting of the Gas Committee was held to consider the results of the prisoner's investigations. He should show that the prisoner—being a skilled person and understanding the duties of his office—was practically responsible for the acceptance of the tenders. Though the Committee, of course, nominally made the selection, he undertook the investigation into the quality of the coal, and his opinion and his judgment governed the Committee. He was therefore the person really responsible for the selection of the tenders, which ought to have been those for coal which in his opinion would be the best for the purpose for which the Corporation required it. At the meeting on the 1st of June he called the Committee's attention to the results obtained by his tests; and upon his recommendation, from out of the seven lots of coal, four were selected as coal which should be contracted for. In that same month of June the Mayor or the Town Clerk received a letter from a person named Ellis Lever, which he (the learned Counsel) was entitled to refer to, because he had evidence that it was laid before the prisoner and his attention was distinctly called to it. That letter was dated May 22; and he proposed to read it.

Mr. WADDY did not understand how this was to be made evidence. It was a letter from a person named Lever, who had no connection with this case, and it was to be made evidence, without calling the writer, because somebody had said to defendant "here is a letter from someone."

His LORDSHIP did not see how a letter written by someone to the Town Clerk could be evidence unless the writer came to prove it, or it was shown to the defendant in the course of the enquiry.

Mr. ATKINSON said he was in a position to prove that it was shown to the prisoner.

Mr. WADDY remarked that if that was so, and if his client made any remark upon the letter, he should offer no opposition to its production.

Mr. ATKINSON: I am going to show that the letter was laid before defendant, and that his attention was called to the charges in that letter and in the *Pall Mall Gazette*.

Mr. WADDY: Then I venture to say that that could not be evidence; and that anything more improper on the part of these people cannot be conceived. This gentleman was challenged to bring an action; and was told that if he did not do so, he was to be held to be guilty.

His LORDSHIP pointed out that there were two ways in which the letter could be made evidence. If it was brought before the Committee while the prisoner was present, it would be part of the transaction; and it would also be evidence if his attention was called to it and he was asked to make an explanation.

Mr. ATKINSON said it was actually before the Committee while the prisoner was present.

His LORDSHIP said he could not say it was not evidence; though how it might effect the prisoner he could not say.

Mr. WADDY: The result will be and I venture to say it is what is intended, that any articles however scurrilous written by the *Pall Mall Gazette*, or any other newspaper, may be read here to prejudice the prisoner. The only notice we have received of these letters is this "At the time these tenders were under consideration by the Gas Committee two letters were read, one from Mr. Ellis Lever and the other from Mr. T. K. Fox."

His LORDSHIP: Haven't you had copies of them?

Mr. WADDY: No; and it does not say they were laid before the defendant.

His LORDSHIP: In one sense his attention was called to them; he ought to know of them.

Mr. WADDY: Yes. He was challenged to bring an action, though they

had got the opinion of a learned friend of ours that such an action would not lie.

Mr. ATKINSON: No, no; that is not the point. We have given notice to admit these letters, and no application has been made for copies of them. The Solicitor on the other side has actually inspected them.

Mr. WADDY: Was that after you stormed his office?

Mr. ATKINSON: I don't know; but he has seen them.

Mr. WADDY said he would leave the matter in the hands of the Court.

His LORDSHIP said it was unfortunate that the prisoner should not have had the fullest opportunity of inspecting the documents; but he could not say they were not evidence.

Mr. ATKINSON then proceeded to read the letters. The first was dated, Colwyn Bay, May 22; it was from Mr. Ellis Lever and was as follows: "I am in receipt of your circular letter of the 19th inst., informing me that my firm's offer of cannel has been declined by the Gas-Works Committee, which, with the information in my possession, does not surprise me. In the interests of fair and honourable trading, as also of the ratepayers and gas consumers of Halifax, I must ask you for an appointment, to enable me to show you how the Committee have been dealt with in the past." On June 3, the Town Clerk received the following letter from Mr. T. K. Fox, of the Silkestone Coal Company: "I wish to know why my firm were not asked to send sample trucks of gas coal, as resolved by the Committee. Our tender has been declined without giving the coal a trial; and I am confident the material we offered is worth far more than some of that you have purchased. It is not in the interest of the Corporation that the ratepayers should not have the best value for their money; and the Halifax Corporation will be well advised to inquire into the charge I make before putting their seal to any contracts. I am informed on very good authority that one man has an interest, directly or indirectly, in many contracts with the Gas Department of the Corporation of Halifax; and it would be well that this matter should be sifted to the bottom. Halifax cannot desire a repetition of the Salford scandal." Then, continued the learned Counsel, on the 7th of June, an article appeared in the *Pall Mall Gazette*—

His LORDSHIP (interrupting) asked how it was proposed to bring that in as evidence.

Mr. ATKINSON said the article was brought to Mr. Carr's attention; and he was called upon—an indemnity being offered him—to meet the charges suggested in the letters and the article by an action brought for the purpose of clearing himself.

Mr. WADDY remarked that the charges, whatever they were, were not before the Court in this case.

His LORDSHIP said that was so. The prisoner was not charged with conspiracy, but with mutilation of the books.

Mr. ATKINSON said the essence of the charge was fraud.

Mr. WADDY observed that at the time these letters and articles were written, the mutilation of the book had not taken place.

Mr. ATKINSON said that was surely not the point. Fraud might exist before mutilation, and the mutilation would take place afterwards for the purpose of covering the fraud.

His LORDSHIP: All this only goes to prove a wider range of misconduct on the part of the defendant.

Mr. ATKINSON replied that they had to deal with the question of the intention to defraud. There was no doubt about the mutilation; and the sole question was as to the intention with which the mutilation took place.

His LORDSHIP said he could not shut the evidence out if he was told that it was necessary; but it was very unlike an ordinary proceeding in a case of this kind.

Mr. WADDY observed that not one particle of this evidence was gone into before the Magistrate.

His LORDSHIP: It is very unfortunate that the case should assume such a position. This is practically a new case; there can be no doubt about that.

Mr. ATKINSON remarked that these matters had been before the prisoner from the time they were written. He then went on to read from the *Pall Mall Gazette* article headed "Corrupt Practices in the Gas Industry;" which was as follows:—"The existence of corruption in the gas industry has been sufficiently demonstrated by the notorious Salford case; but whether it is the laggard way in which that criminal has been treated, or that the evil is too deeply seated, it does not appear that there has been any change for the better. Similar charges have been brought against officials in other towns."

His LORDSHIP (interrupting): No, surely.

Mr. ATKINSON then passed at once to the last sentence of the article—"We should hear shortly of disclosures at Halifax if the parties concerned dare to court inquiry"—and said he should prove that the prisoner's attention was called to these charges, and, further, that the Mayor (Mr. Booth) offered him an indemnity if he would bring an action against the *Pall Mall Gazette* in reference to the insinuation in that article, calling attention to frauds in another Corporation, and suggesting that there might be disclosures of the same kind at Halifax.

His LORDSHIP said a criminal intent could not necessarily be assumed from a refusal to take such a course. It was a new thing to throw a newspaper article at a man and say "Unless you bring an action you must resign."

Mr. WADDY: The Corporation were advised by Mr. R. S. Wright, whose opinion they took, that an action would not lie.

His LORDSHIP said the case, as he understood it, was a very simple one; and he deprecated the introduction of outside matter. It was alleged against the prisoner that, having received certain tenders, and made certain examinations of the tenders by way of testing the coal, and the Committee having accepted certain of the tenders, he then destroyed the evidence as to whether or not the tenders accepted were the most advantageous. What this meant was that, after having made analyses of the coal offered to the Corporation, he knowingly selected the worst class of coal; and then to cover the fraud on his part he mutilated the book. That was really the question. It was a case within a small compass; and none of the sort of evidence that had been alluded to ought to affect it. What he meant was that, if the Corporation's case was a good one, it did not need this general surrounding. It was a clear charge against the prisoner to be supported by evidence.

Mr. ATKINSON said what he had mentioned was not perhaps his strongest evidence. Some of the sheets from this book had been destroyed; and some they had in their possession. The question the jury would have to decide was what was the intention of the prisoner in taking these leaves out of the book. If he established the fact that distinct charges were formulated against the prisoner, that it was stated in his presence that he had received money which belonged to the Corporation and kept it for his own use, and that when he was alleged to have been guilty of malpractices in connection with his profession, he declined to bring an action, he submitted that this would be evidence to go to the jury.

His LORDSHIP said all that was brought to the prisoner's knowledge was essential to the issue; but it did not follow because an article appeared in a newspaper that a man was bound to take one course or another.

Mr. ATKINSON repeated that he had stronger evidence bearing on the matter.

His LORDSHIP said that what had been advanced might be important evidence; but he wanted to know what the facts were, and whether there were fraudulent acceptances of tenders.

Mr. ATKINSON explained that he was dealing with these matters in order of date. These were circumstances before the actual discovery.

His LORDSHIP: Yes, before discovery; but, as he understood it, the prosecution said that before this meeting on June 1, the prisoner must have been guilty of accepting contracts that were against the interests of the Corporation.

Mr. ATKINSON said that was what he intended to prove.

His LORDSHIP said it was impossible to always tell what men would do when charged with dishonesty. Some took a sort of wilful course, and said: "I know I am honest, and I shall not take any action." It was probable that others would take a different course; but the inference to be drawn in either case was not important. This was a criminal action; and there must be proof for every allegation. Evidence should first be given that the defendant behaved dishonestly in not accepting certain tenders; and then that he destroyed the evidence of this by taking the leaves from the book.

Mr. ATKINSON said he would pass on at once to disclose what was discovered of the prisoner's conduct after the Corporation got possession of the leaves which contained tests of coal undoubtedly accepted by him. On the 12th of September prisoner resigned his position as Gas Engineer to the Halifax Corporation. On the 27th of September a letter was written to him by the Town Clerk asking for the production of the tests laid before the Committee on the 1st of June—viz., the tests with regard to the seven tenders specially referred to him. These tests were in the prisoner's possession at that time (the 27th of September), or ought to have been, because in June he went to the Town Hall and asked for them, saying he had left them on a desk. A clerk would tell the Court that he handed the tests to the prisoner at that time. On the 27th of September prisoner wrote, in reply to the application of the Town Clerk, that he had not got any of these tests. That was untrue; and it would prove to be untrue. The reason why he denied the possession would become obvious when he mentioned the subsequent fact. Subsequently a book was discovered in which entries had been made, by direction of the prisoner, of tests which had been taken from time to time by the prisoner with reference to the coal supply of the Corporation. That book was in a mutilated condition—no less than 79 pages having been torn out of it. Inquiries were made; and it was discovered that on the day on which the prisoner received the letter from the Town Clerk asking for these very tests (made between May 18 and June 7), he had directed a clerk named Milner to tear from the book everyone of the pages which contained records of tests. Proceedings were then taken against the prisoner; and he was brought before the Magistrates.

His LORDSHIP: Were these leaves given to the prisoner?

Mr. ATKINSON: Yes; the clerk handed them to him. When prisoner was before the Magistrate a number of documents were produced in Court, which apparently included the leaves torn out of the book. Some of them were shown to the witnesses called on the part of the prosecution; and it was suggested that they were perfectly harmless because they contained tests of coal sent to him by private individuals (although he was a servant of the Corporation) in order that he might test it. The Corporation were not satisfied with that. They obtained a search warrant, which was executed—it was an unfortunate fact, but must be mentioned—on the premises of the Solicitors for the prisoner. Here 67 of the missing sheets were recovered. It was suggested that they were private tests; but it was discovered that 44 of them represented tests made by prisoner of coal which had been the subject of contract by the Corporation. They were therefore clearly documents belonging to the Corporation, affecting the Corporation business, and ought undoubtedly to have been left in the book. These tests had been submitted to persons skilled in these matters; and the results had been compared with the contracts which had been accepted by the prisoner on behalf of the Corporation, and with the coal rejected by the prisoner as coal not fit for the purpose for which the Corporation required it. The result was that in a number of instances coal which was tested by the prisoner—the tests being contained in these sheets—was found to be quite inferior to other coal which was tendered at the same time; and the inferior coal, or rather the coal at the higher price, had been accepted by the prisoner, and that which would produce better results, at a lower price, had been rejected. That was not a solitary instance—it had been done again and again—and the loss to the Corporation would be proved to be enormous. He might suggest the purpose which the prisoner had in view; but it would present itself to the minds of the jury. He had already said that in May there were thirteen tenders, of which six representing coal previously tested were accepted; and of the remaining seven tests were ordered to be made. In the six there was a tender from the Mirfield Coal Company, who offered 10,000 tons.

Mr. WADDY objected that no notice of this had been given to the defendant. A list containing the analyses of three kinds of coal was supplied; but the Mirfield Coal Company was not one of them. The three mentioned had been submitted to the analyst, who would be called for the defence; but they had had no opportunity of testing any statement as to the Mirfield Coal Company.

His LORDSHIP: I never blame people unless I know the whole of the facts, and I suppose the Corporation in this case found out their facts at the last moment. What takes place before the Magistrates may be only preliminary to what may be afterwards found out and laid before the jury; but when it is a matter which requires investigating, like an analysis, the prisoner should have ample notice.

Mr. ATKINSON said he had other cases in which undoubtedly notice was given. Amongst the thirteen tenders there were three—viz.: Milnes, Stansfield, and Co., who offered 10,000 tons; E. Lister Kaye, 10,000 tons; and Newton, Chambers, and Co., 10,000 tons—

Mr. WADDY: The analyses of the two former were completed and reported upon before the third offer came.

Mr. ATKINSON: I shall prove that the tenders were all sent in at the same time.

Mr. WADDY: Of these two, one report was made and the coal bought before the test of the other was made.

Mr. ATKINSON: I am instructed that the Council had not ratified these contracts before the tests had been made by the prisoner.

Mr. WADDY: But the purchase had been made by the Committee. How can it be said that there is any fraud, any preference one over another, when the one is done and finished before the other is heard of?

His LORDSHIP: They were not opened at the same time?

Mr. ATKINSON: I am told all tenders were opened at the same time.

His LORDSHIP: The parties should know what is in agreement between them. It is very inconvenient to turn this Court and jury into a committee of inquiry into everything that can be said in this matter.

Mr. ATKINSON: There is considerable difficulty in the case, arising out of the length of time over which this extends. My learned friend says

that these three tenders cannot be brought against the prisoner, because in reference to two of them the contracts were made before the other was considered. That will, however, arise upon the evidence rather than upon my opening.

His LORDSHIP: I don't think it necessary you should prove the actual contracts. It is a question after all of the motive of the prisoner. If the prisoner did fraudulently manipulate the contracts, and rejected the good and accepted the bad, that is an element in the case. Is there any evidence that he had any interest in any of these?

Mr. ATKINSON: We can't prove it; we say it is an inference arising from the facts.

His LORDSHIP: Have you any evidence of corrupt motive?

Mr. ATKINSON: No, my Lord.

His LORDSHIP: You simply say that rejecting the good and accepting the bad is evidence enough of motive?

Mr. ATKINSON: Yes, my Lord, and the destruction of the documents.

His LORDSHIP: That I mean—motive for the destruction of the documents. Do you know the nature of the documents destroyed?

Mr. ATKINSON: Yes, they were recovered.

Mr. WADDY: Seventy altogether, including the three attached to the depositions.

Mr. ATKINSON said he was telling the jury that three tenders were sent in. That of Newton, Chambers, & Co. was for 40,000 tons at 7s. 9d., Milnes, Stansfield, & Co., and E. Lister Kaye, 10,000 each at 9s. 2d.—a difference between the two latter and the first-named of 1s. 5d. per ton. The tenders of Milnes, Stansfield, & Co., and E. Lister Kaye were in the six accepted by the Gas Committee on May 18; and on the same day tests were ordered to be made of the coal of Newton, Chambers, & Co. The tests in the latter case were favourable; and having got them in his hands, it was the duty of the prisoner to inform the Council, before the other contracts were ratified, that Newton, Chambers, & Co.'s coal was equal in quality to the other, and advise them to accept the tender of 40,000 tons, in place of that which he did advise them to accept.

His LORDSHIP: But I understand that, in the cases of Milnes, Stansfield, & Co. and Lister Kaye, the tenders were accepted.

Mr. ATKINSON: Yes.

His LORDSHIP: Then you must compare Newton, Chambers, and Co.'s coal with the offers open at that time; that is to say with existing offers, and not with existing contracts.

Mr. ATKINSON: What I submit is that they were all open.

His LORDSHIP: Yes, in one sense.

Mr. ATKINSON: We are dealing with the conduct of the prisoner. The contracts had not been accepted in the sense that they were accepted by the Corporation.

His LORDSHIP: Yes; but suppose for a moment that the prisoner had, carelessly or otherwise, accepted contracts from Milnes, Stansfield, and Co., and the other firm, which he found afterwards were not absolutely the best, it would be rather curious if they found themselves ousted after their tenders were accepted by the Committee.

Mr. ATKINSON said the tenders had not been accepted so far as any communication between the parties.

Mr. WADDY: They had sent circulars round to those who tendered.

His LORDSHIP said he was trying to arrive at what would be the conduct of the prisoner under the circumstances.

Mr. ATKINSON said the result to the Corporation was serious, because the loss to them would be about £1000.

His LORDSHIP: What I am trying to balance in my own mind is this: Here is a person against whom a criminal charge is made. He has accepted these two tenders—I mean he has forwarded them to the Committee, and the Committee have voted on them and adopted them; and then, after all, there comes this information. If this had been an action for discharging him for unbusinesslike qualities, I could have understood it; but to make it the foundation for a criminal charge is going a very long way. However, that is for the jury.

Mr. ATKINSON: What the Corporation say is that, when he got these tests, it was his bounden duty to call attention to them.

His LORDSHIP: The charge against him is not of rejecting this and accepting the other, but of mutilating the books. You say this is evidence of guilty knowledge in mutilating these books.

Mr. ATKINSON: Yes, my Lord, it is incidental yet necessary.

His LORDSHIP: I thought you had had a much stronger case—a case in which A. and B. both tender, one is clearly the better coal, and the other is clearly the worse; and he accepts the worse and rejects the better, and then, in order to hide that, he destroys the books. If you have a case like that, it would be another thing.

Mr. ATKINSON said he had such a case in the one which Mr. Waddy objected to—the Mirfield Company's case.

His LORDSHIP: And in that you have not given notice. There was an abstract opinion that no man should ever do anything but what was best for his employers. But suppose a man made the best contract he could at the time, and before it was sealed or signed a better offer turned up, was he bound to reject the first? Take an ordinary case in life. A man sent his servant to buy the best wine he could at a certain price. One wine merchant offered him wine at 20s. a dozen and another at 25s. a dozen. The latter was the worse, but he took it because the merchant gave him 4s. or 5s. a dozen for his own pocket. In that case, there was a clear act of dishonesty. But suppose the employer sent him to a certain place to buy wine, and he was on his way to buy it when he heard of a better offer. He did not think that in that event a jury would convict him of dishonesty because he did not go back to his master and make a fool of himself and the other man.

Mr. ATKINSON: But suppose the master before concluding his bargain with the first sends him to another man?

Mr. WADDY said his friend would find that the test in the Mirfield Company's case was not made at the same time as the others, but, as a matter of fact, was made so far back as March 3, 1879.

Mr. ATKINSON remarked that he did not care about the date of the test.

Mr. WADDY said the Company had supplied a stated quantity of coal for several years.

His LORDSHIP: Well, I am afraid I cannot say any more; but I think it is a pity that we cannot get at the real issue. One ought to have some exact definition of the charges.

Mr. ATKINSON, continuing his address, said the fact of the mutilation of the book was practically undisputed. He was prepared to prove that on the 27th of September he denied all knowledge of the tests.

Mr. WADDY: No; read the letter.

Mr. ATKINSON said he, at all events, denied that he had them in his possession, and the fact that they were after that taken from the book, if it stood alone, should be sufficient to lead the jury to the conclusion that there was a purpose in abstracting these documents.

His LORDSHIP: How came it that notice was not given of this Mirfield case?

Mr. ATKINSON was unable to say.

Mr. WADDY: I don't object to you going into the Mirfield case. I am prepared to answer all things said in the hearing of the jury.

Mr. ATKINSON said he should prove that the test of Newton, Chambers, and Co.'s coal had been made by the prisoner; and it was one of the tests which were missing. It was found on inspecting the sheets, that only two out of the seven tests were still in existence. Where the five had gone the prosecution did not know. They had, however, obtained from Newton, Chambers, and Co. some coal of the same quality as was submitted to the prisoner, and the result of a test of this was to show that their coal at 7s. 9d. per ton was practically equal in quality to the coal supplied by Milnes, Stansfield, and Co. at 9s. 2d., and nearly equal to that of Lister Kaye. There was therefore a loss to the Corporation in the first case of 1s. 5d. per ton; and, as the coal of Lister Kaye was only worth to the Corporation 8s. 6d. per ton, there was a loss in that case of 8d. a ton. The total loss was about £1000 on these two contracts. Milnes, Stansfield, and Co. tendered for 10,000 tons, all of which was accepted; Newton, Chambers, and Co. tendered for 40,000 tons, of which 1500 tons only were accepted; and E. Lister Kaye tendered for 10,000 tons, of which 8000 tons were accepted. In the case of the Mirfield Coal Company, 10,000 tons were offered at 6s. 5d. per ton; but its value to the Corporation, as shown by the prisoner's own test, was 9s. 5d. per ton, and the Corporation would have gained 3s. a ton had that tender been accepted.

His LORDSHIP: Is there any evidence on that on the other side?

Mr. WADDY: I have no evidence—the matter has been sprung upon us—unless I can call the prisoner himself.

His LORDSHIP: said it was a pity the matter had not been raised. The proper course would have been to have a Committee to inquire and report; and upon that report an indictment might have been framed. The prisoner was there to meet certain charges; and they were entering into a criminal inquiry. Was it not possible now to adopt some course so as to put the case in such a shape that the issue might be tried? The prisoner's character ought not to depend upon an accident, nor yet ought the case for the Corporation.

Mr. WADDY remarked that it was impossible to enter a criminal case for trial elsewhere.

His LORDSHIP said if he had known of this difficulty while sitting at Pontefract, or somewhere else, he should have suggested that the case might stand over for the purpose of inquiry.

Mr. WADDY: That would be a terrible thing to do now.

His LORDSHIP: Of course, the defendant comes here to meet the case.

Mr. WADDY: If any civil charge had been made against my client, he would have met it with the greatest readiness.

Mr. ATKINSON: He had ample opportunity.

Mr. WADDY: That I absolutely deny; and it is contradicted by the letters.

His LORDSHIP said this was not a civil case; and it was obvious to everybody that a case of this kind ought to have been most accurately formulated. No doubt the Corporation had done its best; but before the indictment was absolutely framed and sent up to the Grand Jury, it would have been wiser that something further should have been done. Let them just remember what would happen at every stage. The Jury would have to consider the difference between these facts—the difference in the contracts, the state of the market, the illuminating power of the gas and all these things they must be thoroughly convinced upon before they decided one way or the other. Whether the prisoner could account for the thing honestly, or whether he removed the records in order to cover up some previous sin, would have to be considered. Whether there was a previous sin or not depended entirely on the whole question of the tenders, on the value of the different calculations made upon the analyses, and of the truth also or the accuracy of the estimate as to the market value of the coal and the particular value of it to the Corporation.

Mr. ATKINSON said the difficulty was that it was not until after the commitment of the prisoner that the Corporation could obtain the books; so the evidence could not be given before the Magistrates. The tests had to be submitted to skilled witnesses, and it was only at the very last moment the Corporation had formed any opinion of the character of the tests.

Mr. ATKINSON said his friend was entitled to deal with the fact that they had not supplied particulars as to the Mirfield Coal Company.

Mr. WADDY said that if his learned friend would hand him the analysis in the Mirfield Company's case, he would not complain.

His LORDSHIP, speaking to the jury, said the question to which they were to address themselves was, assuming that the defendant did destroy certain books, did he do it with a corrupt motive. If he did these things carelessly, or even improperly in one sense, he would not be committing a crime. The first question was, What was his object in doing this? In order to arrive at that, they must inquire into all these points.

Mr. ATKINSON said there were only four tests with which he would trouble the jury. The Mirfield Coal Company tendered 10,000 tons at 6s. 5d., which was worth 9s. 5d. The test of that coal was in the possession of the prisoner, for it was on one of the sheets which had been recovered. It was true it was an old test, made in 1879; but the prisoner knew the result of the test, and the value of the coal to the Corporation. The tender of Milnes, Stansfield, and Co. was accepted, for 10,000 tons, though the price was 9s. 2d. and the value only 7s. 9d.; but not a single ton was ordered from the Mirfield Coal Company, though the price was only 6s. 5d., and the value 9s. 5d. The evidence which would show this to the Corporation was the tests which were in the book; but when the prisoner found that inquiry was being made for them, he ordered his clerk to tear out, not only the seven tests, but every test contained in the book from 1879 to 1888. It was impossible for the prosecution to prove what pecuniary object the prisoner had, if he did do it, in advising the Committee to pay a higher price for their coal than they could have got it for. When a man was asked to produce a book or a document belonging to his employers, he did not immediately proceed to destroy it, or tear leaves from it without he had some strong motive, and unless some explanation were offered, the inference was irresistible. When asked on the 27th of September for these tests, he wrote back to say that he did not possess them. He (the learned Counsel) would show that that was absolutely true.

Mr. WADDY objected that no notice was given his client to admit the letters.

Mr. ATKINSON read the correspondence which took place on the 27th of September between the Town Clerk and Mr. Carr. The Town Clerk asked for the tests referred to in Mr. Carr's report of June; and Mr. Carr replied that he had not seen them since they were submitted to the Committee, and was under the impression that they were taken possession of by another official, as they related to contracts which were accepted. That statement was untrue; and it was the strongest testimony the jury could have against the prisoner.

James Milner, Chief Clerk in the Halifax Corporation Gas Department, was then called on behalf of the prosecution. In answer to his LORDSHIP and Mr. BANKS, he said he recognized the foolscap copying-book produced. It was used for the purpose of having reports of different kinds copied into it. There were seventy-nine sheets missing from the book. About the 28th of September he tore out the leaves, upon being asked by the prisoner to take the coal tests from the book. The book was kept in Mr.

Carr's office. He could not say why the prisoner asked him to take out the tests. The sheets contained copies of coal tests which had been made by the prisoner. The documents were copied consecutively. He simply took out the sheets when he was told to do so. He did not know whether sheets had been taken out of the book before he took these out or not.

Mr. WADDY: You are the Chief Clerk. Is there anyone in the gas-works who knows more about them than you do?

Witness: I do not know; there may be, or there may not.

His LORDSHIP: You must know if there is.—No, in my department there is not.

By Mr. WADDY: He could not tell whether the test of the Mirfield Company's coal in 1879 was of screened or unscreened coal. It would make a deal of difference whether it was screened or unscreened; but he could not tell whether the sheet produced gave the result of one or the other. He did not know whether the Mirfield Company really supplied screened or unscreened coal.

Mr. ATKINSON said that the tender was for "coal such as previously supplied."

Mr. WADDY: Is it not a fact that the coal actually supplied was unscreened?—I don't know.

Is there any human being that does, except the prisoner?—Yes.

Who?—The man's dead.

In answer to further questions, witness said he copied the coal tests made by Mr. Carr to lay before the Committee. They were different in form from those produced. In none of those produced was there any money value given; but in the tests laid before the Committee, the money value was worked out and stated. He did not, to his knowledge, tear any tests of that character out of the book. The earliest record in the book was dated February 1876; and he had been the person who copied the various documents into it. He had spoiled some pages and torn them out from time to time.

Mr. WADDY: Am I right in saying that that may have happened eight or nine times?—I could not say.

Didn't you tell the Magistrates it may have happened eight or nine times?—Yes, I did. He could not say that every sheet except those he so destroyed had been recovered; but he would not venture to say it was not so.

His LORDSHIP: Nine may be accounted for in that way?—Yes.

His LORDSHIP: That simplifies the condition of things.

Mr. WADDY: Do you know as a matter of fact that Mr. Carr was in the habit of making analyses for other engineers, for which he was paid, altogether apart from his business.—I know he has made tests.

Don't you know that vendors of coal were in the habit of getting his analysis for the purpose of putting it out with a view of getting customers?—I can't say that.

His LORDSHIP: You never saw them alluded to in advertisements of excellent coal analyzed by Mr. Carr?—Not in that way. I have seen the analyses in print in the form given on pages taken out of the book.

Mr. ATKINSON, in reply to his LORDSHIP, said some members of the Corporation knew that Mr. Carr made these private analyses; but the Corporation as a whole did not know. Forty-four of the tests produced related, however, to coal tendered for to the Corporation.

Mr. WADDY said this was the first time any objection had been hinted against the prisoner's private practice in that way. He asked the witness if it was not true that on one occasion Mr. Carr sued a man in the County Court for his fee of £5 5s., and called a member of the Gas Committee as a witness in support of his claim.

Witness said he had no recollection of this matter.

Mr. WADDY: I ask you, sir, the Chief Clerk, to tell me of one single case in which you undertake to say that the Corporation have lost money by this man? I give you the whole range of the thirteen years.—It is a thing which I have no knowledge of at all. I don't know.

Now, I will carry it further. Don't you know that, with regard to these private analyses which this gentleman made, the fact was that coal was sent to him, sometimes a considerable quantity (a ton at a time), that he used what he wanted for the purpose, and then always made the Corporation a present of the balance, and put it on to the Corporation heap?—No, sir, they never came in large quantities like that.

What quantities did they come in?—A box or sack.

As a matter of fact, whatever was the amount, don't you know that what he did not need went on to the Corporation heap?—It did, sir.

Do you also know that when this inquiry, instigated by this man Lever, first began, the Mayor, I think it was, alleged that there were hundreds of tons short?—No, sir, I don't.

Don't you know that he stated it in the Council Chamber coolly?—I cannot say, sir.

His LORDSHIP: One way or the other—you don't know?—No.

Mr. WADDY: Is it not a fact that an investigation was then held, and it was found that, instead of being hundreds of tons short, they had actually got 1200 tons more than they ought to have had?

His LORDSHIP: Do you know that?—Yes, sir.

Yes; you do. There is something you know, then. (Laughter). Speak so that you can be heard. It is a very important thing to hear all that is said.

Mr. WADDY: The corrupt administration of this man (the prisoner) resulted in this, that you had actually got 1200 tons of coal more than you could account for, instead of less as the Mayor said?

His LORDSHIP: He does not know what the Mayor said; and the prisoner is not indicted for stealing coal.

Mr. WADDY: But there has been an enormous amount of prejudice imported into this case. Is it not a fact that the alleged robbery from the Corporation by this gentleman has ended in this—that in his time the gas-rate has been reduced from 4s. to 1s. 9d.?—Yes; I believe it was 4s. per 1000 cubic feet.

His LORDSHIP: That is for the same quality of gas, I suppose?

Mr. WADDY: Yes, my Lord.

His LORDSHIP: Do you make more than one quality?

Witness: Well, of course the quality varies.

His LORDSHIP: Don't say "of course;" I don't know. Of course, it varies every day, according to your ovens and a number of other things. Do you mean to say that it is all of one quality?—For anything I know, the standard is 14 candles.

Mr. WADDY: You try, at all events, to make the same gas as near as you can?—Yes.

And after having reduced the price in that way, there was actually a profit at the first half of this year of £2000. Is not that a fact?—I don't know.

Why, you are Chief Clerk! The books must go through your hands?—No, sir, I don't.

We have seen now what are the kind of analyses that are entered into that book; now, I must ask you, Is it a fact that of those tests which were sent into the Committee meeting not one was ever entered into that book?—Not to my knowledge.

His LORDSHIP: You are sure of that?—Not to my knowledge.

Mr. WADDY: You were the only man that copied them in weren't you?

His LORDSHIP: That is a very important question.—I don't remember ever copying any into that book.

Mr. WADDY: Now, Mr. Milner, you will tell me fairly upon your oath, as far as you know, is it not a fact that Mr. Carr, by your hand, never tore out a single one of those tests belonging to the Corporation?—It is a thing I could not swear, Sir.

You did?—Yes, Sir.

You selected them?—No, Sir, I took them all out.

They were torn out by your hand?—Yes, Sir.

His LORDSHIP: What did he say?—He said "Take the coal tests out."

What did you understand by that?—The whole of them.

Mr. WADDY: You must have looked at them if they were torn out. Now, Sir, upon your oath, did you ever copy into that book one single test meant for the Corporation?—I cannot swear, Sir.

His LORDSHIP: Do you believe it?—I don't think I did.

Mr. WADDY: You don't think you did? Well, do be fair.

His LORDSHIP: We have got a further step; we have got this, that the two tests or analyses were of a different character—one for the Corporation, and this done privately, containing the chemical analysis.

Mr. ATKINSON: A chemical analysis is necessary in each case.

Mr. WADDY: We will have it perfectly clear. As far as you know, the tests for the Corporation, in any stage of them, were never entered into that book?—As far as I know, they were not.

Either in the chemical stage or in any other stage, as far as you know?—No, sir.

Am I not right in this—that when the Corporation wanted a test made, it was always made out on a loose sheet of paper, copied by you on a loose sheet of paper, and sent into the Committee?—Yes, Sir; I made them out on loose sheets.

In further examination, witness said that on Nov. 23, three of the sheets were produced as samples, and the others were admitted to be in the keeping of Mr. Storey. He did not know that Mr. Storey undertook to furnish copies. He did not know that the Town Clerk, having ascertained the luncheon hour of Mr. Storey, took out a warrant and obtained possession of the letters.

His LORDSHIP (to Mr. Waddy): Is it the cruelty of the luncheon time that you particularly complain of?

Mr. WADDY: No, not the cruelty, but the meanness; and, certainly, it is the first time in my experience that I ever heard of such a proceeding as that one solicitor, after asking for documents from another solicitor, should go behind his back and obtain a search-warrant.

His LORDSHIP: Well, that is a bye-issue.

Mr. WADDY: Like a good many others that my friend detained us with this morning.

Re-examined by Mr. ATKINSON, witness said his duties were to keep the carbonizing and other accounts; but all his time was not spent in book-keeping. He had nothing to do with these tests except to copy them. He had no practical knowledge of coal testing except commercially; but he knew these were not tests for the Gas Committee, because they were not in the form in which such tests were made.

Do you know whether any of these were chemical tests of coal which was being tendered to the Corporation? Not that I am aware of.

The question was repeated, and witness gave the same answer.

His LORDSHIP: You may lead the horse to the water; but you cannot make him drink.

Witness explained that, so far as he knew, the tests for the Corporation were only made out for the commercial value, and not chemically. Those for the Corporation never to his knowledge had the chemical part attached.

James Nicholl, Borough Accountant, said that pages had been torn out of the book produced. He had not examined the pages recovered under the search warrant; but had seen copies of them, and made a list of those which he alleged were tests of Corporation coal.

His LORDSHIP: How could he make a list without examining the documents themselves?

At this stage the examination stopped for want of the sheets containing the analyses; and his Lordship said that if it would facilitate the matter, he would adjourn for luncheon. The Court adjourned accordingly. On resuming,

Mr. Nicholl said he had glanced through the lists which had been handed to him. He had not carefully examined them and gone through all the figures.

His LORDSHIP, at this stage, said he could not help feeling that this was really not a case that could be shaped against the prisoner, after the explanations which had been given as to the books. Whether he had been wise or prudent, possibly honest, in conducting the affairs of the Corporation was open to question, but to pitch upon these 70 pages, and say that he took them out with criminal intent was, it seemed to him, now that the books were produced and to a certain extent explained, a matter on which no evidence was possible; and he felt great difficulty in putting the case to the jury. It did not follow that the tearing out of the leaves was a crime.

Mr. ATKINSON said he was placed in a difficulty by the circumstance that the documents which were relied upon only came into the possession of the Corporation recently. He could show that, with reference to the seven tests taken after the 18th of May, only two were to be found, and they were amongst the leaves from the book. That put at rest the fact of all the pages relating to private tests.

Mr. WADDY: If my friend proposes to contradict in this way his own witnesses we shall never be done.

His LORDSHIP: When the jury come to consider the question, how can they say that 68 leaves were torn out with a proper motive, and 2 were torn out with an improper motive?

Mr. ATKINSON said a large number of the tests undoubtedly related to coal not supplied for purposes of the Corporation.

His LORDSHIP: I am quite certain no jury ought to convict, nor ought I to leave it to the jury unless there is some specific reasonable proposition to leave to them. It would not be fair to the prisoner to assume this in any sense.

Mr. ATKINSON said he had indicated the nature of the facts which for the prosecution he had intended to prove. He thought he should have been in a position to prove these facts. A certain number of these tests undoubtedly referred to Corporation coal; not all of them.

His LORDSHIP said the whole force of that was taken away by the evidence that the prisoner did not go and select the 2 which might incriminate himself; but he asked for the mass and got, in a perfectly public manner, the whole 70.

Mr. ATKINSON said he was only endeavouring to discharge his duty, but if his Lordship's view was that he was not entitled to ask the jury to find the prisoner guilty, he should not think it necessary to proceed further.

His LORDSHIP: Not only is that my view, but if this had been an ordinary case between individuals, I should some time before this have said that I did not see my way to leave any case for the jury. Inasmuch as there appeared to be a question of a public scandal, in which some wrong had been done by a public servant, I was unwilling at an earlier stage to

interrupt anything that might throw light on the subject. But the further we have gone, the wider we have got from evidence which incriminates the prisoner; and on the other hand the more clearly do we see that there could be no conviction against him.

His Lordship then directed a verdict of "Not guilty," and Mr. Carr was discharged on all the counts.

HIGHGATE PETTY SESSIONS—MONDAY, DEC. 10.

(Before Mr. BODKIN and a Bench of Magistrates.)

BARNET DISTRICT GAS AND WATER COMPANY v. ALEXANDER.

This was an action brought for the purpose of having the house occupied by the defendant assessed for the purpose of fixing the water-rate.

Mr. BANNISTER appeared for the Company; Mr. W. C. JACKSON for defendant.

Mr. BANNISTER, in opening the case, submitted that defendant had no right to challenge the basis upon which the Company charged for their water, as this question was recently settled in the Court of Queen's Bench, in the case of *Stevens v. Barnet Gas and Water Company*. In this case, the defendant lived in a house at Southgate, which was assessed for the Queen's taxes at £58 a year; but the Company not desiring to have any disputes with their consumers, offered simply to charge for water on an assessment of £50, although they had power to charge on £53. The defendant refused to pay on £50; and consequently it had been necessary to take proceedings. As he had refused the liberal offer of the Company, he should ask the Bench to give them all they were entitled to, by fixing the assessment at £53.

Mr. T. H. Martin, Assoc. M. Inst. C.E., the Engineer of the Company, proved that the defendant received a supply of water from the Company at his premises No. 7, Southgate Villas, New Southgate. The water-rate used to be charged on an assessment of £50; but defendant had refused to pay on that amount. The letting value of the house would be £58 or £60 per annum.

Mr. Venables, auctioneer, said that he had seen the house, and considered its letting value was from £55 to £60 per annum.

Mr. JACKSON said Mr. Alexander had occupied his present house since 1882. He took it on a three years' agreement, at £50 a year, and had remained as a yearly tenant at £50; but he was now in negotiation with his landlord for a reduction. There was a gentleman present who occupied a similar house opposite the defendant's, and who was only paying £40 a year rent; and he recently bought his house in the open market for £400. The ground-rent was only £5 10s. In 1886, Mr. Alexander wrote to the Company saying he found that his neighbours were paying on a much lower scale than himself; and he must decline to continue to pay on his existing assessment. They, however, took no notice of his letters for two years, when they sent him in a demand for nine quarters on the £58 assessment. Originally, it should be stated, they assessed him at £65.

Defendant was then called and stated that the actual amount of the assessment of his house for Queen's taxes was £50, and not £53. He was assessed for poor-rate at £36. For three years he paid the water-rate on a £65 assessment. The house opposite his, which was let for £40 a year, was a better one than his own. He complained of the Company not answering his letters and not sending in the demand-notes for two years. Had they replied to his letter in 1886 in the negative, he would have left his house, because he had made up his mind not to pay on £53; but he obtained no answer, and the result was he could not leave the house now until March, 1890.

Cross-examined: He did not admit that the Company had a right to claim on the gross rental.

Mr. BODKIN observed that one of the Metropolitan Water Companies was entitled to charge upon the gross rental.

Mr. BANNISTER said he must deny that the Company had treated Mr. Alexander with any discourtesy, or had neglected to answer his letters. He had sent a great number of voluminous letters to the Company on the subject, and had rejected their reasonable offer, threatening to place the matter before the Local Government Board; and it was only as a last extremity that they brought the case into Court.

Mr. Simpson was called, and said he occupied the house facing Mr. Alexander's, and only paid a rent of £40 a year for it.

Mr. Prout said he lived at No. 12 in the same row of houses, and paid £45 a year rent. He was summoned under similar circumstances to Mr. Alexander.

The Bench having conferred,

Mr. BODKIN remarked that they had decided to fix the value of the house at £48 a year; and this being so, the Company would have to pay the Court fees.

Mr. BANNISTER: Is that so, Sir, after we have exhibited all this forbearance?

Mr. BODKIN: You have not succeeded.

BARNET GAS AND WATER COMPANY v. HOLDEN.

This was in every respect a similar case to the above.

Defendant, who resided at No. 7, Station Road, East Finchley, admitted that he gave £500 for his house; but contended that he only ought to be charged for water on the scale of the rateable assessment, which was £32.

After some discussion,

The Bench fixed the amount at £40, and gave the Company costs.

NEWBURY CORPORATION GAS SUPPLY.—At the last meeting of the Newbury Town Council, the Gas Committee reported that they had an offer to renew a bond for a loan of £6000 on the security of the gas-works at 3½ per cent. provided it is not disturbed for 7 years. Mr. Lucas proposed the adoption of the report, and said that there was every prospect of the Committee being able to re-adjust their capital at 3½, instead of 4½ per cent. Already they had secured £2300 at the lower rate; and now they had the present offer of £6000. The report was adopted.

THE PROJECTED ELECTRIC LIGHTING OF THE CITY.—At the meeting of the Commission of Sewers last Tuesday, Mr. Treloar asked the Chairman of the Streets Committee when they were to receive the Committee's report on the question of the electric lighting of the City, and why it had been delayed. Mr. Bridgman replied that the Committee had done all they possibly could in the matter. They had decided upon the principle on which the conditions for tendering should be based; and the matter was now with the officers. The Engineer was putting the matter into proper shape; and as soon as this was done, the Committee would be glad to discuss it. They had determined that the matter should be settled before they went out of office, so that before a new Commission was appointed, he (Mr. Bridgman) believed they would be able to report that they had arrived at satisfactory conditions. Mr. Morton—a member of the Committee—expressed the opinion that the Committee had been playing with the question a whole year, and wasting time.

Miscellaneous News.

METROPOLITAN BOARD OF WORKS.

THE PROPOSED ALTERATION IN THE STANDARD OF LIGHT.

At the Meeting of the Metropolitan Board of Works last Friday, the Special Purposes Committee submitted a report, recommending that they be authorized to approach the Board of Trade to urge the early introduction into Parliament of a Bill to provide for the adoption of a new and reliable standard of illuminating power, and for the prescription of a standard photometer, with a view to securing uniformity of result in the testing of gas in the Metropolis.

Mr. J. ABBOTT, Chairman of Committee, in moving the adoption of the report, said that the testing of gas was one of the most important duties entrusted to the Board. This subject of standards of light had been before the Board since 1879. The movers, in the first instance, were the Board of Trade, who, in the year named, referred the matter to a Committee, who condemned the present mode of testing gas. Four years subsequent to that—viz., in 1883—the South Metropolitan Gas Company confirmed the opinion of that Committee, and expressed an opinion that the Board of Works should apply to the Board of Trade, in order to get some alteration in the method. For many years there had been reports frequently made by the Special Purposes Committee of the Metropolitan Board of Works in relation to this matter; but for want of unanimity it was considered by the Board that any attempt to deal with the question would end in parliamentary difference, and probably involve a large expenditure, with but little result. He was glad to be able now to report that the circumstances had entirely altered. A fortnight ago a proposition was made by the South Metropolitan Gas Company to be heard by the Special Purposes Committee by means of a deputation. The Committee were empowered by the Board to receive such a deputation. The Chairman of the Company (Mr. G. Livesey) and one or two of the other Directors, attended by the Chief Engineer of the Company (Mr. F. Livesey), attended a meeting, and put the matter before the Committee, with the result that they were convinced the time had arrived to go to the Board of Trade, with a view to their bringing in a Bill to get an Act of Parliament passed, so as to prevent the sperm candle being any longer used for gas testing. Although the Gaslight and Coke Company had not expressed an opinion, it seemed to the Committee that the representation to the Board of Trade would be almost unanimous; and that an alteration in the present arrangements would be obtained.

Mr. PURDY seconded the motion.

Mr. RICHARDSON said this was a very interesting question, but was very little understood by the public. The point was to substitute a more exact and trustworthy standard of light than the sperm candle, which was at present the only legal standard for the testing of gas. Experiments made had shown that in some instances the sperm candle test was largely in favour of the consumers, while other sperm candle tests showed the very reverse—viz., in favour of the gas companies. The candles were very rarely alike; and the result was that the consumers and the gas companies became dissatisfied. Practically, at the present time, the Act for regulating the lighting by gas of the Metropolis was a dead letter, and wanted thoroughly reconsidering. It was at present a useless expenditure of hundreds of pounds a year for the examination of gas in the Metropolis—in fact it was a simple waste of money.

Mr. JONES thought that, if they approached the Board of Trade, that body would no doubt say, "Be good enough to explain what the new photometer is that you wish to introduce." He hoped the Board would not be so foolish as to go to the Board of Trade as proposed by the Committee, but postpone the matter, and let the great County Council undertake it.

Mr. ABBOTT, in reply, said that had the last speaker been a member of the Special Purposes Committee, he would not have made the observations he had. There was perfect unanimity of opinion between the Board of Trade Referees and the Gas Companies on this motion. The Chairman of the South Metropolitan Gas Company and the others interested were unanimously of opinion that the Committee should ask the Board to go to the Board of Trade. A large amount of money had been expended, and a great deal of time had been given to the consideration of this question. Something like 2000 experiments had been made by the Chemist of the Board (Mr. Dibdin); and in these experiments, he had been assisted by four or five of the Gas Examiners. Therefore this report had not come before the Board without due thought and care. The matter had already been ten years under consideration; and now, when there was a likelihood of getting the question settled, he thought the Board should certainly avail themselves of the opportunity. There was no intention or desire for the standard to be altered either to the disadvantage of the consumers or the gas companies. All that was wanted was to get a reliable standard; the sperm candle being admitted on all hands to be non-reliable and unsatisfactory.

The report was adopted.

SOUTH METROPOLITAN GAS COMPANY.

An Extraordinary General Meeting of this Company was held last Wednesday, at the Bridge House Hotel, Borough, S.E.—Mr. GEORGE LIVESY in the chair—for the purpose of electing a Director in the place of the late Mr. T. Rowland Hill.

The SECRETARY (Mr. Frank Bush) having read the notice convening the meeting,

The CHAIRMAN said: Gentlemen, this is a purely formal meeting. We are required by our Act of Parliament to fill up all vacancies on the Board by a general meeting, or an extraordinary general meeting if the vacancy occurs at an intermediate period. I do not know that there is anything for me to say on this occasion beyond a word or two in reference to our late colleague, Mr. T. R. Hill. We have lost in him a most valuable Director; a man who was of great service to the Company from his business experience; and a man whom we all highly respected for his personal qualities. He was an admirable Director, and did his duty most faithfully and earnestly, and worked in the most cordial and friendly manner with all of his colleagues. We feel his loss very greatly indeed. We certainly did not expect when, two years ago, we lost another of our Directors—Mr. Gibbs—that there would so soon be a further vacancy. I have now, therefore, simply to say that we have met for the purpose of electing a successor to Mr. Hill. The Company, I am happy to inform you, is in as good and prosperous a position as ever; and I have no doubt whatever that the gentleman who has come forward for election will devote his energies to maintain its prosperity and welfare.

Mr. SHAND said that the matter they had before them was a purely formal one; but still it was one that must be gone through. He had to propose—"That Mr. John Ewart be elected a Director in place of Mr. T. R. Hill (deceased)." He had no personal knowledge of Mr. Ewart; but the previous day a mutual friend gave a good account of him, and assured him that he would make a good Director. The firm of James Morrison and Co., of which Mr. Ewart was the managing partner, was

well known; and he (Mr. Shand) had no doubt he would bring his business experience to bear upon the work he would have to do on the Board of their Company. He supposed Mr. Ewart had not much knowledge of engineering matters; but with the engineering talent on the Board, that was not required. He (Mr. Shand) had himself been a Director of Gas Companies for many years, and knew the duties of a position of this kind; and from what he had heard of Mr. Ewart, he would make a good Director.

Mr. BUTLER said he had much pleasure in seconding the motion, and for the following reasons:—As far as experience of the gas business was concerned, he supposed the Board of their Company was better off than any in the world; for they had at its head a gentleman who certainly was the best authority on gas matters in the world, and then he was assisted by another Engineer who, he had no doubt, was very useful. They had also a gentleman from the Royal Engineers; and then they had a barrister in Mr. Rostron, who, he supposed, occasionally, when the business men of the Board had been trying to take a common-sense view of a thing, and had sailed a little close to the law, had to put them right. Then the only other qualification necessary to make the Board complete was that they should have some thoroughly good business men; and Mr. Mews and Mr. White, he was sure, carried out all that was wished in that direction. Unless he was very much misinformed in the inquiry he had made concerning the gentleman who he hoped—there was not much doubt about it—would be elected to the vacant position, he thought he was just the man wanted to complete the Board. He was a man in the prime of life; he had had considerable business experience; he was straightforward; and he was a gentleman the Directors of the Board would have a great deal of pleasure in working with. He was sure that the present Board worked cordially together; and he should be very sorry if anything should ever be introduced that would disturb this cordiality. In these times, he continued, people talked a great deal about electricity. All the experts he had spoken to about it thought there was some advancement to be made, and that probably there would be a great deal of electricity used; but one and all agreed that it would not be at the expense of gas. If they continued to reduce the price of gas, and keep up its quality, he believed they would be capable of competing with electricity. Most people had not been used to paying a very long price for their illuminating agent. When, however, they came to use electricity, they would find it was a very expensive affair; and he did not think they would afterwards begrudge so much the money for their gas bills when they came to pay them.

The resolution was carried unanimously.

Mr. GROVER said that, having voted for the resolution, he wished to make one remark. Whenever it was necessary—and he hoped it would be some time to come—to make another appointment of this kind, he thought they should select a gentleman who was resident in the Company's district. It was, to his mind, a great disadvantage not having a member of the Board living in the district.

The CHAIRMAN remarked that he had had great experience of resident Directors; and, in his opinion, it was a decided disadvantage for a Company to have Directors residing in the district. He had much pleasure in announcing to Mr. Ewart that he had been unanimously elected a Director of the Company.

Mr. EWART said he had to return his sincere thanks for the honour the shareholders had done him in electing him a Director of the Company. He regarded it as a great honour because he had always considered the South Metropolitan Company to be the leading Gas Company in the world. There were one or two Companies with larger capitals; but in all other respects the South Metropolitan took the lead. Their stock stood at a higher price in the market; their dividends were higher than any other Company's; and, further than that, they charged the lowest price for gas. Beyond this, in the matter of economical manufacture, and in adopting all the most recent appliances for improved production, he believed the Company stood second to none. The position that the Company occupied had resulted mostly from its excellent management. Almost from its commencement, it had had the advantage of having engineers upon the Board. An active member of one of the earlier Boards was a namesake of his; and he served the Company well for many years. Of course, a large amount of work had fallen on the existing Board. The present was a time of great competition in every way; and he was sure the shareholders were all well satisfied with the way in which this competition had been met. In the past few years oil and petroleum had been cheaper than ever before; but against this gas had held its own. In the interval their dividends had been increased, while the price of gas had been lowered. The competition which more immediately threatened them was that of the electric light. He did not think they had cause for any anxiety in the future. They had met competition in the past by supplying good gas at a low price; and as long as they continued on this line, they need not have any apprehension as to the electric light.

This concluded the business of the meeting.

THE DEACON WASTE-WATER METER IN USE AT CHESTER.—At the recent monthly meeting of the Chester Town Council, the Town Clerk read a letter from Mr. E. Lloyd, the Secretary of the Chester Water-Works Company, to the effect that the Deacon waste-water meter system recently undertaken by the Company had now been completed; and since its completion—on the 21st ult.—the supply of water for the entire district has been constant both by day and night, and will continue so in the future. The Ex-Mayor said, as Chairman of the Water Company, he might mention that this was part of a plan that had been carried out in order to make the supply of water to the city as perfect as it could possibly be. It saved water to the extent of nearly one-half; and it would be of advantage in the sewerage works. They had only one-half of the sewage to deal with instead of the whole.

THE SEDGLEY LOCAL BOARD GAS UNDERTAKING.—At the last meeting of the Sedgley Local Board, in replying to a question on the subject, the Chairman (Mr. S. Wilkes, J.P.) said the parishioners had no need at all to have any thoughts that the gas undertaking was not paying. He hoped to make a statement next March, which would, perhaps, be rather pleasing to those people who had said the Board were doing the worst thing for the parish that could be done in taking over the gas-works concern. He was pleased to say that up to the present they had paid their debts and owed no man anything, excepting the loan; and he hoped to be able to hand over to the district rate account a small sum next March. Mr. Hughes remarked that, although the money would be going in reduction of the rates, a good many of the consumers would like perhaps to see a small reduction in the price of gas. The Chairman observed that they must consider the expense the Board had been put to; and he thought that before they could ask for a reduction, the profits of the gas undertaking should be sufficient to cover the lighting of the roads. The people in Lower Gornal and Gornal Wood had, at all events, experienced a change from the old state of things; for a reduction had been effected to them from 5s. 6d. and 6s. to 3s. 6d. per 1000 cubic feet.

THE DUBLIN CORPORATION AND THE GAS SUPPLY OF THE CITY.

The discussion in the Dublin Municipal Council on the 10th inst. on the quality of the gas supplied to the city (a report of which was given in the JOURNAL last week) has elicited from Professor Tichborne a letter, published in the local press, in which he replies to the various statements which were made concerning himself. In regard to the assertion that the supply of gas could be of different quality in different parts of the city, he thought it imperative to get some information from the Secretary of the Company (Mr. W. F. Cotton). To this end, he addressed the following letter to that gentleman:—"It has been openly stated that there are two supplies of gas to the city, and that the gas on the north side might differ from that upon the south, &c. If such were the case, you will, of course, see that it might invalidate recorded tests taken at the testing station in Burgh Quay, as well as any taken in other places. I should, therefore, be obliged if you would officially answer the following questions:—(1) Are there more works than one for the manufacture of gas in Dublin? (2) Does the whole of the gas pass from the works through one trunk main to supply the city; or are there two or more mains proceeding from the works? (3) By any possible arrangement could the gas on the north side differ from the south at any given time?" In his reply to these questions, Mr. Cotton said: "(1) All the gas supplied to the city is manufactured at one and the same works. (2) The whole of the gas manufactured on our works passes through one trunk main to supply the city, from which all the feeders of mains are supplied. (3) The answer to this question is 'no.'" Continuing his letter, Professor Tichborne says: "As regards the mode of conducting my own testings, some statements were made which are entirely erroneous. All my recorded testings for illuminating power are conducted at the testing office at Burgh Quay, as required by Act of Parliament, in the presence of an officer of the Company; and, when taken, the results are signed and handed to the said officer. The instruments at George Street are merely used for my own information, and as a check. I never test two nights running at the same hour; and these examinations are so arranged that they fairly represent the illuminating power at the various hours allowed by the Act (5 to 11 p.m. in winter). I have also to state that from inquiries I have since made, my observations have been the earliest tests officially taken up to the evening of the 12th of December. The Inspector of Public Lighting has given some tests which do not agree with mine. I am not in a position to explain this discrepancy, as I am in ignorance of where or how his tests are made, or with what kind of instruments they are performed. I am sorry I do not meet the Inspector oftener, when, by comparing notes, I might be in a better position to throw some light on the discrepancies. I have never chanced to meet that gentleman at the official testing-station but once during the last 60 visits to the testing-station, which have extended over the past three to four months. I am quite sure, however, when necessary, I shall be in a position to substantiate my returns; and until I have further evidence before me, I must decline to acknowledge that the Inspector's testings carry any weight with them. I have made a suggestion to the Paving and Lighting Committee, which will, I think, if carried out, clear up some points of importance."

The inevitable budget of letters in the local papers from "Ratepayers" and others has followed the discussion in the Dublin City Council alluded to above. One writer, under the *nom de plume* of "A Ratepayer," says: "It must be apparent to the ratepayers, who are the sufferers, that underlying these unseemly squabbles, there is some personal animosity or malignity which ought not to be tolerated in the Municipal Council. I am told that the Paving and Lighting Committee were sick of the subject, and the loss of time spent in wrangling over it, and gladly delegated their powers to a special or some other Committee composed of men who are never likely to settle the question. Would that the Council could see their way, like sensible business men, . . . to call in an independent umpire to settle the matter, and save us from a repetition of scenes calculated to lower our assembly in the eyes of the world, and bring the metropolis into disgrace." "Ratepayer" then goes on to advocate the introduction of electric or large gas-lamps to improve the lighting of the thoroughfares, which, according to his letter, is at present "disgraceful."

Another correspondent—"J. McConnell"—appears to be able to discern a variation of even $\frac{1}{2}$ candle in the illuminating power of the gas burnt in the public lamps. The gist of this gentleman's letter to the newspapers will be found in the reply thereto by Mr. W. F. Cotton, the Secretary of the Gas Company. "Imagination," says Mr. Cotton "works wonders, judging from the letter . . . signed 'J. McConnell.' This gentleman informs us that—'The night before, the streets were illuminated to such an extent that the journey after business to the suburbs, which for some time past was attended with danger, became much less difficult by the aid of the good gas which shone forth from the lamps.' And then he informs us that all those blessings are owing to a 16-candle gas being shed upon the paths. Perhaps it will surprise this gentleman to learn that, according to the reports made by the Inspector of Public Lighting, the difference in the illuminating power of the gas on the night referred to and the previous one amounted to $\frac{1}{2}$ -candle, and that the $\frac{1}{2}$ -candle if applied to the light emitted from a public lamp, consuming 4 feet per hour, would increase the light to the extent of four-tenths of a candle, assuming the Inspector's report to be reliable. Mr. McConnell is to be congratulated on his visionary organs. A gentleman who can detect four-tenths of a candle difference in the illuminating power of a flame in a public lamp, especially when seen through glass besmeared with filth, must indeed have exceptional sight. I fear Mr. McConnell has been carried away by the recent debate in the Corporation; and the evident attempt by some members of that body to cast upon this Company the responsibility for the present wretched condition of the public lighting of the city. Councillor Robinson, for instance, stated that the numerous complaints of the artisans were now easily explained—that the Company were supplying 13 and 14 candle gas for 16. This member of the Corporation ought to have known that what the artisans complained of was the absence of light altogether in the mornings; and being obliged to grope their way through dark streets when going to their daily toil, and that the shopkeepers and others complained of streets being left in total darkness up to a late hour in the evening. Alderman Mulhgan made an attempt to show that the complaints arose owing to the Company neglecting to keep the lamps in repair. The lamps are kept in as good order as heretofore. It is only within the past few months that we have heard complaints of this sort, although up to that period the condition of the public lamps of Dublin would bear comparison for cleanliness with any other public lamps in the kingdom. The fact is the unfortunate overworked lamplighters, who are employed by the Corporation, are taken away from their legitimate work; and, as a consequence, are unable to keep the public lamps clean or in proper order."

Alluding to what it terms the "Gas Question," the *Freeman's Journal* of yesterday week says: "In the course of the last discussion at the Corporation, it was conclusively shown that the city was being cheated out of certain contractual rights and benefits for which it was paying over the

mail. But from the Gas Company's point of view it can be established with equal conclusiveness that this is all a myth, and that the Corporation critics do not understand what they are talking about. The Gas Company, however, does not content itself with crying out 'You're another.' Mr. Cotton, the very efficient Secretary, steps out and challenges the Corporation to prove their charge. 'We have contracted,' he says in effect, 'to perform certain conditions. If we break our contract, we are subject to certain money penalties. You say we have violated that contract. Prove it, if you think so, and enforce the penalties.' This simplifies the question very much, and knits the issue. The only objection to it is that the suggestion involves law proceedings; and law proceedings involve the ratepayers' money, and, accordingly, the independent outsider immediately becomes an interested spectator." Our contemporary thinks that Professor Tichborne's letter does not give the ratepayers much satisfaction, and that it leaves matters very much where they were.

EDINBURGH AND LEITH GAS COMMISSION.

At the Meeting of the Edinburgh and Leith Gas Commission last Wednesday—Provost Aitken (Leith) in the chair—Mr. R. Mitchell was instructed, with a view to allowing the contracts for stores for both the Edinburgh and Leith works to expire at the same time, to arrange with the contractors to the Edinburgh works to allow their contracts to run till Whitsunday, when those of Leith will expire. It was reported by Mr. Mitchell that, from Aug. 1 to Nov. 30 last, there had been made at the New Street works 271,199,000 cubic feet of gas from 27,469 $\frac{1}{2}$ tons of coal and 1370 $\frac{1}{2}$ tons of lime; and by Mr. Linton that, from Aug. 1 to the 5th inst., there had been made at the Leith works 139,834,000 cubic feet of gas from 13,956 $\frac{1}{2}$ tons of coal and 667 $\frac{1}{2}$ tons of lime. The average number of retorts in action during November was: At the Edinburgh works, 454; at the Leith works, 192. Bailie Archibald thought it important that monthly reports from the Engineers should be received by the Commission, embracing the quantity of gas made, the price of coal consumed, and the amount of wages paid. The suggestion was acquiesced in. There was laid on the table a report as to the use of gas as a motive power and heating and cooking agent. Bailie Walcot, in explaining the report, said the Sub-Committee went to Glasgow, where Mr. W. Foulis, the Manager of the Corporation Gas-Works, was kind enough to show and explain all the arrangements in force there. The Glasgow Corporation do not let out on hire heating-stoves, as these were much more liable to depreciate than cooking-stoves; but they sold a large quantity of them at 12 $\frac{1}{2}$ per cent. under list price. They kept a considerable stock of cooking-stoves for sale, also at 12 $\frac{1}{2}$ per cent. under list price; and they also let these out on hire. Reckoning the cost of these stoves, and the expense of fitting them up, they found they had a return of something like 10 per cent. per annum. There was a great demand for the cooking-stoves; and the result had been extremely favourable, so far as the consumption of gas was concerned. It brought the summer demand for gas almost up to the winter consumption. The increase was represented by something like 12 million cubic feet a month; and they felt that they had in this full compensation. He thought that they should do something at once in letting out cooking apparatus. Bailie Archibald remarked that he had some reluctance in embarking upon a business that might interfere with private traders. He was not sure either that there would be the same demand for these stoves in Edinburgh. Bailie Walcot said, as regarded Glasgow, Mr. Foulis expressed not merely his own opinion, but the opinion of tradesmen, when he said that, instead of selling fewer stoves since the Corporation had taken up this work, they sold a great many more. Bailie Turnbull proposed that the matter be remitted to the Works Committee, with power to inquire as to the experience of other companies who had tried the system. This was agreed to. It was stated that the gas-rental from Nov. 14 to the 7th inst. amounted to £21,109, and that the total receipts since Aug. 1 were £48,875. It was also stated that the Commissioners had taken over the consumers' deposits from the Companies, amounting in the case of the Edinburgh Company to nearly £5000; and in the Leith Company, to about £2000.

THE ELECTRIC LIGHTING EXPERIMENT AT LEAMINGTON.

The Leamington correspondent of the *Birmingham Gazette* writes as follows in last Wednesday's issue of our contemporary:—"Very little doubt is now entertained that Messrs. Chamberlain and Hookham's experiments with the lighting of the streets of Leamington by electricity will come to an end next year. It will be remembered that those gentlemen, who are trading under the title of the Midland Electric Light and Power Company, last year laid down a plant at the Royal Spa, at a cost of upwards of £30,000. The Corporation agreed to lay on the current to their public buildings, and also to pay the Company £400 a year for lighting the Parade and Bath Street. These thoroughfares have been lighted by 183 16-candle power incandescent lamps. Dissatisfied with the effect of this arrangement, the Corporation two months ago asked Messrs. Chamberlain and Hookham to make experiments with alternative systems. They met the Local Authority in a very liberal spirit, and set up the arc system, the "Sunbeam" lamps, and the 25-candle power incandescent lamps. It has now been ascertained that the annual expense to the borough of lighting the Parade and Bath Street by the respective systems would be as follows:—Twenty arc lamps, at £42 each, £840; 30 "Sunbeam" lamps, at £30 each, £900; 90 25-candle power lamps (after the pattern of those now on trial in Bath Street), £600. The present contract price for the supply of electricity to the specified area is £400 a year. The amount previously paid to the Gas Company for lighting the two thoroughfares was less than £200 a year. In view of the disproportionate increase in the cost of electricity as compared with gas, it is believed that, at their meeting on the 14th prox., the Leamington Corporation will give the required twelve months' notice to determine the supply of the current to the public lamps."

The General Purposes Committee of the Leamington Corporation, which consists of the whole of the members of the Town Council, held a special meeting last Tuesday, to consider the electric lighting on the Parade. The ex-Mayor (Mr. John Fell), who was largely instrumental in introducing the electric light at Leamington, presided as Chairman of the Committee. The Parade and Bath Street, from Christ Church to the railway bridges, have for about twelve months been lighted by 16-candle incandescent lamps; but they were considered so unsatisfactory that, for the last five weeks, experiments have been made with arc lights of 3000-candle power, "Sunbeam" incandescent lamps of 300 candle-power, and lamps of double the power of those ordinarily in use. The arc light was considered too unsightly, and not a good example; and the only light the Committee could approve was the "Sunbeam." But the terms of the Midland Electric Light and Power Company for these lamps were considered to be simply prohibitive. The Committee accordingly decided to recommend the Town Council to take steps to determine the existing contract with the Company, which can only be done by giving twelve months' notice. The incandescent lights, though they have failed to give satisfaction for street purposes, answer remarkably well, it is said, for shops, shop

windows, and public buildings in the town where they are used. The managers of the Company recently stated that they cared very little whether the Council continued the use of electricity for street purposes; but the decision now come to will mean a loss of about £400 a year to them.

ELECTRIC LIGHTING MATTERS IN PARLIAMENT.

In the House of Commons yesterday week, Mr. Howarth asked the First Commissioner of Works whether, during the ensuing recess, he could see his way to make such an extension of the electric lighting arrangements in the House as would check further injury to the stonework in the corridors and staircase leading from the Star Court to the Commons lobby; and whether it would be possible to carry the electric light into the different rooms connected with the Reporters' Gallery. In reply, Mr. Plunket said he quite agreed in the desirability of the objects sought by his honourable friend; and he had under consideration a scheme for extending the electric lighting of the building, which would include and go somewhat further than the suggestion made by Mr. Howarth. The cost, however, of the installation would be considerable; and he (Mr. Plunket) must obtain the opinion of the Treasury upon its financial aspect. He feared it would not in any case be possible to complete the arrangements earlier than Easter. Sir J. Swinburne inquired whether the right honourable gentleman was aware that the electric light had been so dim in the library that members had had to use candles as auxiliaries. Mr. Plunket thought it must be very seldom that candles were used. He had never seen them in the library.

On Thursday, Mr. Watt asked the President of the Board of Trade whether the Electric Lighting Act of 1882 precluded the Board of Trade or local authorities from granting Licences to one or more persons, firms, or Companies to light the same area; whether the Act contained restrictions as to the breaking up of any street without the written consent of the Board of Trade; whether inquiries are made by the Board of Trade as to the ability of undertakers to carry out the work before Licences are granted; whether he could state what number of Licences had been granted since the last return was issued; and whether it was a fact that the reason assigned by companies which obtained Licences under the Act of 1882 for abandoning these was the enormous law costs which would have been incurred owing to the opposition of the local boards or councils. In reply, Sir Michael Hicks Beach said that the Electric Lighting Act, 1882, did not preclude the granting of Licences to one or more persons, firms, or companies to light the same area. With reference to the second question, the Board of Trade could not give power to break up streets except under a Licence or Provisional Order. As regards the third question, inquiries such as those suggested by the honourable member were made by the Board of Trade. Two Licences had been granted since the last report to Parliament. As to the last part of the question, he said that no such reason as that referred to by the honourable member had, to his knowledge, been assigned for the abandonment of Licences.

On the same evening, Sir Henry Roscoe put a series of questions to the President of the Board of Trade bearing on the same matter. He inquired whether his attention had been called to notices given for supplying electric light in the parish of Kensington by the four following Companies:—The Kensington and Knightsbridge Electric Company, Limited, the Chelsea Electricity Supply Company, Limited, the Notting-hill Electric Lighting Company, Limited, and the House-to-House Electric Supply Company, Limited; whether he was aware that these Companies proposed to conduct their operations mainly, or very largely, within the same area, and in many instances to take power to break up the same streets and places; whether it was the duty of the Board of Trade, before granting any Provisional Order, to take cognizance, of its own motion, of such *prima facie* objections; and whether the Board would not take any cognizance unless and until it was moved thereto by the local authority, or other parties interested. In reply, Sir Michael Hicks Beach said the answer to the first three questions of the honourable member was "Yes;" and to the last, that it is the duty of the Board of Trade, in framing a Provisional Order, to consider any objections to which their attention is called, and also any such as may occur to them.

Sir George Campbell, also referring to the applications now being made by various Companies to supply Kensington and other parts of the Metropolis with electric light, on Thursday, asked the President of the Board of Trade if he would take care that concessions were not sanctioned till the applicants had given some substantial guarantees that they would really carry out the proposed works, and not merely hawk about the concessions in the market, and throw them up if no profit was made there, as was so generally the case when Provisional Orders were granted under the former Act. Sir Michael Hicks Beach replied that in all Provisional Orders and most Licences, clauses were introduced providing for the deposit by the undertakers of an annual sum; and the powers so given could not be transferred without the sanction of the Board of Trade.

METROPOLIS WATER SUPPLY.

Messrs. Crookes, Odling, and Tidy, in the course of their report to the Official Water Examiner of the Metropolis (General A. de Courcy Scott), on the quality of the daily samples taken of the water supplied to London during November, say: "Despite the swollen and unfavourable state of the rivers during the past month, the condition of the water supply to the Metropolis, derived both from the Thames and the Lea, has continued excellent. It is the admitted character of river-derived water to vary in composition, although for the most part within a very small range, from week to week and month to month; and although it is satisfactory to know that during times of heat and drought, when the maintenance of a high standard of excellence in drinking water is more especially called for, the state of the river as a source of supply is at its best, it is hardly less satisfactory to observe, by means of adequate storage reservoirs and filter-beds, how slight, for the most part, is the influence, upon the character of the water supply, of the less favourable condition of the river prevailing in rainy seasons. Although somewhat reduced by the results recorded during the month of August, the mean standard of purity for the four preceding months was decidedly high; and notwithstanding the altered condition of the river during the past month, in only one particular do the results obtained differ appreciably from the mean results of the previous four months; and that particular—viz., the degree of freedom from colour-tint when subjected not to mere inspection, but to the exact determination afforded by the colorimeter—not one of any weighty significance. As regards the proportion of organic matter present, as measured by the determination of the organic carbon, the mean result for the month furnished by the Thames-derived supplies, was 0.164 part of organic carbon in 100,000 parts of the water, as against a mean of 0.159 part for the previous four months, during which time, moreover, the maximum proportion met with during the past month, or 0.191 part in 100,000 parts of the water, was in several instances attained and exceeded. In the case of the East London Company's water derived from the Lea, the difference was in the same direction, and to a similar insignificant extent; the mean amount of organic carbon for the month being 0.155 part in 100,000 parts of water, as against a mean of 0.148 part for the previous four months."

NOTES FROM SCOTLAND. (FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

The Edinburgh and Leith Gas Commissioners' meetings are of interest on account of the circumstance that so many gentlemen have been suddenly placed in the responsible position of having the control of the valuable property connected with artificial lighting; and it is only to be expected that now and then some "original notions" should be ventilated by the Commissioners in their new position. There has not been much of that sort of thing, possibly on account of the precaution of having all ordinary business first considered in Committee; but there have been one or two instances. A few weeks ago several of the Commissioners made a good deal out of the method of selling coke; but whether it was popularity for themselves, or capital for the Commissioners which they were seeking, is a question I decline to answer. They took exception to a contractor buying several thousand tons of coke for their works at from 5s. to 6s. per ton, while poor people purchasing in hundredweights were charged as high as 10s. 6d. An attempt was also made to create a quite unworthy feeling in the Commission against selling the coke to strangers, and particularly against giving a stranger a large order at a lower figure than that at which a local gentleman had obtained a much smaller order. These questions, of no great value in themselves, were treated with so much warmth that a remit to a Committee was necessary to enable the points raised to be coolly considered. This process has now been gone through; and at Wednesday's meeting the Committee's report resolving to sell coke on the best terms obtainable—the normal rate being 7s. a ton—was agreed to without comment. That is to say, the good sense of the majority of the Commissioners prevailed, and they have resolved, in the matter of coke at least, to conduct their concern on business principles, and not as a benevolent institution which is not the object of their existence. This resolution did not interfere with the one which immediately followed, and which is in every way exceedingly appropriate—viz., to distribute 1000 tickets entitling the holder to a hundredweight of coke for 3d. If on no other ground, this is a commendable practice on account of its being a good advertisement of the Commissioners' coke.

The Dundee Gas Commissioners made an official inspection of their gas-works last Thursday. The Engineer (Mr. J. M'Crae) conducted the party over the works; and everything was found in good order. Attention was directed to the employment of tar for firing steam-boilers, in connection with which it was explained that for this purpose a ton of tar is equal to 2 tons of coal. The regenerator furnaces—an adaptation by Mr. M'Crae of the Siemens furnace—were found to be giving excellent results; and the much-talked of air-process of purification was also explained. The inspection lasted fully an hour and a half; and at its close, Lord Provost Hunter, on behalf of his fellow Commissioners, expressed their thorough satisfaction with the condition of every department of the works, not only in regard to the means at the disposal of the staff for the manufacture of the large quantity of gas now being made, and for carrying on the relative work, but on the method, order, and cleanliness everywhere observable. The output of the works is at present 2,400,000 cubic feet per day.

Last Sunday morning, damage to the amount of nearly £1000 was done to the building of the Heriot-Watt College in Edinburgh, the origin of which is believed to have been the fusing of an electric light wire. The College which was only opened this year, was lighted by electricity at a cost of more than £2000. On Saturday night only a portion of the building was lighted; and it is surmised that the extra strength of the current passing through the wire leading to the apartments which were occupied had resulted in the fire.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

The proposal on the part of a majority of the Glasgow Corporation Gas Committee to take from the past year's gas surplus a sum of £3000 and apply it to the general purposes of the Corporation, has already raised some opposition outside the Council. At a recent meeting of the Fifth Municipal Ward Committee, the Secretary was instructed to request the ward representatives to oppose the motion when it comes up for discussion, as it was considered that the funds of one Trust should be applied to the benefit of the ratepayers directly interested in the Trust; in other words, that the gas consumers should get all the benefit that can result from surplus profits made by the gas undertaking.

The Town Council of Coatbridge, at their last meeting, had under consideration a report from the Fire and Lighting Committee, in which it was stated that they had had an interview with Mr. Wilson, Secretary and Manager of the Gas Company, regarding the terms of a new gas contract. He stated that the Directors of the Company had offered to supply gas for the street lamps, &c., by average meter, at 3s. 9d. per 1000 cubic feet. After full consideration was given to the matter, however, the Committee resolved to recommend that the Council should take in hand the lighting and extinguishing of the lamps themselves. Mr. Sharp explained to the Council that after the Committee had drafted their report, the Directors of the Company had, at an interview, agreed to take off 2s. 6d. per lamp, and do the lighting, cleaning, and storing, which would reduce the charges to 32s. 6d. and 37s. 6d. per lamp. The Committee, however, had previously decided on doing the lighting and cleaning after December themselves, as they believed it would be cheaper. The next thing was the number of meters to be fixed; and it was thought by the Committee that there should be one meter for every twelve lamps, but the Directors wanted a meter for every ten lamps. For each meter the cost would be £1 10s. On the motion of Bailie Gilchrist, it was remitted back to the Committee to come to an amicable settlement in regard to the meters; it being understood that the contract with the Company was only to be renewed in so far as the supply of gas was concerned.

The Royal Burgh of Renfrew seems to be getting deeper and deeper into the mire with regard to its gas supply, which is in the hands of the Town Council. There was lately a very serious difficulty with the supply, inasmuch as on a recent Friday, there had been burned over a period of 24 hours, 52,100 cubic feet of gas; so that on the Saturday morning the amount of gas left was only 3000 feet. On the suggestion of the Provost, it was remitted to the Gas Committee to look into the matter of gasholder accommodation, and see what could be done to improve it, and report to the Council. It may be remembered that several years ago the Renfrew municipal authorities made overtures to the Glasgow Corporation Gas Committee to contract to extend their gas-mains to Renfrew and supply the town with gas. Already the mains extend to the burgh of Govan and to Linthouse, where there is a large shipbuilding and engineering establishment, with a considerable resident population. The proposal was not entertained by the Glasgow Gas Committee. For the present, therefore, the town must continue to be in a bad way in respect of its gas supply, and help must come from itself, or from the adjoining burgh of Paisley, which perhaps might entertain such overtures as those which were made to Glasgow.

The shares of the Partick, Hillhead, and Maryhill Gas Company have

Issue.	Share	When ex- Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon invest- ment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	12 Oct.	10½	Alliance & Dublin 10 p. c.	10	18½—19	..	5 10 6
100,000	10	"	7½	Do. 7 p. c.	10	12½—13½	..	5 11 1
300,000	100	2 July	5	Australian (Sydney) 5½ p. c. Deb.	100	111—113	+1	4 8 6
100,000	20	29 Nov.	10	Bahia, Limited	20	24—25	..	8 0 0
200,000	5	14 Nov.	7½	Bombay, Limited	5	62—71	..	5 8 3
40,000	5	"	7½	Do. New	4	5—5½	..	5 9 1
380,000	Stock.	29 Aug.	11½	Brentford Consolidated	100	223—228	..	5 3 1
125,000	"	"	12	Do. New	100	164—168	..	5 4 2
220,000	20	13 Sept.	10½	Brighton & Hove, Original	20	43—45	..	4 13 4
320,000	20	28 Sept.	11½	British	20	43—45	..	5 0 0
50,000	10	13 Sept.	11	Bromley, Ordinary 10 p. c.	10	19—21	..	5 4 9
39,000	10	"	8	Do. 7 p. c.	10	13—14	..	5 14 3
328,750	10	14 Nov.	8	Buenos Ayres (New) Limited	10	13½—14½	..	5 10 4
200,000	10	2 July	6	Do. 6 p. c. Deb.	100	110—112	..	5 7 1
150,000	20	10 Aug.	7	Cagliari, Limited	20	26—28	..	5 0 0
550,000	Stock.	12 Oct.	13½	Commercial, Old Stock	100	257—262	..	5 4 11
130,000	"	"	10½	Do. New do.	100	209—214	..	5 0 5
121,234	"	28 June	4½	Do. 4½ p. c. Deb. do.	100	123—128	..	8 10 3
557,320	20	13 Dec.	13	Continental Union, Limited	20	44—46½	+1	5 13 0
242,680	20	"	13	Do. New '69 & '72	14	30—32½	+½	5 13 7
200,000	20	"	10	Do. 7 p. c. Pref.	20	36—38½	..	5 5 3
75,000	Stock.	28 Sept.	10	Crystal Palace District	100	205—215	..	4 13 0
234,060	10	27 July	13	European, Limited	10	254—263	..	4 18 1
120,030	10	"	13	Do. New.	7½	18—19	..	5 2 7
354,060	10	"	13	Do. do.	5	12—13	..	5 0 0
5,468,600	Stock.	29 Aug.	13	Gaslight & Coke, A, Ordinary	100	249—253	..	5 2 9
100,000	"	"	4	Do. B, 4 p. c. max.	100	100—105	..	3 16 3
665,000	"	"	10	Do. C, D, & E, 10 p. c. Pf.	100	257—262	..	3 16 4
30,000	"	"	5	Do. F, 5 p. c. Pref.	100	125—130	..	3 16 11
60,000	"	"	7½	Do. G, 7½ p. c. do.	100	182—187	..	4 0 2
1,300,000	"	"	7	Do. H, 7 p. c. max.	100	167—172	..	4 1 4
463,000	"	"	10	Do. J, 10 p. c. Pref.	100	255—260	..	3 16 11
1,061,150	"	13 Dec.	4	Do. 4 p. c. Deb. Stk.	100	118—121	..	3 6 1
294,850	"	"	4½	Do. 4½ p. c. do.	100	122—127	..	3 10 10
650,000	"	"	6	Do. 6 p. c. do.	100	170—175	-2	3 8 6
3,600,000	Stock.	14 Nov.	10	Imperial Continental	100	204—207	..	4 16 6
75,000	5	13 Dec.	6	Malta & Mediterranean, Ltd.	5	5—5½	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	113—115	..	4 6 11
541,920	20	29 Nov.	6	Monte Video, Limited	20	19—20	..	5 0 0
150,000	5	29 Nov.	10	Oriental, Limited	5	82—91	..	5 8 1
60,000	5	28 Sept.	7	Ottoman, Limited	5	6—7	..	5 0 0
166,870	10	27 July	4	Pará, Limited	10	5½—6½	..	6 3 1
420,000	100	2 Nov.	6	People's Gas of Chicago— 1st Mtg. Bds.	100	104—107	..	5 12 1
500,000	100	1 Dec.	6	2nd Do.	100	92—97	..	6 3 9
100,000	10	12 Oct.	10	San Paulo, Limited	10	154—164	..	6 1 2
500,000	Stock.	29 Aug.	15½	South Metropolitan, A Stock	100	237—242	..	5 2 7
1,350,000	"	"	12	Do. B do.	100	232—236	-1	5 1 8
141,500	"	"	13	Do. C do.	100	245—255	..	5 1 11
630,000	"	28 June	5	Do. 5 p. c. Deb. Stk.	100	135—140	..	3 11 5
60,000	5	29 Aug.	11	Tottenham & Edm'ton, Orig.	5	11—13	..	4 4 0
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WATER COMPANIES.								
717,167	Stock.	28 June	9	Chelsea, Ordinary	100	260—265	..	3 7 11
1,720,560	Stock.	12 Oct.	7	East London, Ordinary	100	199—202	..	3 9 9
700,000	50	13 Dec.	9	Grand Junction.	50	121—125*	..	3 12 0
708,000	Stock.	10 Aug.	10½	Kent	100	275—280	..	3 15 0
1,043,800	Stock.	28 June	9	Lambeth, 10 p. c. max.	100	257—262	+2	3 8 8
406,200	100	"	7½	Do. 7½ p. c. max.	100	200—205	..	3 13 2
200,000	Stock.	28 Sept.	4	Do. 4 p. c. Deb. Stk.	100	117—120	..	3 6 8
500,000	Stock.	27 July	13½	New River, New Shares	100	350—360	..	3 7 4
1,000,000	Stock.	"	4	Do. 4 p. c. Deb. Stk.	100	123—127	..	3 3 0
902,300	Stock.	13 Dec.	6	S'th'w & V'hall, 10 p. c. max.	100	166—171	-2	3 10 2
128,500	100	"	6	Do. 7½ p. c. do.	100	158—163*	..	3 13 7
1,155,066	Stock.	"	10	West Middlesex	100	261—265*	..	3 15 6
* Ex div								

THE ACCOUNTS OF THE AIRDRIE AND COATBRIDGE WATER COMPANY.—In the House of Commons last Wednesday, Mr. Donald Crawford gave notice that he should ask the Lord Advocate on Saturday whether his attention had been called to a report by Mr. J. Muir, C.A., on the accounts of the Airdrie and Coatbridge Water Company, in which it was stated that the Directors had levied rates exceeding those authorized by Parliament, and adopted a method of accounts which deprived the ratepayers of a reduction of rates amounting to upwards of £5000; whether any contradiction or explanation of the above statement had been given since the report was published on Nov. 17; and whether he will inquire into the matter, and consider what remedy can be afforded to the ratepayers.

DESTRUCTION OF A TAR DISTILLERY BY FIRE.—Last Wednesday night, a disastrous fire occurred at Cardiff, resulting in the total demolition of the large tar distillery works belonging to the Cardiff Collieries Supply Company. The fire, it is supposed, originated in the boiler-house; and within a very short time the whole works was one mass of flame. In it were large tanks filled with some thousands of gallons of naphtha and various oils. In one large tank were 3000 gallons of creosote; and between 500 and 600 tons of resin in bulk were stored in the yard. The Dock and Town Fire Brigade were speedily on the spot; but they were absolutely powerless to do anything. The damage is estimated at from £10,000 to £15,000.

THE WATER SUPPLY OF PONTEFRAC AND DISTRICT.—At the last meeting of the Pontefract Town Council, it was reported that the wells were now yielding 96,346 gallons of water per day. A letter was subsequently read from the Castleford Local Board inquiring the terms on which the Corporation would supply their district with water when the new scheme proposed was carried out. In reply, the Corporation offered a supply at 7d. per 1000 gallons. The Finance Committee recommended that under the Borough Extension Act, 1865, the Corporation should apply for a Provisional Order to extend their borrowing powers from the present limit of £23,352, in order to supply adjoining districts with water, and for extending the water-mains. This proposal was agreed to after some animated discussion.

THE PROPOSED ELECTRIC LIGHTING SCHEME OF THE DUBLIN CORPORATION.—At the meeting of the Municipal Council yesterday week, the Town Clerk read a letter from the Special Committee appointed to consider the question of the Corporation undertaking electric lighting in the city.

The letter described the present position of the matter, and submitted that as the Gas Company were no longer proceeding for a Provisional Order, it would probably be found more expeditious and less expensive for the Corporation to seek powers for supplying electricity for public and private purposes, either by an extension of the Licence now about to issue, or by seeking a new Licence. Mr. Robinson, Chairman of the Public Lighting Committee, moved the adoption of the letter. The Committee, he said, were in doubt whether they should proceed by Provisional Order or obtain powers by means of a Licence. The latter would only be available for seven years; but an Order would be unlimited as to time. If they took the seven years' Licence, they would not be able to make as good terms with the contractors as if they had the Provisional Order; but, on the other hand, an Order would entail petitions against the Corporation, and a contest over the matter. An Order, before it took effect, would also have to be confirmed by Act of Parliament; while the Licence could be obtained at much less expense, and could be renewed when the seven years had expired. Mr. Mayne, M.P., seconded the motion, and it was adopted.

THE WATER SUPPLY OF HYTHE.—The Hythe Town Council met on Monday last week to take into consideration the terms of the Bill intended to be introduced into Parliament next session for various powers; the most important object being to acquire, compulsorily or by agreement, the Black Rock Spring. In reply to several questions, the Town Clerk (Mr. G. Wilks) made a long statement, in the course of which he said the Black Rock Spring yielded 50,000 gallons every 24 hours; and the level of the water was sufficient not only to supply the Seabrook portion of the borough, but also to a very large extent to give a constant supply to every house in the town without the aid of machinery. They were bound to provide a water supply for the new portion of the borough which was springing up at Seabrook; and he stated that the gross estimated rental of the houses in that district amounted to considerably over £900 a year. At the present time Seabrook was supplied by the Sandgate Local Board, under an agreement which could at any time be terminated at one month's notice. Various clauses in the proposed Bill were considered; and one authorizing the Council to enlarge their present borrowing powers for the purposes of the Bill, and the purposes of their water-works undertaking generally, was carried. The clause authorizing the Council to levy rates and charges for the purposes of the Bill was also carried; and eventually it was decided that the corporate seal be affixed to the necessary preliminary petition.

GWYNNE & CO., ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C. GWYNNE & BEALE'S PATENT GAS EXHAUSTERS & ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

Exhausters of nearly all sizes in Stock.

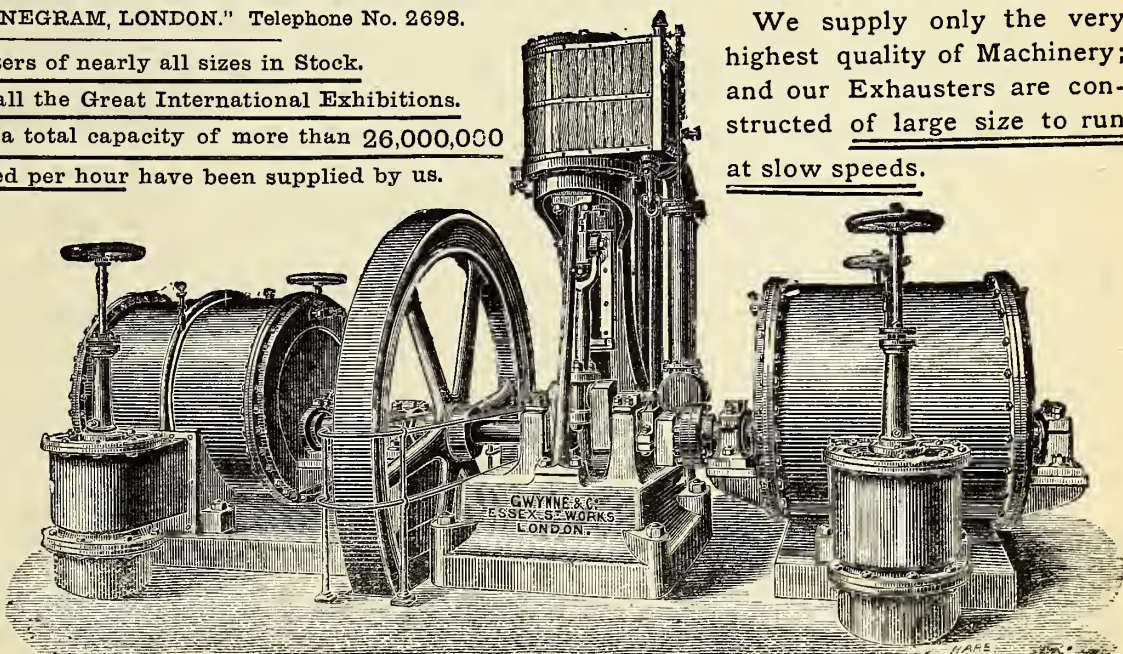
Prize Medals at all the Great International Exhibitions.

Exhausters equal to a total capacity of more than 26,000,000 cubic feet passed per hour have been supplied by us.

Our new Patent Non-Fluctuating Exhausters, to work without the slightest oscillation or variation in pressure, are strongly recommended.

MAKERS OF EVERY DESCRIPTION OF HYDRAULIC AND GAS MACHINERY.

Gwynne & Co.'s New Catalogue and List of Testimonials can now be obtained on application.



Exhausters and Vertical Engine as supplied for both the Fulham and Bromley-by-Bow Stations of The Gaslight and Coke Company.

We supply only the very highest quality of Machinery; and our Exhausters are constructed of large size to run at slow speeds.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application. Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C. JOHN WM. O'NEILL, Managing Director.

ANDREW STEPHENSON, Agent for the Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.

CANNEL COAL, &c.

JOHN ROMANS & SON, EDINBURGH. Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS. Prices, &c., will be forwarded on application to No. 30, ST. ANDREW SQUARE, EDINBURGH, } Scotland. No. 54, BERNARD STREET, LEITH, }

SULPHURIC ACID, B.O.V., for Sulphate of Ammonia Making. Guaranteed clear, of full strength, and to produce a fine white-coloured salt. Delivered in carboys or railway tank wagons. For prices and terms address **BALE, BAKER, AND CO.**, 120 & 121, Newgate Street, LONDON.

TIMMIS & CO., of STOURBRIDGE

Make only the best quality of FIRE-CLAY RETORTS, BRICKS, TILES, & LUMPS. Also SPECIAL SILICA BRICKS, to stand great heats. All descriptions kept in Stock. For Prices apply to **JAMES LAWRIE AND CO.**, 63, Old Broad Street, E.C., Sole Agents for London and District. Telegraphic Address: "EIRWAL, LONDON."

ALEX. WRIGHT & Co., 55, 55a, and 56, MILLRANK STREET, LONDON, S.W. [Telegraphic Address: "PRECISION LONDON."] Makers of Wet and Dry Gas-Meters, Station Meters and Governors, Photometers, and Gas-Testing Apparatus, Test Gas-holders and Meters, Registering and other Gauges, &c., &c. * See Advertisement on Page III. of the Wrapper of last week's issue.

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gas-holders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings. * See Advertisement on p. III. of Wrapper of this week's issue. Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

ACETATE OF LEAD BOOKS.

TEST Papers and Solutions for Gas- Works prepared by **R. D. Gibbs**, Summerfield Crescent, Birmingham. Analysis of Coal, Oxide, and all Gas Materials.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased. 120 and 121, NEWGATE STREET, LONDON, E.C.

TUBES.

FOR Gas, Steam, and Water; Galvanized, White Enamelled, and Hydraulic Tubes and Co. JOHN SPENCER, Globe Tube Works, WEDNESBURY; and 14, Great St. Thomas Apostle, LONDON.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID for making SULPHATE OF AMMONIA of high quality and colour. Highest References and all particulars supplied on application.

HUTCHINSON BROTHERS, Barnsley, Gas Engineers and Contractors, Makers of Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Tools, and Sundries. * See large Advertisement in last week's issue, page 911.

FOR SALE—A Tar and Ammonia Works in Yorkshire. Well situated for obtaining Tar and Liquor. Terms easy. Address Box 25, Post Office, HECKMONDWIRE.

TO CHEMICAL MANUFACTURERS & OTHERS.

TO LET—Extensive Premises, situate between Wrexham and Rnabon, on a Branch of the Great Western Railway, consisting of Large SHED, 167 feet long by 25 feet wide; BUILDINGS, 37 feet by 28 feet; 67 feet by 27 feet; and 25 feet by 20 feet; WHARF, 500 feet long, with Railway Siding running the whole length. Within easy access, by rail, of several large Gas-Works.

Apply to GEO. E. WOODFORD, RUABON.

SITUATION Wanted as Fitter in a Gas or other Works. Twenty years' experience in Lead and Iron Pipe Fitting. Can put in Mains and Services, Fix Meters, House Fittings, Gas-Stoves, Repair Lamps, and do General Repairs at Works.

Address JOHN KEMP, 60, Cannon Street, Blackpool, LANCASHIRE.

INSPECTOR.

WANTED, by the Richmond (Surrey) Gas Company, a competent Man as INSPECTOR. Candidates must have had good experience in Main and Service Laying, Inspection and Testing of Meters, and the general outdoor work of a Gas Company.

Applications, in own handwriting (accompanied by not more than three recent testimonials), stating wages required, age, and present employment, to be addressed to the ENGINEER, Gas-Works, Richmond, SURREY.

Dec. 14, 1888.

SHEFFIELD UNITED GASLIGHT COMPANY.

WORKS SUPERINTENDENT.

WANTED, by the Directors of this Company, an experienced and competent Man to act as SUPERINTENDENT at their Effingham Street Gas-Works.

He will be required to reside on the Works; House, Coal, and Gas free. The maximum make of Gas at this station is about three-and-a-half million cubic feet per day.

Applications, stating age, previous engagements, and salary required, to be made by letter only, addressed to Sir Fredk. T. Mappin, Bart., M.P., Chairman of the Company, Gas Offices, Sheffield, not later than Monday, the 7th of January, 1889.

Testimonials not to be sent till asked for.

HAMBURY THOMAS, General Manager.

Commercial Street, Sheffield,
Dec. 14, 1888.

GAS EXHAUSTERS WANTED.

THE Gas Committee of the Bingley Improvement Commissioners hereby invite Manufacturers of Exhausters to TENDER for the Construction and Erection of a Set of DUPLICATE EXHAUSTERS at their Gas-Works.

Form of tender, &c., to be had from the undersigned.

By order,
GEORGE DUNBAR MALAM, Engineer.

Dec. 17, 1888.

RAMSGATE CORPORATION.

(GAS AND WATER DEPARTMENT.)

THE Committee invite Tenders for the supply of a STATION METER, to pass 40,000 cubic feet per Hour, with 14-inch Slide-Valves and Connections, and Bye-pass.

Tenders to be sent in not later than Tuesday, Jan. 1, 1889.

The Committee do not bind themselves to accept the lowest or any tender.

Full particulars on application to

WILLIAM A. VALON, Engineer.

BOROUGH OF DARWEN.

(GAS-WORKS DEPARTMENT.)

TENDERS FOR PURIFIERS.

THE Corporation are prepared to receive TENDERS for the Supply and Erection of Three New PURIFIERS, each 25 feet by 30 feet, with Pillars and Girders complete. Also the REMOVAL of one of similar size, from one building to another.

Plans and Specifications may be seen, and all necessary information obtained from the Gas Engineer, Mr. Thos. Duxbury, Charles Street, Darwen.

Sealed tenders, endorsed "Tender for Purifiers," to be delivered at my Office, on or before Nine a.m. on the 31st of December.

The Corporation do not bind themselves to accept the lowest or any tender.

By order,

CHAS. COSTEKER, Town Clerk.

Town Clerk's Office, Darwen,

Dec. 5, 1888.

BRISTOL UNITED GASLIGHT COMPANY.

AMMONIACAL LIQUOR.

THE Directors of this Company invite TENDERS for the purchase of the AMMONIACAL LIQUOR to be produced at one or either of their three Stations during a period of One, Three, Five, or Seven years, commencing on the 1st day of July, 1889.

The annual quantities and strengths of the Liquor produced at each of the Stations at present are approximately as follows:—

	Gallons.	Strength.
Canons' Marsh Station,	1,000,000	of 14 ounce
Avon Street	1,300,000	" 15 "
Stapleton	700,000	" 17 "

Conditions of Contract, and forms of tender, may be obtained on application to the undersigned, to whom also tenders, sealed, and endorsed "Tender for Ammoniacal Liquor," must be delivered not later than Ten a.m. on Monday, the 28th day of January, 1889.

The Directors do not bind themselves to accept the highest or any tender.

JAS. V. GREEN, Secretary.

Chief Offices: Canons' Marsh,
Bristol, November, 1888.

OXIDE OF IRON.

THE Directors of the Colchester Gas Company invite TENDERS for the supply of 60 tons IRISH BOG ORE, to be delivered at the Company's Wharf, Colchester. Also for the PURCHASE of about 250 tons SPENT OXIDE, f.o.b. Colchester.

Tenders and samples to be sent to the undersigned on or before the 31st inst.

SIDNEY E. STEVENSON, Manager.

Gas-Works, Colchester, Dec. 19, 1888.

HARWICH GAS AND COKE COMPANY.

THE Directors of the said Company are prepared to receive TENDERS for the supply of TAR and AMMONIACAL LIQUOR produced at their Works during 1889.

Information thereon can be obtained of the Secretary, Harwich.

Tenders to be sent, under Seal, to the Secretary, by Tuesday, the 8th day of January, 1889.

The Directors will not be bound to accept the highest or any tender.

EDWARD CHAPMAN, Secretary.

Harwich, Dec. 21, 1888.

TO GASHOLDER MAKERS.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for RE-SHEETING a Two-lift GASHOLDER (115 feet in diameter) at their Effingham Street Station; and also for ENLARGING THE SAME by adding a third Lift thereto.

Specifications and Drawings may be seen on application to, and forms of tender, with bill of quantities, obtained from the Company's Engineer, Mr. Fletcher W. Stevenson.

The Directors do not bind themselves to accept the lowest or any tender.

Tenders, marked "Tender for Repairing and Enlarging Gasholder," to be addressed to the undersigned not later than Monday, Jan. 7, 1889.

HAMBURY THOMAS, General Manager.

Gas Offices, Commercial Street,
Sheffield, Dec. 14, 1888.

CORPORATION OF LEICESTER.

CAST-IRON PIPE CONTRACT.

THE Gas Committee of the above Cor-poration are prepared to receive TENDERS for the supply of the necessary CAST-IRON PIPES and CONNECTIONS, from 3 inches to 24 inches in diameter, required during the Twelve months ending the 31st of December, 1889.

Specification and form of tender to be obtained from the Engineer.

Tenders, addressed to Councillor Lennard, Chairman, and endorsed "Tender for Cast-Iron Pipes, &c.," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, Jan. 12, 1889, prox.

The Committee do not bind themselves to accept the lowest or any tender.

ALFRED COLSON, C.E., Engineer and Manager.
Gas Offices, Millstone Lane,
Leicester, Dec. 14, 1888.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Invention may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.
Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on application.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

Prices are Reduced.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

WENLOCK IRON WHARF, 21 & 22, WHARF ROAD,
CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter; and make and erect to order RE-TORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

To effect a great saving in

GAS-FURNACES use our
Special **GANNISTER BRICKS.**
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Consulting & Contracting Gas Engineers,
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LAURENCE POUNTNEY HILL,
CANNON STREET, LONDON.

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On Special Terms or Guaranteed Dividends.

Contractors for the Erection of New and Remodelling of existing Gas-Works from own or Engineers' Drawings.

25 Years' experience in Gas Manufacture and Distribution in London and the Provinces.

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Agents for Fire-Clay Goods and other Gas-Plant. Also for Foreign Gas Companies.

All Communications to be addressed to the Firm.

Telegraphic Address: "GASIFICATION, LONDON."

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD**BLACK BED GAS COAL.***Prices and Analysis on application.***MIRFIELD (GAS-COAL) COLLIERY COMPY.****MIRFIELD, NORMANTON.****CAST-IRON PIPES**

FOR GAS AND WATER.

VALVES

FOR GAS, WATER, AND STEAM.

TELEGRAMS: "PIPES GLASGOW."

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ARTIFICIAL PEROXIDE OF IRON,**LUX MASS,**

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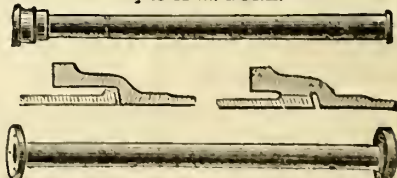
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GAS AND WATER PIPES.

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GLASGOW;

AND BON LEA FOUNDRY,

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Makers of SANITARY & RAIN PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.

